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# Improving Australia's containerised grain exports

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Australian Export Grains Innovation Centre

# Improving Australia's containerised grain exports

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Department of  
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AEGIC is an initiative of the Western Australian State Government  
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# Improving **Australia's containerised grain exports**

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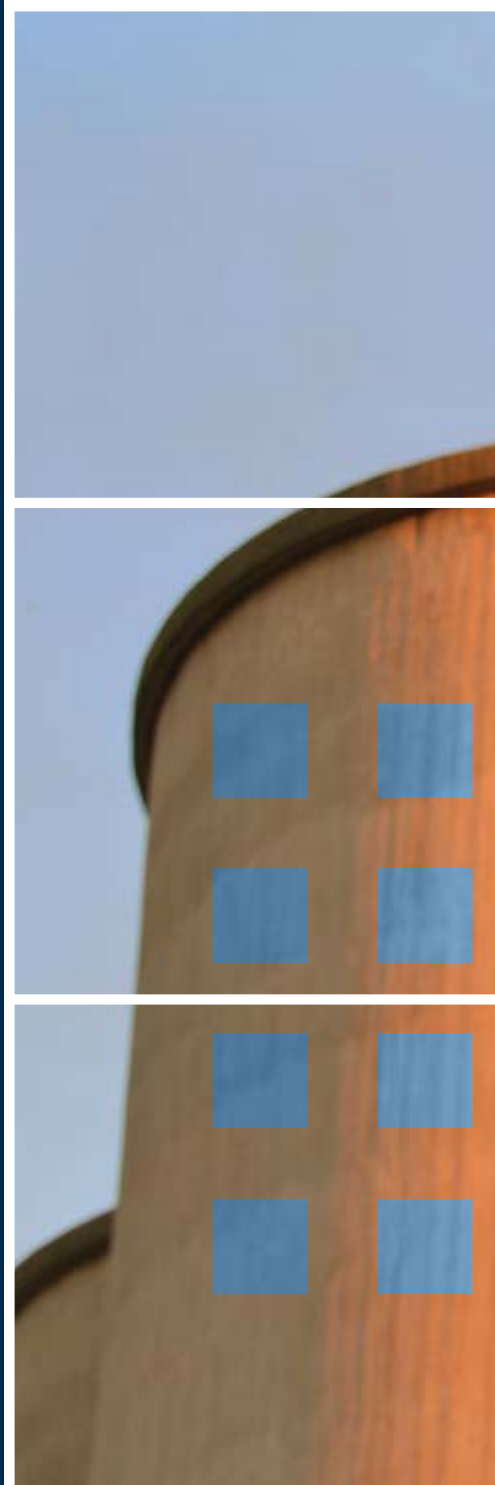
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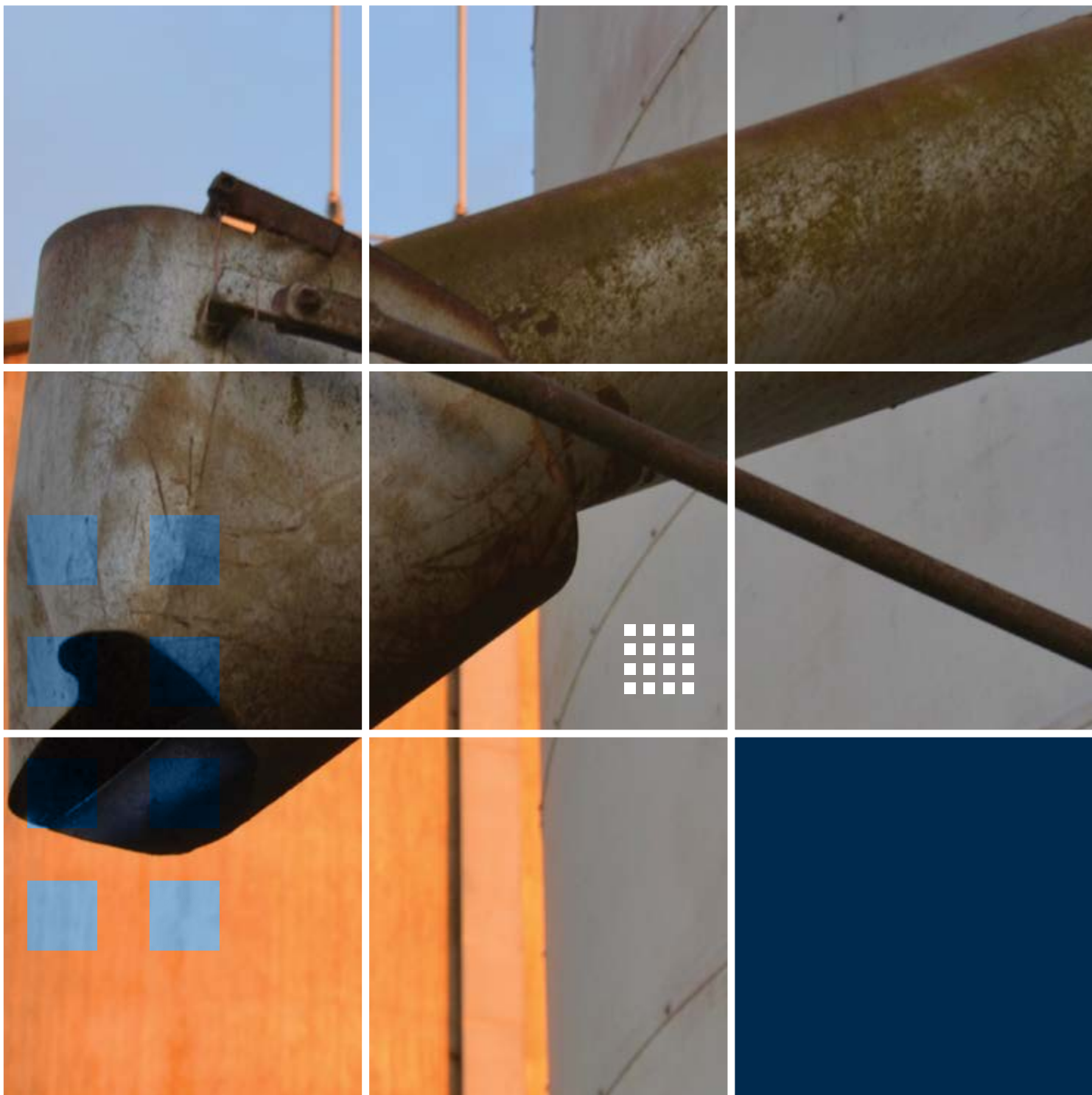
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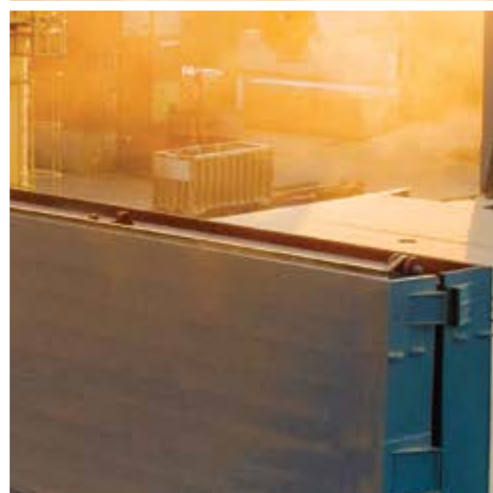






**3mmt**

Australia annually  
exports over 3mmt of  
containerised grain.







# Acknowledgements

We would like to thank Nigel Hart for his useful input, prior to his taking on the role of Managing Director of the GRDC, in helping fashion this report and undertaking some activities that this report draws upon.

Several farmers, exporters of containerised grain and fodder, government officials and other businesses or entities that are key service providers in bulk and containerised grain supply chains usefully engaged with the project team to ensure we were well-informed about the nature of bulk and containerised supply chains. Many of these individuals and organisations were usefully clear and honest about the challenges they were facing. We thank them for their time and preparedness to share with us their insights and concerns.

## Preface

This report provides an overview of Australia's containerised grain export supply chains. We compare them to Australia's bulk grain supply chains. The report does not analyse in fine detail the characteristics of particular containerised grain supply chains to identify specific opportunities for their improvement. Rather the report outlines the main broad ways in which Australia's containerised grain supply chains can be improved by investment, policy or regulatory change and education.



**>70%**

Over 70 per cent  
of Australia's grain  
packing businesses are  
in eastern Australia.

# Recommendations

## Market access

- Develop and support new or existing market opportunities for Australian grain and fodder and identify opportunities that fit the capabilities of Australia's supply chains.

## Supply chain investment

- Support investments that create or maintain least-cost, low emission grain paths for containerised grain and fodder.
  - Support infrastructure investments that complement the Inland Rail to facilitate cost-effective movement of containerised grain and fodder, and empty containers.
  - Invest in transport modes and pathways that increase mass limits.
  - Invest in infrastructure to fix inefficiencies in the supply chain caused by larger ships, inadequate rail access to some container ports, and a shortage of space in some empty container parks.
  - Invest in protection and maintenance of buffer zones of container transport corridors.

## Grower education

- Educate growers and other prospective participants about execution risks associated with containerised grain.
- Educate these same participants about how to soundly manage these risks when exporting containerised grain and fodder.

## Oversight and regulation

- More effectively monitor bulk and container supply chains to support evidence-based policy-making and beneficial investment.
  - More effectively regulate container ports to boost their efficiency and avoid anti-competitive behaviour.
  - Ensure container port developments by governments and industry achieve enduring economic and ESG (environmental, social, governance) outcomes rather than sole short-term budgetary relief or commercial advantage to incumbents.
  - Review and appropriately regulate domestic and international container shipping.
  - Enhance coordination and provision of data hubs to facilitate management and investment in containerised grain supply chains.
  - Protect and maintain buffer zones of least-cost, low emission containerised grain pathways.
- Frequently revise biosecurity protocols and processes underpinning containerised grain exports to improve their cost-effectiveness. Continuously improve the training of authorised officers.
- Investigate policies and regulations to cost-effectively reduce export execution risks in containerised grain supply chains.
- Where appropriate, further align transport regulations to form national standards to support least cost corridor networks.
- Help devise cost-effective responses to the structural challenge of gradual reduced availability of 20ft food grade containers.

# Key findings



## Australia regularly exports over 3mmt of grain in containers

There are over 100 grain container packing businesses in Australia and over 70 per cent are located in NSW, Vic or Qld. In these three states the export of containerised grain is especially important. Over the period 2014–15 to 2020–21 containerised grain exports accounted for 36, 28 and 34 per cent of all grain exports in Vic, NSW and Qld respectively. Nationally, over the same period, containerised grain exports annually averaged 3.24mmt.



## Australia regularly exports around 1mmt of fodder in containers

Complementing containerised grain exports are exports of fodder. Often unappreciated is how much fodder is exported via containers from Australian ports. Over several decades Australia has developed some key markets for export hay, with often around 1mmt of fodder being exported via containers from Australia.



## Relative to the bulk export of grain, containerisation offers several advantages but also some disadvantages

This report outlines the advantages and disadvantages of exporting grain and fodder in containers and compares the nature and costliness of typical containerised grain supply chains against those of bulk export supply chains. The many advantages of containerisation ensure it will remain an important part of the supply of Australian grain to overseas customers.

The per tonne costs of containerised grain supply chains, prior to ocean freight charges, are not greatly different from the costs of Australia's bulk grain supply chains. However, by far the main cost component of containerised grain supply chains is sea freight. Its cost exploded during 2020 and 2021 with rates quadrupling or being even higher, leading to massive increases in profits for container shipping lines. The divergence in price trends between bulk grain and containerised grain sea freight rates in 2020 through to 2022, however, greatly eroded the profitability of containerised grain and fodder exports from Australia. This divergence of sea freight rates was mostly due to COVID impacts.

A review of bulk supply chain costs reveals WA growers receive a larger income per tonne for the same crop grade compared to growers in eastern states and SA. For similar situations (i.e. same grade, quality and distance from port), WA growers in 2020–21 likely received up to \$22/tonne at a receival site more than growers in SA and likely received up to \$18/tonne more in 2021–22. These differences affect the profitability of grain production on farms.



## The ramifications of COVID have greatly affected the profitability of containerised grain exports

Since 2020 the spread of COVID greatly affected the profitability of export of containerised grain and fodder. COVID impacts altered household demand for various consumer products and reduced the reliability and availability of shipping containers and container shipper services. Unfortunately, the export of containerised grain and fodder from Australia was one casualty of these COVID impacts. The ease and profitability of exporting grain and fodder in containers greatly deteriorated during 2020 and these difficulties have extended into 2022. This report outlines reasons for these problems and useful responses by governments and industry.

This report finds that the main difficulties in exporting containerised grain and fodder from Australia are unfortunately largely beyond the control of Australian governments and the Australian grains industry. Some of these difficulties, however, are not permanent. Structural adjustment in shipping services and shipping container availability eventually will remedy the situation experienced mostly in 2020 and into 2022. Nonetheless, due to the depth and longevity of the period of adjustment, many Australian businesses greatly exposed to the problems in exporting containerised grain and fodder have suffered substantial losses or reductions in profit from 2020 into 2022, despite the volumes of exports of containerised grain being maintained. Growers directly involved in containerised grain exports have in some cases altered their planting intentions due to erosion in profit margins of some crops.



## Government and industry actions can generate enduring value for the Australian containerised grain and fodder export industry

These actions are not simply band aid remedies but are immediately and strategically worthwhile actions. Some actions are relatively easy to implement quickly. Others are liable to prove more challenging to introduce. Yet both sets of actions can create and protect enduring value for Australia's export of grain and fodder in containers.

Beneficial actions exist in four areas: market access; supply chain investment, oversight and regulation; and grower education.

### Market access

Collaboration between Australian governments and the Australian grains industry can ensure new or existing market opportunities for Australian containerised grain and fodder are maintained, further developed, or freshly developed. This is a traditional yet worthwhile ongoing focus of engagement between governments, state and federal, and grains industry stakeholders.

Growing populations and per capita wealth in East Asia, South East Asia and South Asia underpin increasing market opportunities for Australian containerised grain and fodder, especially where end users have a preference or sole ability to receive containerised products.



## Supply chain investment

Opportunities for new investments in supply chain infrastructure can create or maintain least-cost, low emission grain paths for containerised grain and fodder. Such least-cost, low emission grain pathways are essential if Australia's international competitiveness is to be protected and road congestion around ports is to be reduced. In eastern Australia are opportunities for investments to complement the Inland Rail and thereby facilitate the cost-effective, low emission movement of containerised grain and fodder. Some of these investments are already underway or are being planned within the framework of the National Freight and Supply Chain Strategy. Such investments will help drought-proof eastern Australia and help lessen the cost of food items dependent on feed grains and fodder. Greater use of the Inland Rail will allow more empty containers to be moved more quickly, at lesser cost, to export positions where they are most needed. This would require, however, greater coordination between track owners, shipping lines, stevedores, rail operators, freight forwarders and grain packers.

Additional investments in infrastructure can fix some inefficiencies in the containerised grain export supply chain caused by larger ships, inadequate rail access to container ports and a shortage of space in some empty container parks.

Although rail is considered as the most reliable, low emission and efficient land transport for large volumes of grain, especially over long distances, nonetheless, over the last decade, on average, only around 10 to 12 per cent of containers have been transported by rail to container ports in Melbourne and Sydney. For example, in 2020–21 only 2, 6 and 16 per cent of containers arrived by rail at the container ports in Brisbane, Melbourne and Sydney. If this split of market share of rail and trucks continues into 2030, noting firstly that grain is only one of the many commodities transported in containers and secondly, further growth in container-based trade is forecast, a doubling in the number of trucks conveying containers may be required, leading to road congestion at and around ports.

To lessen future road traffic congestion, greater investment in intermodal hubs and rail access to ports is necessary. Increasing volumes of containers also will increase the demand for space to house empty containers at or near ports. Provision of land and infrastructure for empty container parks and rail services to ports is a major investment challenge due to the expense and scarcity of land at and around ports. The National Freight and Supply Chain Strategy makes plain the economic desirability of forming and protecting least cost freight networks and corridors and the NSW State Infrastructure Strategy 2022–2042 indicates these investments are an immediate priority.

City populations continue to grow in size and wealth, as does housing density. These trends increase the value and use of waterfront land and cause access to ports to often become congested. Urban encroachment can erode buffer zones of freight corridors and lessen the ease of access to port facilities. Traffic congestion and traffic noise become increasingly important issues. Yet ports are often geographically rare locations with unique characteristics that need to be preserved if the full value of their stream of economic trade benefits is to be extracted. As locations, often with natural endowments, ports and their access corridors require strategic oversight, on-going investment, protection and management.

### **Oversight and regulation**

Australian governments can aid the cost-effective, low emission flow of containerised grain and fodder via their oversight and regulatory roles. More specifically, the ACCC should be provided with statutory powers to gather the required information from industry players to closely examine margins throughout the containerised grain supply chain, including domestic and international shipping, to ensure no excessive use of market power is occurring and that information flows are sufficient to encourage the discipline of competition.

In reviewing vulnerable supply chains in Australia, the Productivity Commission (2021) stated that “Supply chains can be long, complex, and opaque, and data can be difficult to obtain.” (p. 7). The Productivity Commission identified that governments should aid the management of risks in supply chains through provision of information and expertise in risk identification. Prevailing opaqueness in supply chains fuels their inefficiency. Already the ACCC has a role as a regulator of some port operations and in that role collects critical information, which when appropriately shared, can help identify risks and issues in that key part of grain supply chains.

The value to the government and users of grain supply chains of accurate datasets is that they can be indicators of efficiency and emissions intensity and can help de-risk investments or inform policy to improve those supply chains. The National Freight and Supply Chain Strategy identifies the need to better measure freight and supply chain performance in Australia as a priority action and the deputy chair of the ACCC has indicated that a close analysis of margins through the grain supply chain would be useful, but only if the ACCC had the statutory powers to gather the required information from industry players. Enhanced coordination and provision of open data hubs can facilitate management and investment in containerised grain supply chains. Rolling out across Australia open data freight hubs, as is already in place in NSW, potentially ensures greater access to timely data to facilitate management, coordination and investment in containerised grain and fodder supply chains.

Bulk grain and container supply chain services, including domestic shipping and intermodal terminals, should be effectively monitored to support evidence-based policy-making and beneficial investment in those supply chains. Australian bulk and container grain terminals, including intermodal terminals, should be more effectively regulated to avoid spatial monopolist behaviour and greater efficiencies and better coordination should be encouraged.

An assessment of the economic and environmental benefits of a consistent national approach to modal pricing of transport services, especially road versus rail, is overdue. In addition, port developments by governments and industry require greater scrutiny to ensure they achieve enduring economic and ESG (environmental, social, and governance) outcomes rather than sole short-term budgetary relief or commercial advantage to incumbents.

Inflexible work practices and rigidities in employment conditions unhelpfully add to the inefficiency of operations at many Australian ports and need remedy by government and industry action. Some enterprise agreements, for example, contain restrictive conditions beyond what would be considered reasonable in any industry. In consequence, Australian ports operate sub-optimally by international comparison (see ACCC, 2021) and remedial action by governments, state and federal, is required. Four of the five main container ports in Australia are identified by the ACCC (2021) to be in the worst-performing 15 per cent of ports globally. The poorly ranked container ports are Melbourne, Sydney, Adelaide and Fremantle. These poor rankings infer that many of Australia's key grain export competitors benefit from their superior, more efficient and effective port operations. Given that port logistics costs are a key component of the overall cost of landed containerised grain and fodder, it follows that inefficiencies and inadequate service competition at Australian container ports reduces the market share for Australian containerised grain and fodder.

Owners and operators of containerised grain and fodder businesses were surveyed and revealed that they considered government regulation as the most effective mechanism to achieve beneficial reform. Yet a body like the ACCC that could best inform and evince regulatory and monitoring power in fact lacks all the necessary legislative teeth to gather the required information across the containerised grain supply chain. Especially challenging for regulators is their need to monitor and assess the behaviour of international shipping. Australian collaboration with relevant international or regional reviews of international shipping may be a useful initial foray.

Governments need to do more than just commission reports that outline issues and opportunities affecting container supply chains. Governments need to ensure that grain supply chain businesses and service providers, including domestic and international shipping, are subject to monitoring, scrutiny and regulation, where required, to ensure that the wider Australian economy and not just a handful of entities within those supply chains are beneficiaries of the operations of those supply chains. There is ample evidence of governments failing to facilitate productivity improvement, but rather unwittingly supporting economic and environmental harm to the wider economy.

Government action is an increasing pressing need. Governments of Australia's key grain export competitors, Canada and the USA, are already taking action to create greater efficiencies in their containerised grain export industries.

Another area of required government action is to ensure that biosecurity protocols and processes are frequently revised to improve their cost-effectiveness. Regular detailed reviews of containerised grain or fodder export processes can lessen their regulatory burden through efficient re-design of these processes to include incentive and punitive measures. In addition, the training of authorised officers should be regularly appraised to ensure it remains fit-for-purpose in form and content.

Buffer zones for least-cost, low emission grain pathways should not only be formed but should also be actively protected and maintained by state and local governments. Lastly, wherever cost-efficiencies are not eroded, transport regulations should form national standards to support least cost corridor networks.

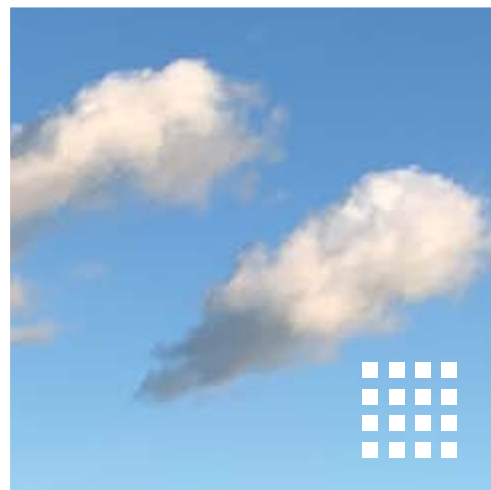
## Opportunities for education

Case studies of containerised grain operations in different states revealed a wide array of execution risks when exporting containerised grain or fodder. These case study participants shared their lessons learned and revealed a fundamental need to educate prospective participants concerning the export of containerised grain or fodder. For example, providing required documentation to the range of entities associated with the export of containerised grain and fodder is essential yet is often more time-consuming and exacting than many prospective participants anticipate. Other oversights and reasons for business failure or under-performance include inadequate planning, a failure to budget, the absence of sound governance and insufficient communication within the business.

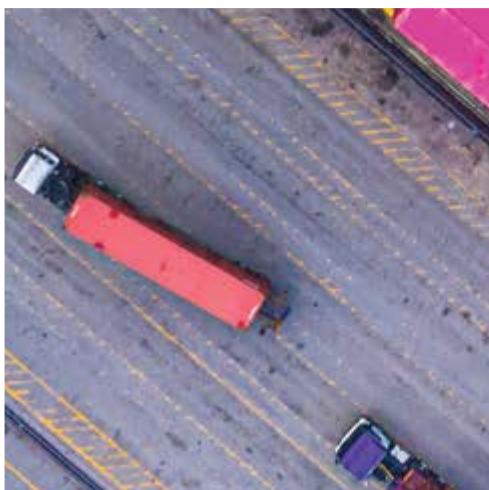
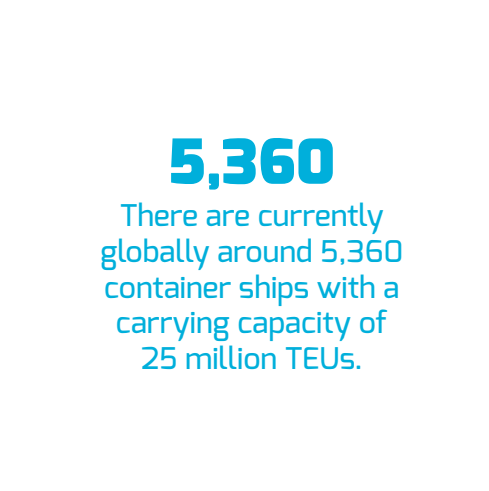
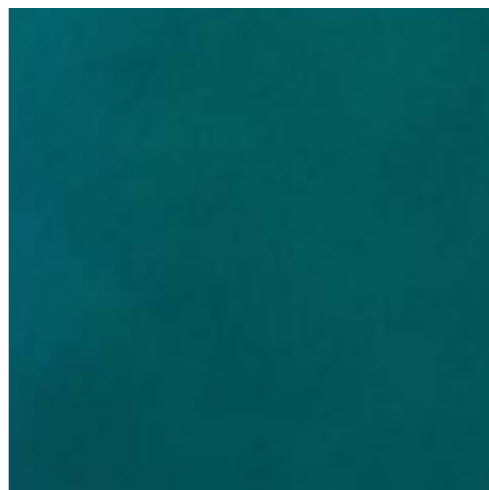
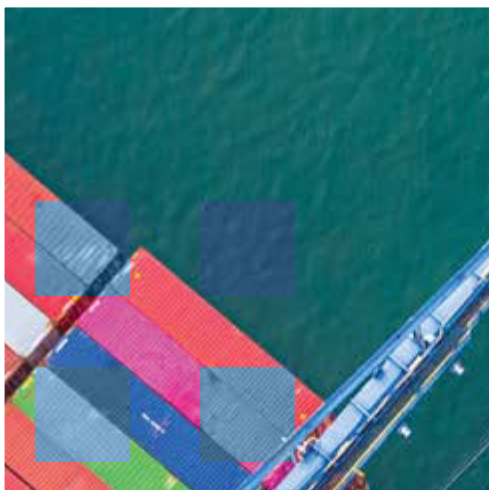
Educating prospective participants, keen to export grain or fodder in containers, about these issues is essential. In addition, educating prospective and current participants about how to best manage these execution risks is also essential. Otherwise, the outcome is likely to be reduced profits and reputational damage to these businesses and possibly to the broader export fraternity.

Industry and government can collaborate to collate information to lessen the opaqueness of containerised grain supply chains and then also invest in education or training for prospective participants in containerised grain export. There is no export manual outlining all the steps and hazards involved in containerised grain or fodder exporting.

Although various organisations offer basic training and education for potential exporters, the many tasks and difficulties faced by exporting business are rarely addressed in sufficient detail.







**5,360**

There are currently globally around 5,360 container ships with a carrying capacity of 25 million TEUs.

# Summary

There are currently globally around 5,360 container ships with a carrying capacity of 25 million TEUs. The grains industry globally has benefitted from containerisation by being able to sell smaller parcels of grains, oilseeds, seeds and fodder. Containerisation also has facilitated access to a wider array of end users and often has been a means of market development, as a pathway to eventual supply of bulk grain.

Containerisation of grain has also benefited from institutional change, as noted by the Productivity Commission's inquiry into wheat export marketing in Australia back in 2010. Until 2008 Australia's main crop, wheat, was subject to statutory marketing that focused on large customers and bulk shipping. Following the demise of the Australian Wheat Board, however, Australian wheat exports in containers gradually grew from 0.5mmt in 2007 to 2.7mmt by 2012; and by 2020–21 4.2mmt of grain was exported from Australia in containers. Nationally around 12 per cent of all grain exports are via containerisation.

Despite the dominant role of bulk shipping and bulk grain supply chains in Australia, containerised grain exports continue to play an important role for certain grain and fodder exports from Australia. Containerisation is especially important for specialty grains such as pulses and is especially important in Australia's eastern states. By illustration, on average over the period 2014–15 to 2020–21, the proportion of grain exports that came from containerisation in Vic, NSW and Qld was 36, 28 and 34 per cent respectively.

The mix of crops exported via containerisation does differ between Australian states. Wheat, lentils and faba beans dominate containerised grain exports from Vic, whereas wheat and chickpeas dominate exports from NSW and Qld.

SA displays the most even mix of containerised grain exports, featuring lentils, faba beans, wheat, field peas and malt. Similarly, WA exports a diverse range of grain exports, but mostly wheat, malt and processed oats. Each grain type, however, tends to be sent to a narrow range of destination countries. Pulses predominately are sent to South Asian and Middle East countries. Malt is exported to only a handful of countries. Sorghum is mostly sent to Japan and wheat is principally sent to China, Taiwan and a subset of South East Asian countries.

What is not always appreciated is how much fodder is exported via containers from Australian ports. Over several decades Australia has developed some key markets for its export of hay, especially Japan and China, such that often around 1mmt of fodder is exported via containers from Australia.

However, since 2020 the spread and management of COVID has disrupted supply chains, particularly containerised supply chains and the consequences of that disruption have been substantial and have extended into 2022. Many importers and exporters have struggled with the consequences of a raft of supply-chain issues. Higher transport and handling costs, and unreliability and uncertainty costs have squeezed or devastated profit margins and placed upward pressure on end user prices, to the extent that the higher costs within supply chains have been able to be passed on.

## Why export containerised grain?

In general, container packing or shipment of grain or fodder via containers is commercially feasible, relative to bulk shipping, when there is:

### i. A viable shipping option for small cargoes that can be reliant on:

- sufficiently high margins on small volumes (e.g. niche qualities or grades), perhaps also supported by closed loop arrangements.
- credit, transport or storage constraints at destination. Some customers can only receive containerised grain, rather than bulk shipments. Pulse Australia (2020), for example, acknowledges the contribution of containerised supply chains to Australia's comparative advantage as an exporter of pulse crops. Australia's containerised supply chains contribute to the reliability, flexibility and timeliness of Australia's pulse exports, facilitating serving smaller customers and higher value niche markets.
- food processor trials of new varieties or grades.

### ii. Opportunities within the bulk supply chain such as where:

- a farmer's grain is produced near a container packer but distant from their nearest bulk terminal or upcountry receival point for the type of grain they grow.
- the farmer produces grain with specialised traits sought by a particular niche market or individual buyer.
- grain buyers want a verifiable provenance of grain production and traceability.

- the bulk handler is perceived by the farmer to be unduly profiteering from their dominant or monopoly position as a service provider of bulk storage, handling and marketing services.
- farm production is of sufficient size and complexity that containerisation of some of the farm's grain production can be a value-adding or market risk diversification strategy for the business.
- packing grain into containers allows more efficient and profitable use of existing farm storage, labour and equipment; and for some large multi-commodity trading businesses, a more profitable use of their transport (e.g. trucking or rail) assets.
- the bulk supply chain is at full capacity or is facing bulk shipping bottlenecks. In this situation, containerised grain supply chains offer a supplementation option.

### iii. Complementarity to a bulk grain supply chain

- Linked to a previously mentioned observation is a related observation that creation and use of containerised grain supply chains enables Australia's grain export industry to better serve a broader range of customers and grain buyers. Containerisation of grain can thus complement bulk supply chains, whilst usefully injecting some competitive pressure on both supply chains (i.e. bulk and container supply chains).



iv. **An opportunity to extract value from atypical or differentiated varieties or to unlock value from crop breeders' stranded crop lines**

- A logical and expected outcome of a bulk handling network system, when combined with the nature of grain classification systems in Australia and the end point royalty financing of Australian crop breeding, is the frequent dominance of a single variety (or handful of varieties). Because crop breeding is funded by end point royalties, crop breeders mostly are encouraged in a bulk system to only generate high-yielding varieties that just meet grade specifications. Hence, farmer adoption of functionally novel varieties within the bulk grade system is disincentivised due to blending and co-mingling of many grain parcels. In some situations, a variety becomes so dominant that the parent grade becomes little more than a proxy for that variety. The grains industry then becomes characterised by the widespread dominance of a few varieties rather than the provision of a diverse portfolio of varieties with a range of functionalities for different end uses or products. Yet, the intense search by crop breeders for the next dominant variety means their breeding programs likely contain some advanced lines with some unique or superior functionalities, but there is no path to market in a bulk system for these lines. However, containerisation and/or closed loop marketing arrangements offer a means to extract value from these unique advanced lines, so they need not be stranded or become biological assets invariably discarded or under-utilised.

Containerisation and/or closed loop arrangements can increase the biological diversity of a region's grain production and increase the diversity of market opportunities for grain producers and crop breeders.

v. **Reward for protecting grain quality from reduced handling**

- One main difference between bulk handling and containerisation of grain is the frequency of handling and mingling. In a bulk handling system, grain more frequently risks being damaged and co-mingled as it moves through the supply chain from farm to bulkhead, from bulkhead to train or truck, then into port storage before being exported via large conveyors. To minimise the risk of damage most bulk handlers have invested in handling equipment that is less damaging (e.g. use of conveyor belts rather than augers; and instituting maximum drop heights). Nonetheless, in general, containerisation involves less co-mingling and damage to the grain from repeated handling. Some pulses, for example, are fairly easily damaged so containerisation is one option to avoid price penalties or downgrades attributable to physical damage.

vi. **A perceived need for greater diversity in grain supply chains**

- In some regions, grain producers opt for selling some of their grain through containerisation to lessen their dependence on the services of the dominant or sole bulk grain handler or marketer.

vii. **Better able to manage some comingling risks**

- Containerisation can limit financial losses that arise from phytosanitary events or quality disputes. In the case of containers unless the contamination is distributed throughout the entire prospective cargo, the initial volume knocked out of loading is often just the one or two affected containers. Hence, the downside commercial risk associated with phytosanitary events or quality disputes is often less in container supply chains compared to bulk grain supply chains.

However, a grower who exports containerised grain or fodder must manage the biosecurity risk by having their own Biosecurity – Authorised Premises and fumigation contract and biosecurity export documents specific to their shipment, whereas the grower who delivers into a bulk system entrusts the processes and management of the bulk handler.

viii. **Access to food grade empty containers**

- When there is a consistent ease of access to food grade containers this facilitates grain containerisation.





However, several disadvantages apply to grain containerisation, including:

**i. Costliness of container supply chains relative to bulk supply chains**

- During 2020 and extending into 2022 the main factors affecting the relative commercial attractiveness of the containerisation of grain and fodder, by far, has been the execution risk and supply chain costs associated with containerisation. The per tonne costs of the container supply chain versus its bulk grain alternative, in many cases have reduced profits from grain containerisation.

**ii. Need for proper business planning, documentation and access to expertise**

- As an additional business venture, farmers are rarely cognizant of all the commercial risks associated with the export of containerised grain and fodder. Lack of education about the entire export process, poor planning, inadequate budgeting, insufficient governance, a failure to seek expert help, improper documentation, and a failure to communicate effectively across the business jeopardizes or lessens the profitability of the operation in many cases. The fact that there are only around 100 container packing businesses across Australia is one indicator that this is not a business venture that should be embraced without proper care, skill, and due diligence.

**iii. Need to avoid over-capitalisation**

- The profitability of exporting grain and fodder can be subject to much uncertainty and volatility. Accordingly, to prevent under-utilisation of assets and to ensure a sufficiently attractive return on capital, it is vital to avoid over-capitalisation. Being able to cease or scale back container trade operations in response to market realities is crucial to the viability of many businesses. Having a capital structure appropriate to the vagaries and volatility of the container trade is a pre-requisite for business success.

**iv. Need to monitor Minimum Residue Limits (MRLs)**

- In markets with tight chemical residue tolerances, the co-mingling of grain that occurs in a bulk system provides a dilution factor that ensures MRLs are rarely breached. By contrast, in container supply chains with some grain being supplied directly ex-farm, with no access to dilution, the risk of breach is greater. Even in a farm silo or bulkhead that on average tests below MRL thresholds, there may be pockets that when packed into a container result in subsequent detection and rejection; and the associated reputational damage. Even more serious are the flow-on reputation loss impacts on the entire grain export industry of Australia.

An increasing number of countries have MRL protocols. It is difficult at any container grain packing site to segregate product until MRL testing is complete; adding to the cost and delaying grain containerisation. Moreover, grain export inspection and MRL testing apply to each container whereas in a bulk system its per hatch.



## Relative costs of container and bulk grain supply chains

Supply chain costs impact the competitiveness of the Australian grain industry. Data describing Australia's bulk grain export supply chains for the 2020–21 and 2021–22 harvests were collated and compared. Overall bulk grain supply chain costs in SA and Australia's eastern states were similar in both years. By contrast, bulk grain supply chain costs in WA substantially increased in 2021–22. However, across Australia, bulk grain supply chains costs in WA still currently remain the lowest, and since 2014–15, bulk grain supply chain costs in WA have decreased by the greatest in real terms. In 2021–22 the bulk grain supply chain costs in WA were between \$17.5 to \$26 per tonne cheaper than in other states for an equivalent distance to port. Each main component of bulk grain supply chain costs (i.e., freight, port fees, and warehouse storage and handling) is less costly in WA. Across all grain-growing regions of Australia, the number of upcountry receival sites is still decreasing, but primary sites are getting more efficient and larger, causing total available storage to be stable or growing, especially when complemented with farmers' on-farm storage. International shipping bulk freight costs have increased greatly in 2021–22, but this is making Australian grain relatively more attractive to buyers in nearby South East Asian markets.

Although a variety of containerised grain supply chains exist across Australia, often a key difference in those chains is whether packing occurs on the farm or at a distant packing facility located either at a regional intermodal centre or at port. An examination of the current typical costs of different containerised grain supply chains reveals that packing on-farm is rarely the more profitable avenue for engaging in the containerised export of grain. Ideally use of packing facilities either at or near port or at regional packing facilities with direct access to cost-effective rail services is preferable.

A comparison of container versus bulk supply chains for grain export reveals that by far the major cost difference between these supply chains is sea freight. The marked escalation in sea freight rates for container services, relative to bulk freight rates, has hugely eroded the preference to receive containerised grain. In some previous years the per tonne cost of sea freight for containerised grain was competitive against bulk rates. However, since mid-2020 the escalation in container sea freight rates and the unreliability of container shipping services has disincentivised the export of containerised grain and fodder.



## COVID impacts

When the first lockdowns hit in March 2020, demand for containerised shipping initially sharply declined as hesitant households curtailed their expenditure and bunkered down. Simultaneously, tighter IMO diesel fuel emission regulations in early 2020 encouraged some shipping lines to retire early some of their older container vessels. However, under lockdown, demand for a range of household goods, mostly manufactured in China, then sharply increased, stimulating and underpinning a demand for containers. Later, as the Chinese and American economies began reopening and government stimulus payments began flowing, consumer demand for goods trafficked in containers escalated further. By the third quarter of 2021, world trade in goods hit a record \$5.6 trillion.

Contemporaneously, demand for bulk freight vessels greatly increased in 2021, placing upward pressure on bulk freight rates. Many major global economies in 2021 announced stimulus packages with emphases on infrastructure projects that increased demand for iron ore and coal and resulted in a lift in demand for bulk sea freight. When combined with the regular demand for bulk agricultural exports, the overall increase in bulk sea freight demand led to a lift in dry bulk sea freight earnings from mid-2020 and then throughout 2021.

Despite the growth in ship revenues, however, the estimated growth in the size of the dry bulk fleet is lessening. The restricted growth is pushing up prices of second-hand bulk vessels as is the higher cost of new vessel construction, principally due to higher prices of steel and the cost of more fuel-efficient engines and associated technologies. The ramification of these trends is that bulk sea freight rates are poised to remain high over the next few years, but this does generate a freight advantage for Australian bulk grain shipped to nearby South East Asian markets, relative to bulk grain shipped to these same markets by distant competitors such as Argentina or the Black Sea region.

Relative to bulk freight rates, container freight rates rose much more quickly and to higher levels under COVID, generating a massive increase in profits for container shipping. This, in turn, sparked a marked increase in newbuilds of container ships. These new, larger ships will become available from 2023 onwards and will likely drive down container sea freight rates, narrowing the gap between container and bulk rates. Eventually over the next handful of years the export of containerised grain and fodder will once again become more commercially attractive.

## The need to scrutinise and regulate parts of grain supply chains

The rapid increase in the cost of shipping containers or bulk, and the increased profits generated by these services, has heightened the scrutiny of shipping services. The issue of concern is whether undue market power or at worst, anti-competitive behaviour, underpins the increase in the pricing of shipping services. Unevenness in market power across a supply chain is not a phenomenon unique to Australia. To facilitate greater scrutiny of their shipping services the Federal Maritime Commission, a key regulator in the USA, observed that, regarding international shipping, few private parties have filed complaints seeking reparations. The Commission has commented that “shipper (and trucker) concerns about retaliation, litigation costs (both in time and money), and attorney fee liability are important disincentives” (FMC, 2021). To combat retaliatory behaviour the Commission has recommended broadening anti-retaliation provisions to better protect complainants. Fines for unlawful behaviour have been potentially doubled and a greater range of informational and financial support measures introduced to encourage affected parties to lodge formal complaints.

Similarly, in 2021 a diverse group of agricultural groups across Canada joined forces to force government action over container availability and cost escalation in container shipping. The group advocated for:

- Greater transparency and clarity into how the Canadian container supply chain was functioning within the context of a global container shortage;
- Identification of domestic legislative or competition law remedies and law changes that would correct shipping line behaviour;
- Engagement with global partners and authorities to develop appropriate regulation of shipping lines.

In Australia, a Productivity Commission inquiry into Australia’s maritime logistics system is underway and is due to report in August 2022. In addition, the ACCC (2021) in its statutorily required monitoring report on container stevedoring observed that “Shipment delays have been mounting as shipping lines are increasingly omitting ports, rolling over cargo and cancelling bookings. Cargo owners around the world are scrambling to book scarce capacity on vessels, bidding up freight rates to unprecedented levels. Freight rates on key global trade routes are around 7 times higher than they were a little over a year ago.” (p. ix). Specifically, regarding the shipping lines, the ACCC (2021) state: “It is also time to repeal Part X of the *Competition and Consumer Act 2010*. Part X permits shipping lines to collaborate on prices, capacity and schedules, among other things, which would otherwise be considered as anti-competitive conduct. There does not appear to be evidence of shipping lines charging excessive freight rates before the pandemic. However, the shipping industry has become more concentrated over the past decade, so there is a growing risk that shipping lines could use Part X to artificially elevate freight rates in the future. Several other countries have already scaled back or removed equivalent exemptions.” (p. xi). Widening the review of shipping to consider the nature and efficiency of domestic shipping is also likely to reveal further opportunities for reform from which domestic consumers and the wider Australian economy will benefit. Reliance on cost-effective interstate shipping of grain and fodder is especially important during prolonged periods of regional drought when large volumes of grain and fodder need to be transported from regions of surplus to regions of deficit.

An earlier monitoring report (ACCC, 2019) stated that although the ACCC viewed increases in infrastructure charges to be of concern and worthy of consideration by policy makers, it reckoned it did not have the power to determine stevedores' charges and that the key issues regarding their pricing actions were beyond the scope of the ACCC's monitoring mandate at key container terminals. To the extent that this is true, then it is essential that the ACCC or its regulatory equivalent be given the powers to collect information which when subject to analysis reveals the need for regulation and reform of the export supply chain for bulk and containerised goods from which the entire economy will benefit.

The National Freight and Supply Chain Strategy identifies the need to better measure freight and supply chain performance in Australia as a priority action and the deputy chair of the ACCC has indicated that a close analysis of margins through the grain supply chain would be useful, but only if the ACCC had statutory powers to gather the required information from industry players. Enhanced coordination and provision of open data hubs can facilitate management and investment in containerised grain supply chains. Rolling out across Australia open data freight hubs, as is already in place in NSW, potentially ensures greater access to timely data to facilitate management, coordination and investment in containerised grain and fodder supply chains.

It is not just greater scrutiny of stevedores' charges or international shipping that requires more scrutiny. There also needs to be greater regulation of privatised ports. The outgoing chair of the ACCC, Rod Sims, publicly commented in early 2022 that Australia's supply and logistics challenges, were worsened by industry concentration and infrastructure bottlenecks. His remedy was to apply competition law to prevent anti-competitive abuses of market power and through general infrastructure reform. In reference to Australian privatised ports, he stated: "We seem to focus on how much we can sell infrastructure assets for in Australia rather than having our infrastructure benefit the wider economy."

The same sentiment was expressed by the ACCC (2021) who indicated that although privatisation of the four major container ports in Australia had improved their dynamism, nonetheless they were under-regulated. In at least one case the port owner had exercised undue market power in charging land rents to port operators.

Australian bulk and container grain terminals, including intermodal terminals, should be more effectively regulated to avoid spatial monopolist behaviour. The experience of greater regulation at the Port of Botany (NSW Transport, 2018) reveals the possible extent of improved efficiency that is possible.

An assessment of the economic and environmental benefits of a consistent national approach to modal pricing of transport services, especially road versus rail, is overdue and would outline further sources of gain in supply chain efficiency.

Aside from the actions of shipping lines and the setting of infrastructure fees, another notable area for needed scrutiny and reform is the cost and productivity of port labour. Inflexible work practices and rigidities in conditions unhelpfully add to the inefficiency of port operations and only encourage and hasten the eventual investment switch into robotic technologies.

The ACCC (2021) found in enterprise agreements restrictive conditions that were "outside the realm of what would be considered reasonable terms and conditions in any industry." (p. 67). The ACCC (2021) also concluded that "Overall, these provisions constrain workplace performance, reduce and distort incentives to improve productivity, reduce timeliness and reliability, and increase labour costs for a given level of activity." (p. 66). These are serious criticisms that point to governments failing to facilitate productivity improvement.



A difficulty seemingly universally facing containerised grain supply chains is their opaqueness. In reviewing vulnerable supply chains in Australia, the Productivity Commission (2021) stated that “Supply chains can be long, complex, and opaque, and data can be difficult to obtain.” (p. 7). Although the ACCC has a role as a regulator of some port operations and in that role collects critical information, which if appropriately shared, can help identify risks and issues in that key part of grain supply chains; even the ACCC is aware that some of its datasets are inadequate. Yet the value to governments and users of grain supply chains of accurate datasets is that they can be indicators of efficiency and emissions intensity and can help de-risk investments that draw on or seek to improve those supply chains.

In the USA the Federal Maritime Commission has used its powers to force shipping companies that carry containers to provide a range of specific information related to vessel calls they have made to the United States since June 2021, including the number of loaded and empty containers carried on a ship’s return journey to Asia. Ocean carriers are now required to share information about the export services they offer American shippers. The Federal Maritime Commission has instituted a Maritime Transportation Data Initiative that commenced with industry meetings in December 2021 and will culminate in June 2022 with an industry-wide Data Summit. The data initiative has three key objectives:

- Catalogue the status quo in maritime data elements, metrics, transmission and access;
- Identify key gaps in data definitions/ classification; and
- Develop recommendations for common data standards and access policies/ protocols.

Collation of data sets and identification of data gaps will allow the Commission to have greater oversight and will provide clarity and understanding about what is underway in the shipping trade, including the containerised goods trade.

The same issue of opaqueness in containerised grain supply chains applies in Canada, despite its bulk grain supply train being subject, under statute, to regular monitoring. A bulk grain monitoring program is commercially managed by Quorum Corporation and supply chain participants are legally required to provide data that reveals the nature and efficiency of their services. However, the same legislative oversight of Canada’s containerised grain supply chains does not exist. It is already reported that entities in that supply chain are not keen to reveal their data for fear it may reveal how well or poorly their businesses may be performing, yet key stakeholders in the Canadian grains industry are advocating for greater regulation and oversight of the containerised grain trade.

Australia lacks the legislative framework to ensure adequate monitoring of its bulk and container grain supply chains; and the opaqueness in the costs and inadequacies of efficiency assessments of supply chain services act as barriers to entry and raise risk premia in transactions. Provision of greater transparency would facilitate commercial exchanges and more greatly reward training and educational services needed by newcomers keen to engage in the trade of bulk or containerised grain.

As an illustration of how regulation can affect supply chain operations, there are approximately 11 different regulated safeworking systems for rail in Australia. Train crews are required to be competent in safeworking systems before they can operate in each relevant sector. Therefore, any train crew wishing to operate Australia-wide is required to be aware of, and comply with, each of the 11 systems. By contrast, there is only one set of safeworking rules that applies to the road freight industry, which means, for example, that a road transport driver with a NSW truck licence, and a NSW licenced truck, may drive anywhere in Australia if they comply with standard rules. Standardisation of rail operating rules and systems should be a priority to facilitate the efficient use of rail freight and ensure greater use of least cost grain paths.

As part of this study a survey of owners and operators of containerised grain and fodder businesses revealed what they viewed to be the most effective reform actions. Overall, they considered government regulation as the most effective mechanism to achieve beneficial reform; yet a body like the ACCC that could best inform and evince that regulatory and monitoring power lacks the legislative teeth to gather the required information across the containerised grain supply chain.

This report finds that governments need to do more than just commission reports that outline issues and opportunities affecting container supply chains. Governments need to ensure that grain supply chain businesses and service providers are subject to monitoring, scrutiny and regulation (where required) to ensure that the wider Australian economy and not just a handful of entities within those supply chains are beneficiaries of the operations of those supply chains. There is ample evidence of governments failing to facilitate productivity improvement, but rather supporting economic and environmental harm to the wider economy.

Government action is an increasingly pressing need. Governments of Australia's key grain export competitors, Canada and the USA, are already taking action to create greater efficiencies in their containerised grain export industries.

Another facet of the need for oversight of export grain supply chains concerns the need to protect buffer zones around least-cost, low emission grain paths. This need has been previously identified by the National Freight and Supply Chain Strategy. Many Australian capital city ports are becoming more boxed in, with urban encroachment and erosion of buffer zones lessening the ease of access to port facilities. Traffic congestion and traffic noise often become increasingly important issues for urban communities whose complaining actions then can lead to erosion of the ease of access to port facilities. Maintenance of buffer zones can also become a casualty of development forces energised by the increasing worth of coastal and city real estate. Hence, a crucial role for all tiers of government, but especially for state governments is a strong oversight of buffer zones to protect and maintain least-cost, low emission grain paths.

## Other opportunities for government and industry action

Collaboration between Australian governments and the Australian grains industry can ensure new or existing market opportunities for Australian containerised grain and fodder are maintained, further developed, or freshly developed. This is a traditional yet worthwhile ongoing focus of engagement between governments, state and federal, and grains industry stakeholders.

Growing populations and per capita wealth in East Asia, South East Asia and South Asia underpin increasing market opportunities for Australian containerised grain and fodder, mostly where end users have a preference or sole ability to receive containerised products.

Another area of required government action is to ensure that biosecurity protocols and processes are frequently revised to improve their cost-effectiveness and that the training of authorised officers, particularly the form and content of that training, remains fit-for-purpose. For authorised officers employed by packers a central part of their training needs to raise or heighten their awareness of their conflict of interest, as despite being paid by the packer, their legal duty is to manage compliance with Commonwealth law rather than being compliant to their employer's immediate needs. Having stated the need to ensure authorised officers remain well-trained, it also needs to be highlighted that the work of authorised officers in recent years has been stressful due to the impacts of COVID that have reduced their staff availability and increased individuals' workloads.

An additional opportunity to pursue, to the extent that existing cost-efficiencies are not eroded, is to further align state-based heavy vehicle regulations to form a single national standard and to especially support least cost corridor networks. Regulatory improvement is in-play. A National Heavy Vehicle Regulator (NHVR) was established in 2013 as a statutory authority to administer the Heavy Vehicle National Law, which applies in all Australia's states and territories except the NT and WA. In August 2022 NSW will transfer its heavy vehicle regulation oversight to the NHVR.

Industry and government can provide educational services for prospective participants in containerised grain exports. Case studies of containerised grain operations in different states, undertaken prior to this report, revealed a wide array of execution risks that accompany the export of containerised grain. Case study participants shared their lessons learned and revealed a fundamental need to educate prospective participants about the export of containerised grain or fodder. For example, providing required documentation to the range of entities associated with the export of containerised grain and fodder is essential yet is often more time-consuming and exacting than many prospective participants anticipate. Other oversights and reasons for business failure or under-performance include inadequate planning, a failure to budget, the absence of sound governance and insufficient communication within the business.

Educating prospective participants, keen to export grain or fodder in containers, about these issues is essential if execution risks are to be properly managed and if reputational damage to their business and the broader export fraternity is to be avoided. There is an opportunity for industry and government collaboration to collate information to lessen the opaqueness of containerised grain supply chains and then also invest in education or training for prospective participants in containerised grain export.

Such education is likely to be strategically increasingly important as farm business owners look to other means besides farm expansion to grow their business wealth. Using containerisation as a means to extract value from traceability, provenance or minor crop production may form part of farm business development in future years, rather than the traditional action of buying out a neighbour.

To its credit, Grain Trade Australia (2018) did release a technical guideline document that provides guidelines for container packing.

## Supply chain investment

There is an on-going need for governments and industry to support investments that create or maintain least-cost, low emission grain paths for containerised grain and fodder. There are planned investments in intermodal terminals and associated rail and road access and infrastructure that will complement the Inland Rail to facilitate cost-effective movement of containerised grain and fodder. These investments, their maintenance and upgrade will need to be an on-going feature of the containerised grain and fodder and empty container supply chain network in eastern Australia.

As a general requirement, there is a need to maintain government and industry investment in transport modes and pathways that increase mass limits as these limits constrain the cost-effective movement of containerised grains.

Rail access to key container ports is typically problematic, requiring further investment to secure access corridors, increase rail capacity and improve the efficiency of rail movements. Reliance on double-stacking and shuttle trains is likely to be increasingly the norm. Although rail is considered to be the most reliable, efficient and low emission land transport for large volumes of grain, especially over long distances, nonetheless, over the last decade, on average, only around 10 to 12 per cent of containers have been transported by rail to the container ports in Melbourne and Sydney. For example, in 2020–21 only 2.1, 6.1 and 15.5 per cent of containers arrived by rail at the container ports in Brisbane, Melbourne and Sydney. If the split of market share of rail and trucks continues into 2030, this may double the number of trucks required, leading to road congestion on road networks servicing the ports. Currently, stevedores and port owners are not supportive of rail, as shipping lines pay the majority of the handling charges in the terminals that relate to road services but rail terminals must be funded by rail operators and so are required to be directly funded by exporters and importers.

The trend toward ever larger container ships and increasing volumes of imported containers will only heighten the need for rail access and exacerbate the shortage of space in many empty container parks. How to cost-effectively deliver the increased space requirements of empty container parks at some key container terminals and ports will become a pressing investment challenge in coming years.

City populations continue to grow in size and wealth, and population housing density is increasing. Port land adjacent to cities is becoming increasingly valuable, yet greater population density often makes access to ports more congested and subject to urban encroachment. Traffic congestion and traffic noise are becoming increasingly important issues for urban communities, yet maintenance of buffer zones can become a casualty of development forces energised by the increasing worth of coastal and city real estate. The NSW State Infrastructure Strategy 2022–2042 indicates that investments to protect freight buffer zones is an immediate priority.

Ports are often geographically rare locations with unique characteristics that need to be preserved if the full value of their temporal stream of economic benefits is to be extracted. As locations, often with natural endowments, they and their access corridors require prioritised strategic oversight, on-going investment, protection and management. DITCRD (2019), for example, identified potential savings worth \$10.8 billion from the protection and early acquisition of seven corridors in a 2016 infrastructure priority list.



## Future supply of container ships

One of the reasons for the high cost of shipping via containers in recent years has been the inadequate investment in new ship building. However, the high profits being generated by shippers has triggered a surge in new container ship building. As of early September 2021, 619 container ships were on order for future delivery. Of those, 381 were ordered in 2021 alone. In early September 2021 the container ship order book held 5.3 million TEU of shipping capacity scheduled to be added to the fleet from 2023 onwards. Never has such a large volume of TEU been ordered in such a short time span, creating eventual downward pressure on sea freight rates for containers. A lowering of those sea freight rates will enhance profits from the export of containerised grain and fodder.

However, the boost to container ship construction has meant that ship-building capacity for bulk vessels is now highly constrained, suggesting sustained pressure on bulk sea freight rates will continue over the next few years and the current differential between bulk versus container shipping rates could narrow, helping restore or enhance commercial interest in exporting grain and fodder in containers.

The magnitude of new orders for container ships might suggest overcapacity could be a future risk, but future supply requirements are clouded by new environment regulations that become law at the start of 2023. These environmental laws will likely limit ship speeds to lessen or cap emissions from sea transport, and so effective shipping capacity may not be as apparent as newbuild orders might suggest. However, it is not just container ships that are affected by new environmental laws. Some analysts estimate that less than 25 per cent of bulkers and tankers will attain the required level of emissions reduction required under new regulations, placing further upward pressure on bulk freight rates as these older vessels are de-commissioned. How rapidly the international shipping fleet will transition into reliance on less polluting fuels is currently uncertain.

The future increased supply of container vessels and the trend towards larger ships should mean that major destination ports of Melbourne, Sydney and Brisbane should eventually benefit from eased access to more containers, with grain and fodder once again becoming attractive back freight opportunities. Smaller ports in Adelaide and Fremantle are less likely to benefit to the same degree due to their lesser growth in containerised freight trade.





## Availability of food grade 20 foot containers

The proportion of 20ft containers within the stock of all containers handled in Australia is gradually declining. Shippers of non-grain commodities prefer to use 40ft containers as their profit margins per shipping slot are greater with 40ft containers. If the proportion of 20ft containers eventually falls to sufficiently low levels, then 20ft containers will become less available, and the cost to convert more of those containers to a food grade level will become an additional expense for exporting. Profit margins for grain export will then become further constrained. However, it should be stressed that just because 20ft containers are becoming a lower proportion of the global stock of containers, does not necessarily imply a problematic availability of 20ft containers, as long as the overall stock of containers imported into Australia continues to grow at a greater rate than containerised export volumes. For example, Australian ports now handle over 8 million containers every year; five times more than 20 years ago. However, Australian grain exports in containers have grown from under 1mmt in 2007 to 4.2mmt in 2020–21. That is over a four-fold increase in containerised grain exports in only 14 years, so the availability of 20ft food grade containers unfortunately is likely to be an increasingly pressing issue despite the greater volume of containers being handled.

An added difficulty for containerised grain exporters, especially pulse exporters, is that one common response by shippers to the disruption caused by the COVID pandemic has been to lessen the frequency of their sailing dates, particularly to the sub-continent and the Middle East. These regions are frequent purchasers of containerised pulses.

There needs to be industry and government monitoring of the availability of 20ft food grade containers and discussion about the most cost-effective responses to the potential structural challenge of gradual reduced availability of 20ft food grade containers. Investing in transport modes and pathways that increase mass limits would appear one obvious component of a solution. Having a jointly owned service business at each main export port to solely provide low-cost refurbishment of 20ft containers to a food grade standard is another option. Encouraging a joint South East Asian and Australian investment in ownership of 20ft containers is another possibility, as many end users in South East Asia are better able to receive and transport 20ft containers.

# Glossary

<b>Berth</b>	A ship's allotted space in a stevedore's container terminal.
<b>Cargo owner</b>	Importers and exporters, also known as shippers.
<b>Crane intensity</b>	Total number of allocated crane hours divided by the elapsed time from labour first boarding the ship to labour last leaving the ship. Crane intensity is an input to calculating 'net crane rate' and 'ship rate'.
<b>Crane rate</b>	An indicator of capital productivity and reflects the intensity to which quayside cranes are worked. It is measured by dividing the total number of containers (TEUs) handled by the crane by the 'elapsed crane time'.
<b>DP World</b>	DP World Australia Ltd operates container terminals in Brisbane, Fremantle, Sydney and Melbourne.
<b>Empty container park</b>	Companies whose business is to store empty containers. They may also provide ancillary services such as container cleaning, repairs and repositioning.
<b>Flinders Adelaide</b>	Flinders Adelaide Container Terminal Pty Ltd, fully-owned by the South Australian port operator, is the sole container stevedore at Port Adelaide.
<b>Hutchison</b>	Hutchison Ports Australia, a member of Hutchison Ports Holdings Group. Hutchison operates terminals in Brisbane and Sydney.
<b>Infrastructure access charge</b>	Now referred to as 'terminal access charge' (see below).
<b>Land transport operators</b>	Truck or rail operators under contract with cargo owners to transport container goods from the stevedores' container terminals to the cargo owner and vice versa.
<b>Landside activities</b>	Activities facilitating the exchange of containers between land transport operators and container stevedores.
<b>Lifts</b>	A 'lift' refers to the lifting of a single unit of container.
<b>Monitored port</b>	Ports under Part VIIA of the CCA subject to monitoring by the ACCC; the international container ports of Adelaide, Brisbane, Burnie, Fremantle, Melbourne, and Sydney.
<b>NSW</b>	New South Wales



<b>NT</b>	Northern Territory
<b>Patrick</b>	Patrick Terminals operates container terminals in Brisbane, Fremantle, Melbourne and Sydney.
<b>Quayside activities</b>	The lifting of containers on and off container ships at berth.
<b>Qld</b>	Queensland
<b>SA</b>	South Australia
<b>Shipping lines</b>	These companies facilitate the ocean-borne transport of containerised cargo from one port to another. Shipping lines may be directly under contract from cargo owners or through intermediary logistics companies. Shipping lines are the primary customers of stevedores.
<b>Stevedores</b>	Firms under contract with shipping lines and port authorities to operate specialist equipment that lift containerised cargo on and off ships in Australia's monitored container ports.
<b>Terminal access charge (TAC)</b>	Previously known as Infrastructure access charge. Charges collected by stevedores on land transport operators when collecting or delivering laden (i.e. not empty) containers.
<b>TEU 20 foot equivalent unit</b>	TEU is the standard unit of measurement for shipping containers. One TEU is equivalent to one 20ft shipping container. One 40ft shipping container is equivalent to two TEUs. It is known as an FEU.
<b>VBS</b>	The 'Vehicle Booking System'. The VBS is an online software tool that enables truck operators to book a time to pick up or drop off a container at the terminal.
<b>Vic</b>	Victoria
<b>VICT</b>	Victorian International Container Terminal Ltd, wholly owned by International Container Terminal Services Inc. VICT operates a container terminal in Melbourne.
<b>WA</b>	Western Australia

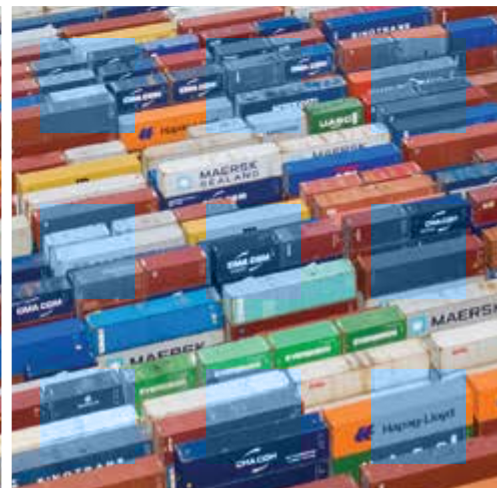
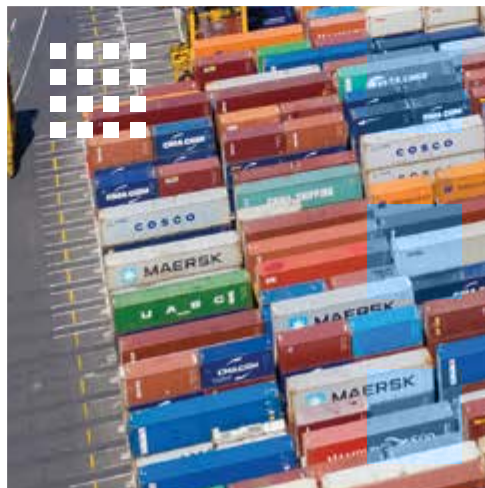






## 6mmt

In 2021-22 6mmt of grain was exported from Australia in containers.



# Introduction

Australia's grains industry has benefited significantly from growth in global trade. Trade growth has been facilitated by trade agreements and improvements in the efficiency of shipping, material handling and land-based supply chains and greater efficiency in farm production of grain.

The creation of shipping containers, to replace more traditional break-bulk shipping, dramatically lowered the cost of transporting many goods (especially non-bulk goods) internationally, by reducing time and labour costs when loading and unloading ships, with additional benefits from reduced theft, lower insurance costs, reduced warehousing costs and lower costs of interconnection with other transport modes.

Over recent decades, huge investments in new container ships, container ports, intermodal hubs and construction of millions of containers have fuelled an international trade based on containerisation. An increasing array of containerised goods are now traded globally. There are currently globally around 5,360 container ships with a carrying capacity of 25 million TEUs.

The grains industry globally has benefitted from containerisation by being able to sell smaller parcels of grains, oilseeds, seeds and fodder. Containerisation also has facilitated access to a wider array of end users and often has been a means of market development to be a pathway to eventual supply of bulk grain.

Containerisation of grain has also benefited from institutional change. For example, in Canada and Australia, their main crop, wheat, was subject to statutory marketing by the Canadian Wheat Board and the Australian Wheat Board up until 2012 and 2008 respectively. Both boards focused on large customers and bulk shipping. The Canadian Wheat Board which operated when grain containerisation was gaining popularity in the 2010s would deliver in containers on a customer's request, but it was not a marketing practice that was actively

promoted. In the case of Australia, following the demise of the Australian Wheat Board, Australian wheat exports in containers gradually grew from 0.5mmt in 2007 to 2.7mmt by 2012. In 2020–21 4.2mmt of grain was exported from Australia in containers. This equates to 11.2 per cent of all grain exported from Australia.

By comparison Canada currently exports around 4mmt of grain in containers, or about 8.8 per cent of its annual grain exports. Like Australia, a gradual structural shift in the mix of mode of grain export has occurred in Canada whereby containerised sales of grain have become increasingly important, especially for sales of minor crops and pulses.

However, since 2020 COVID has disrupted supply chains, particularly containerised supply chains and the consequences of that disruption have been substantial (see [Appendix 11](#)) and have extended into 2022. Many importers and exporters have struggled with the consequences of a raft of supply chain issues. Higher transport and handling costs, and unreliability and uncertainty costs have squeezed or devastated profit margins and placed upward pressure on prices to end users, to the extent that the higher costs paid by supply chain users have been able to be passed on. Container shipping costs on some routes during 2021 reached peaks quadruple average prices in previous years.

The economic costs of these issues have greatly affected the containerised export of grain and fodder from Australia, leading to the next question.



# Why bother with grain containerisation?

To answer this question requires providing some context for Australia's containerised grain exports.

Firstly, considering inherent economies of scale and the widespread distribution of large, efficient bulk grain terminals across all grain production regions of Australia, bulk shipping shoulders the

majority export share of Australia's annual crop (Table 1). Nonetheless despite the dominant role of bulk shipping, containerised grain exports continue to play an important, albeit lesser role concerning grain and fodder exports from Australia (Table 2). In addition, as in Canada,

Table 1. National grain production and usage, 2014-15 to 2020-21

	mt						
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Production	41.93	39.90	58.13	40.06	33.24	30.68	57.59
Containers	3.44	3.13	4.25	3.08	2.20	2.42	4.19
Bulk exports	21.69	20.99	31.53	20.17	13.42	13.30	33.34
Coastal shipments	0.00	0.00	0.00	0.92	3.49	2.50	0.00
Bulk shipments	21.69	20.99	31.53	21.08	16.91	15.80	33.34
Domestic	12.39	12.77	13.36	13.95	14.65	14.32	15.33
<b>Total</b>	<b>37.51</b>	<b>36.90</b>	<b>49.14</b>	<b>38.12</b>	<b>33.76</b>	<b>32.55</b>	<b>52.87</b>

Source: PTSP loading statements; ACF Shipping stem and market share report; ACF Export report; and ACF Supply and Demand report; ABARES, State data underpinning: Australia Crop Report: September 2021 No. 199.

Table 2. Proportion of bulk and containerised shipments by state, 2014-15 to 2020-21

		%					
		WA	SA	Vic	NSW	Qld	Total
2014-15	Bulk	97	97	55	57	67	86
	Containers	3	3	45	43	33	14
2015-16	Bulk	98	98	49	65	66	87
	Containers	2	2	51	35	34	13
2016-17	Bulk	98	96	70	79	67	88
	Containers	2	4	30	21	33	12
2017-18	Bulk	97	94	62	49	56	87
	Containers	3	6	38	51	44	13
2018-19	Bulk	94	84	28	27	26	88
	Containers	6	16	72	73	74	12
2019-20	Bulk	96	86	55	32	39	87
	Containers	4	14	45	68	61	13
2020-21	Bulk	98	92	75	83	76	89
	Containers	2	8	25	17	24	11
Average	Bulk	97	94	64	72	66	88
	Containers	3	6	36	28	34	12

Source: PTSP loading statements; ACF Shipping stem and market share report; and ACF Export report.



containerisation remains an important outlet for specialty grains such as pulses and is especially important in Australia's eastern states (see [Table 2](#) and [Table 3](#)). For each state of Australia, a more detailed description of their exports of containerised grain is shown in [Figure 1](#) to [Figure 5](#).

Table 3. Containerised exports of grain by state, 2014-15 to 2020-21

	mmt								
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Average
New South Wales	0.87	0.91	1.03	0.54	0.25	0.17	1.21	1.54	<b>0.82</b>
Queensland	0.42	0.43	0.60	0.26	0.18	0.17	0.44	0.8	<b>0.41</b>
South Australia	0.20	0.11	0.37	0.35	0.48	0.55	0.56	1.11	<b>0.47</b>
Victoria	1.29	1.20	1.67	1.46	0.43	1.05	1.63	1.85	<b>1.32</b>
Western Australia	0.37	0.24	0.25	0.36	0.83	0.44	0.35	0.68	<b>0.44</b>
National	3.44	3.13	4.25	3.08	2.20	2.42	4.19	6.05	<b>3.60</b>

Source: ACF export report.

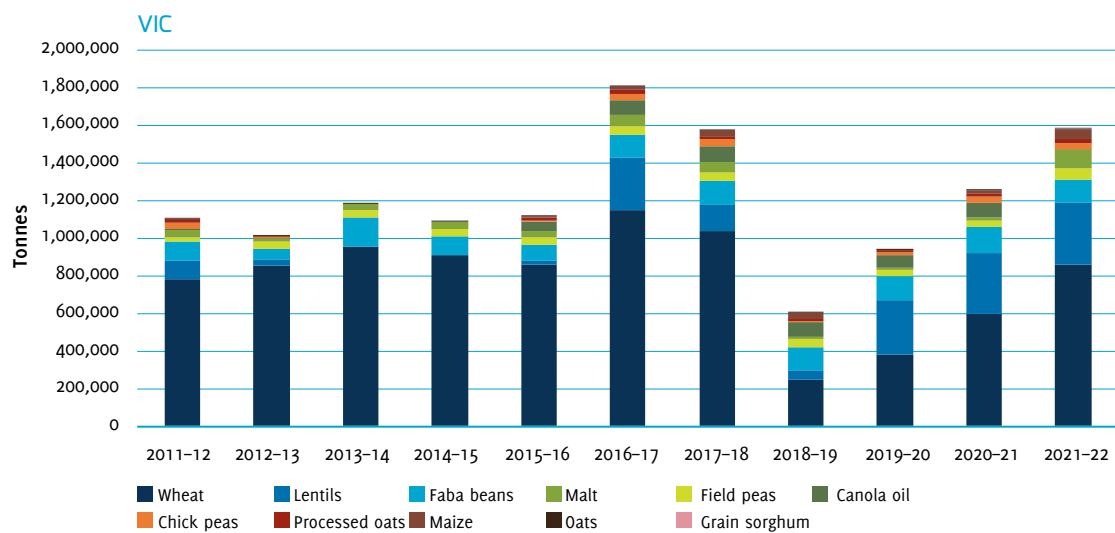


Figure 1. Containerised grain exports from Victoria, 2011-12 to 2021-22

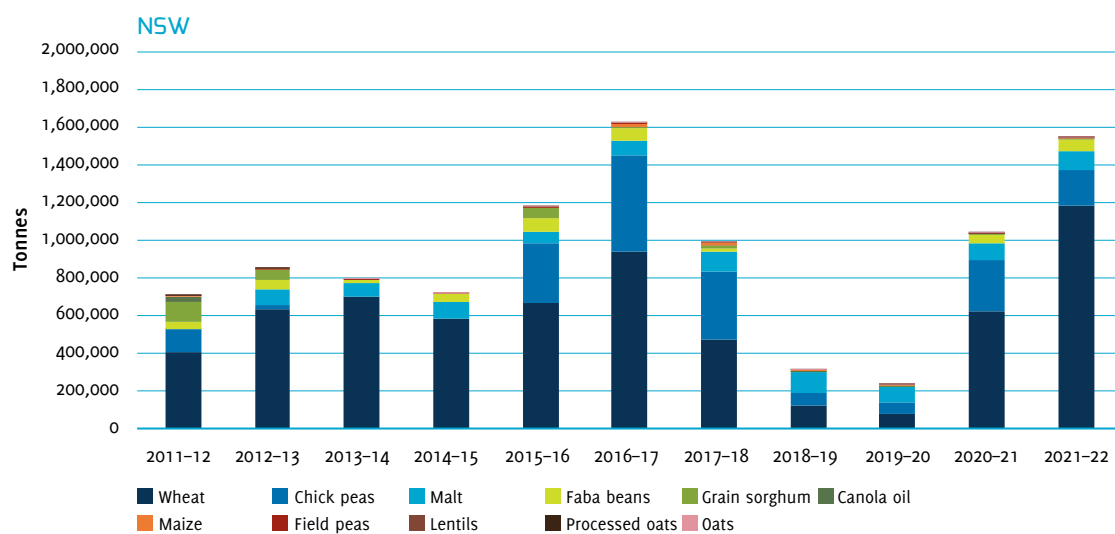


Figure 2. Containerised grain exports from New South Wales, 2011-12 to 2021-22

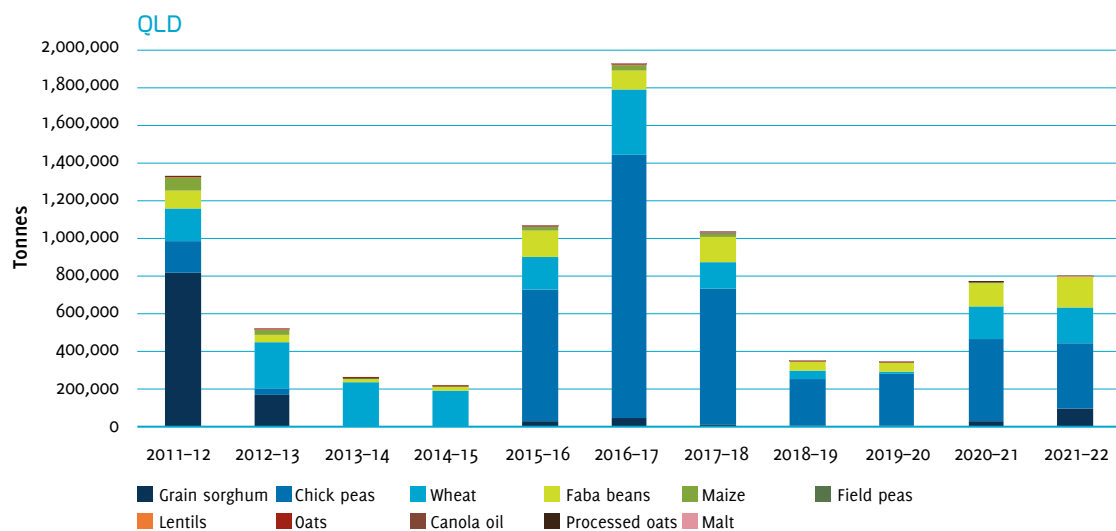


Figure 3. Containerised grain exports from Queensland, 2011-12 to 2021-22

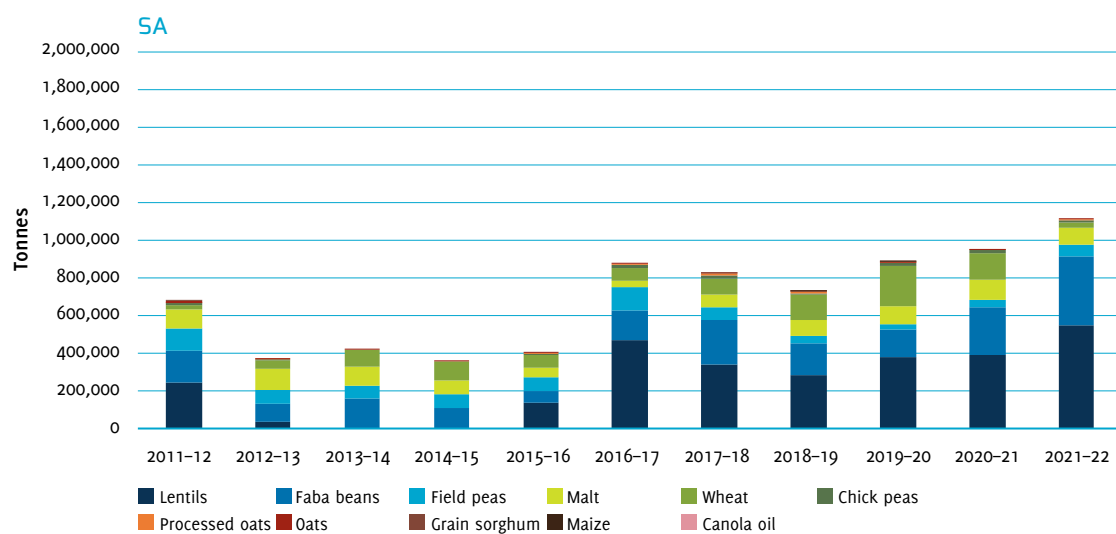


Figure 4. Containerised grain exports from South Australia, 2011-12 to 2021-22

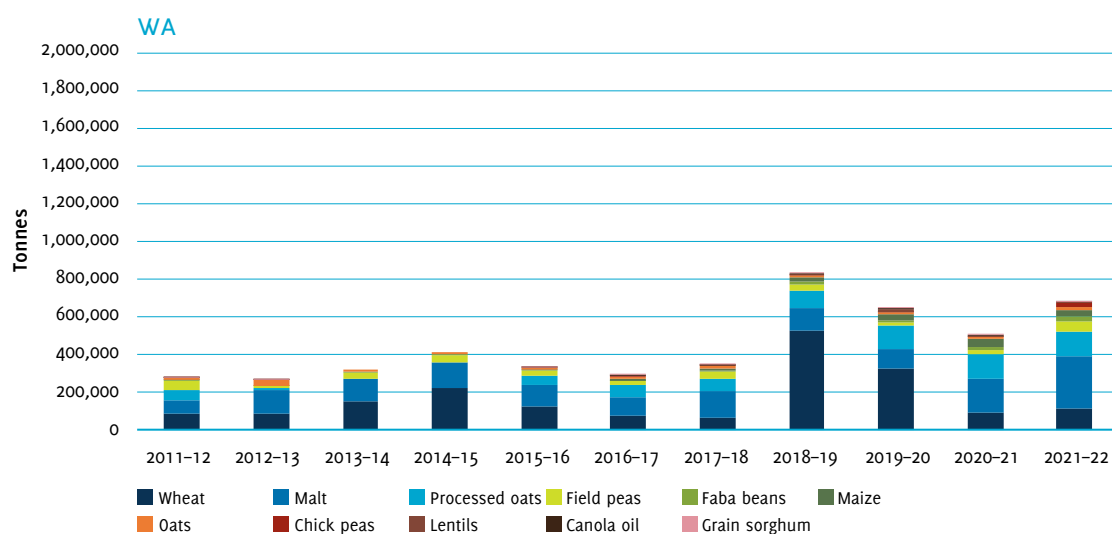


Figure 5. Containerised grain exports from Western Australia, 2011-12 to 2021-22

Uptake of the export of containerised wheat accelerated in the few years after the federal government took action against the Australian Wheat Board (AWB) in July 2008 by repealing the *Wheat Marketing Act 1989* that ended the monopoly bulk export powers of the AWB. The AWB seemingly gave little priority to the sale of Australian wheat via containerisation. The loss of the AWB monopoly powers enabled many smaller grain traders to participate in wheat marketing via containerisation. The uplift in containerised exports of wheat additionally seems to have stimulated the containerised exports of other minor crops, especially lentils out of Vic and SA; chick peas from NSW and Qld, and to a lesser extent malt from NSW and WA. The Productivity Commission's inquiry into Wheat Export Marketing in 2010 noted the uplift in non-bulk wheat exports following deregulation of the AWB.

The marked volatility in grain production in Qld and NSW is evident in the volatility of containerised grain exports from these states. The impact of widespread drought in Qld and NSW in 2017-18 and 2018-19 is evident in the decline in their containerised exports in 2018-19 and 2019-20.

By far the main states that are sources of containerised grain exports are Vic and NSW, although the main focus of their grain exports remains bulk export rather than containerised exports. These two states regularly export between 1mmt and 1.3mmt of containerised grain each year. Of next importance is Qld which is subject to

much greater volatility in its exports of containerised grain, often exporting between 0.5mmt and 1mmt. SA and WA annually export lesser volumes, 0.8mmt and 0.6mmt on average respectively, yet their pattern of export is subject to far less volatility.

Interestingly the commodity mix of containerised grain exports from each state differs. Wheat, lentils, faba beans and canola dominate containerised grain exports from Vic. Wheat and chick peas dominate exports from NSW and Qld, although in some years containerised exports of sorghum from Qld can feature. Malt exports also can also feature in some years for NSW. SA displays the most even mix of containerised grain exports, including wheat, lentils, faba beans, field peas and malt. WA similarly exports a diverse range of grain exports, but mostly wheat, malt and processed oats.

Figure 6 to Figure 10 display the destinations of containerised grain exports from each Australian state. The top 20 destination countries are shown along with the mix of containerised grains they import from Australia. The portfolio of grains principally exported from each state determines the composition of key markets, so there are some marked differences between the states. Pulses principally go to the subcontinent, Egypt and some Middle East countries; sorghum to Japan; malt principally to Korea, Vietnam and Thailand; and wheat and processed to China and a handful of South East Asian countries.



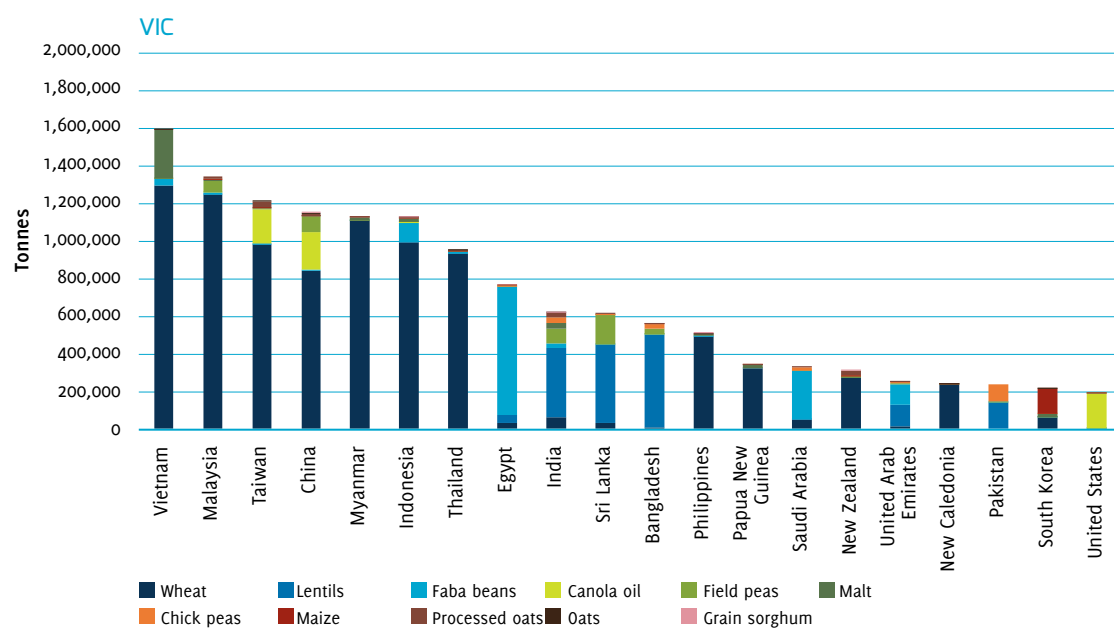


Figure 6. Containerised grain exports from Victoria 2011-12 to 2021-22 to the top 20 countries

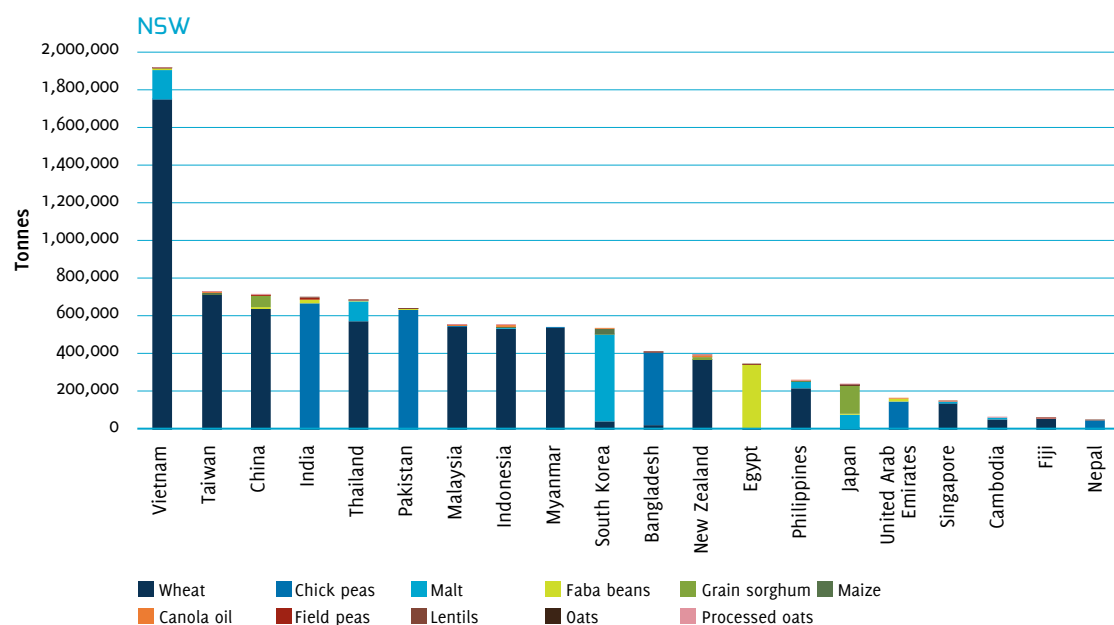


Figure 7. Containerised grain exports from New South Wales 2011-12 to 2021-22 to the top 20 countries

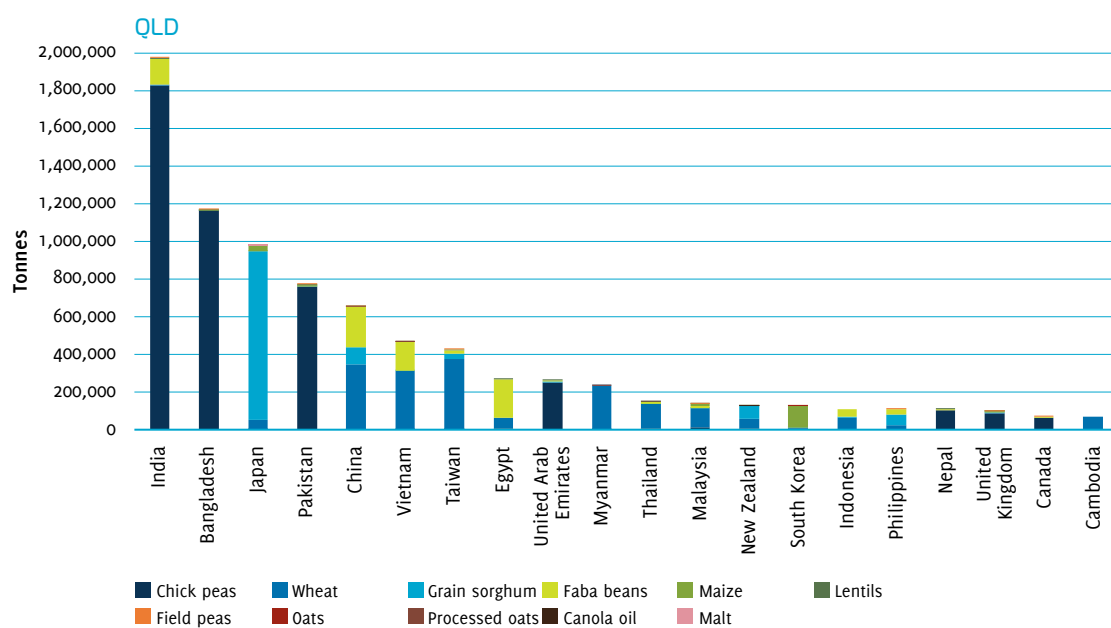


Figure 8. Containerised grain exports from Queensland 2011-12 to 2021-22 to the top 20 countries

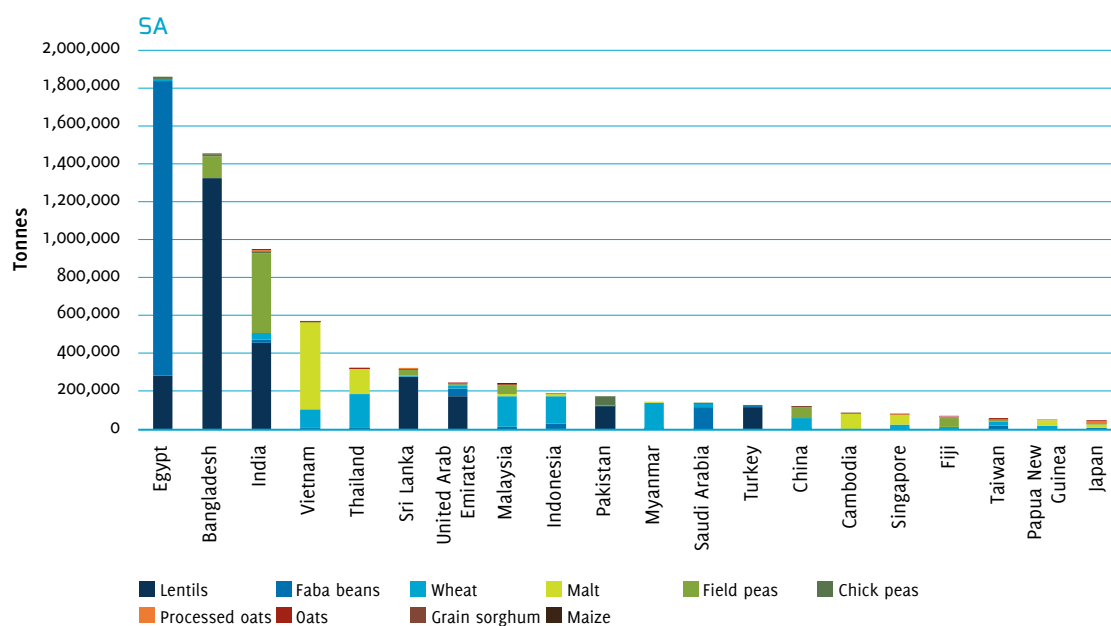


Figure 9. Containerised grain exports from South Australia 2011-12 to 2021-22 to the top 20 countries

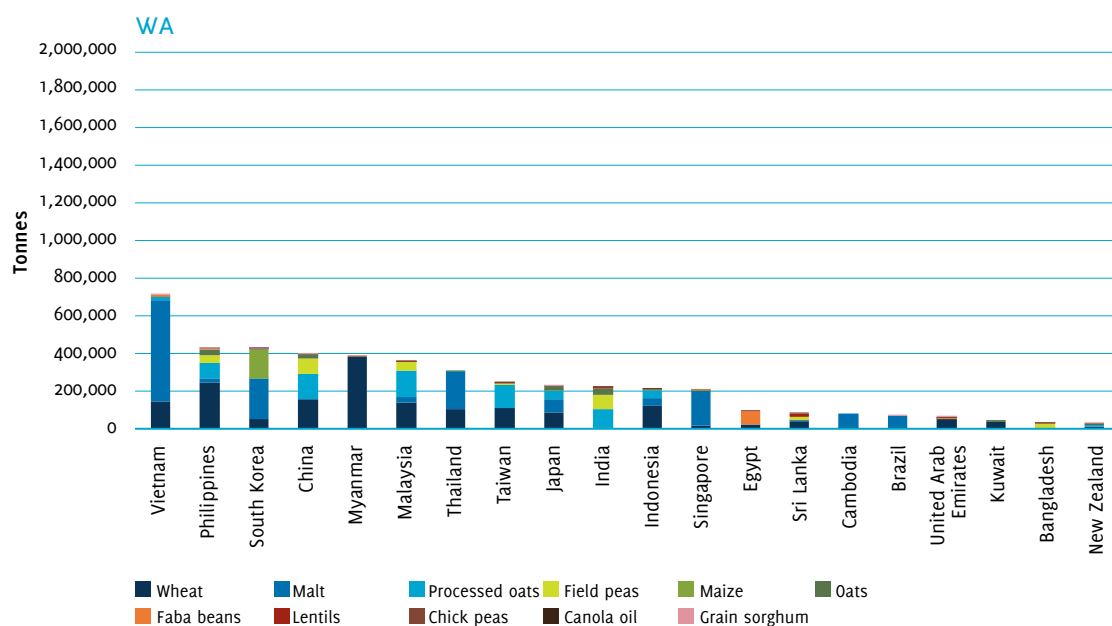


Figure 10. Containerised grain exports from Western Australia 2011-12 to 2021-22 to the top 20 countries

Although, as discussed later in this report, logistical challenges and execution risks have plagued the export of containerised grain in the COVID era, nonetheless the export sector has increased the flow of containerised grain exports. Export data show that in 2021-22 Australia exported 6.05mmt compared to 4.19mmt in 2020-21.

Containerisation of grain generates value for grain growers and end-users insofar as it supports the supply of specialised or niche grains (e.g. pulses, oats, high protein wheat, food grade sorghum) or small parcels of grain or fodder. Containerised trade also serves small or niche markets and can

act as a bridgehead activity from which a bulk trade may then eventuate.

What is not always appreciated is how much fodder is exported via containers from Australian ports. Over several decades Australia has developed some key markets for its export of hay, especially Japan and China, such that often around 1mmt of fodder is exported via containers from Australia (Figure 11). As an illustration, in the early 1980s Japan imported virtually no baled hay, whereas now Japan regularly imports around 2mmt of baled hay via containers. Of that quantity around 0.4mmt is oaten hay from Australia (Figure 12).

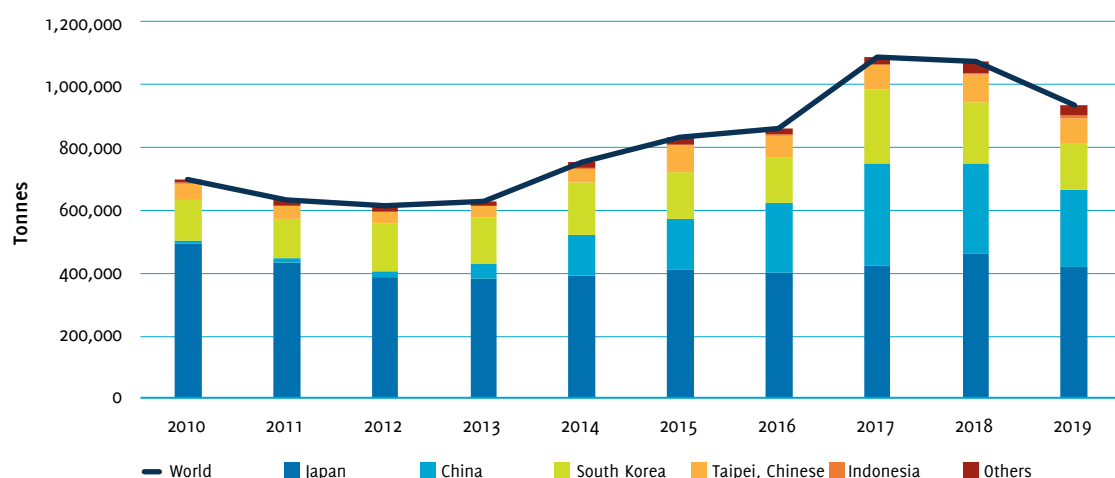


Figure 11. Australian hay and chaff exports

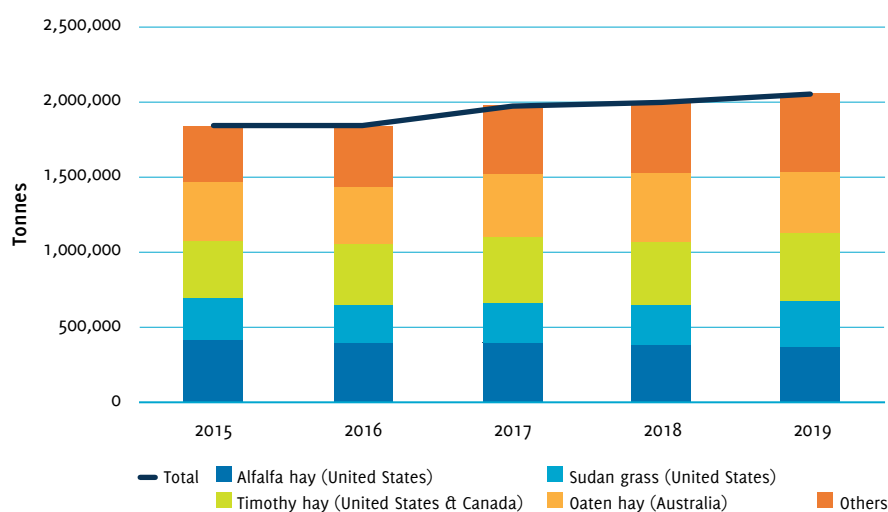
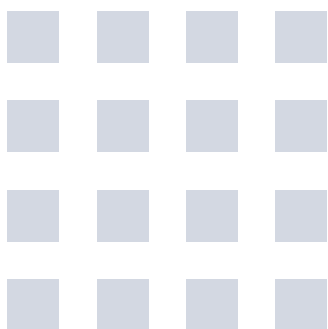


Figure 12. Japan's hay imports by type and source

Source: ITC calculations based on Japanese Ministry of Finance statistics (HS Code: 121490090).  
Hay imports by type: Plant Protection Station, MAFF.

In the long-term Japan's baled hay imports, however, are likely to decline gradually due to the slow decline and ageing of its population. However, other markets especially China, have increased their absolute and relative importance (Figure 11) and remain as strategically valuable outlets for Australian fodder, although in early 2021 the Chinese government opted not to renew 25 of 28 Australian export licences for hay. This export hay trade with China is usually worth about \$160 million a year and represents a third of Australian oaten hay exports.

In contrast to the export of grains and fodder in containers, bulk handlers, as their name implies, focus on trades of bulk grain. Their preference for bulk handling of grain lessens their need to create and manage additional segregations of specialty grades or types of grain at many of their receival sites. Too many segregations involving small amounts of different grains generate 'loss-by-division' at storage sites and raise the unit cost of grain storage and handling. Hence, diverting specialty grains and small parcels of grain or fodder into containerisation can serve as a useful complement to bulk handling which most cost-effectively focuses on the bulk flow of grain.



## The advantages of grain containerisation

In the context of Australian grain exports, efficient, cost-competitive and spatially targeted container packing infrastructure can unlock a diverse range of commercial opportunities for growers and customers. Broadly speaking, container packing or shipment of grain or fodder via containers is commercially feasible, relative to bulk shipping, when there is:

### A viable shipping option for small cargoes

Bulk freight is subject to minimum cargo requirements — usually either a full vessel (between 25–55kt) or in some cases at least one hatch (3–6kt). The upfront cost to load a bulk vessel is such that only larger companies can participate. Port costs have to be paid upfront, ocean freight is payable within a few days of sailing and the grain cargo needs to be purchased in advance of loading. For moderate-sized vessels loaded with grain, millions of dollars of outlay is required; restricting entry to mostly large-sized businesses.

By contrast, containers allow shipping of grain parcels as small as 1 (20ft) FCL<sup>1</sup>. A container carries between 17–30 tonnes (depending on the nature of the grain or fodder cargo). This ability to securely and safely transport small volumes is economically attractive in cases where there are:

- i. sufficiently high margins on these small volumes (e.g. niche qualities or grades or minor grains), perhaps also supported by closed loop arrangements. Pulse Australia (2020), for example, acknowledges the contribution of containerised supply chains to Australia's comparative advantage as an exporter of pulse crops. Australia's containerised supply chains contribute to the reliability, flexibility and timeliness of Australia's pulse exports, facilitating serving smaller customers and higher value niche markets.
- ii. credit, transport or storage constraints at destination. Many end-users historically have operated a 'just in time' approach to sourcing grain due to their limited ability or desire to store large volumes of grain at their location. These users are prepared to pay a premium for small parcels of grain in order to avoid capital investments in land and storage infrastructure at their destination site. Some transport systems in some receiving countries also are best suited to the conveyance by truck of individual containers rather than the bulk movement of grain. Also, some buyers face credit limits and so prefer small volume purchases made possible via containerisation. Some customers require an even, year-round supply of grain or fodder, best served through the regular supply of containerised product. Finally, some customers do not have access to a deep-water port and so need to be serviced by small ships that convey containerised parcels of grain.
- iii. food processor trials of new varieties or grades. Assessing small loads of grain allows food processors to determine the suitability and functionality of new varieties or grades of grain, without committing to expensive large purchases of these varieties or grades.

Further supporting the commercial attractiveness of grain containerisation has been a structural shift in the nature of containerised shipping. When the containerization of grain was in its infancy over 20 years ago, the largest container ships were commonly in the 4500 TEU range. However, over ensuing years larger vessels have been commissioned. Vessels conveying over 8000 TEU are now common, and ships carrying over 18,000 TEUs are entering service. The enlarged carrying capacity of container ships has enabled reductions in or containment of the real cost of sea freight for containers.

<sup>1</sup> In shipping jargon an FCL is a "Full Container Load". This means the entire space of a container is solely allocated to a single user (i.e. not shared with any other user).



### Inadequacies in the bulk grain supply chain

The rationale for a grower not delivering all their grain into a bulk handling network, but rather relying on some containerisation, is mostly due to considerations of geography, differentiation, and cost. Explaining further; containerisation is increasingly attractive:

- i. where a farmer's grain is produced near a container packer but distant from their nearest bulk terminal or upcountry receival point for the type of grain they grow. Container packing assets are relatively inexpensive to build and set up and thus, can be installed across these supply 'hot spots' within a region.
- ii. if the farmer produces grain with specialised traits sought by a particular niche market or individual buyer.
- iii. where an end user requires a verifiable provenance of grain production and traceability.
- iv. whenever the bulk handler is perceived by the farmer to be unduly profiteering from their dominant or monopoly position as a service provider of bulk storage, handling and marketing services. Containerisation is one way a farmer can divert grain away from the monopoly or dominant bulk grain service provider.
- v. where farm production is of sufficient size and complexity that containerisation of some of the farm's grain production can be a value-adding or market risk diversification strategy for the business. Accessing small traders increases the price pressure on the farmer's grains by supporting a larger pool of potential buyers.
- vi. where packing grain into containers allows more efficient and profitable use of existing farm storage, labour and equipment; and for some large multi-commodity trading businesses, a more profitable use of their transport (e.g. trucking or rail) assets. The presence of either complementary containerised goods (e.g. meat products) or other products (e.g. timber, minerals) can help ensure cost-efficiency of a region's transport services (e.g. rail routes to port) that deliver commercial feasibility for containerised exports.

- vii. whenever the bulk supply chain is at full capacity or is facing bulk shipping bottlenecks, containerised grain supply chains offer a supplementation option.

### Complementarity to a bulk grain supply chain

Linked to a previously mentioned observation that successful containerisation requires a viable shipping option for small cargoes, is a related observation that creation and use of containerised grain supply chains enables Australia's grain export industry to better serve a broader range of customers and grain buyers. Containerisation of grain can thus complement bulk supply chains, whilst usefully injecting some competitive pressure on both supply chains (i.e. bulk and container supply chains).

The formation and maintenance of containerised grain supply chains helps the Australian export grains sector in its role as a supplier of grain and fodder. Australia's grains industry is not large like the EU, USA or Russian grain sectors. Moreover, Australia cannot easily increase its grain production, as Australia lacks easy access to additional arable land to support greater production. Nonetheless, however, Australia has sufficient large-scale logistics and port infrastructure to receive post-panamax, panamax and handymax-sized vessels and Australia's small population relative to its grain output frequently allows Australia to be a source of exportable grain surpluses; notwithstanding occasional periods of persistent drought. In addition, Australia has a broadly distributed container freight footprint, complemented by customer-centric marketing and supported (up until the last few years) by attractive back-haul freight rates for containers.

These facilities, a mindset for marketing and usually attractive back-haul freight rates ensure Australian businesses can frequently deliver a range of grains, some with unique characteristics, to meet the functionality requirements of end-users with significant flexibility. This ensures a wide range of potential customers can be served; those who buy several panamax loads of grain, through to very small buyers, who need only one container of a specialist grain.

### **An opportunity to extract value from atypical or differentiated varieties or to unlock value from crop breeders' stranded crop lines**

A logical and expected outcome of a bulk handling network system, when combined with the nature of grain classification systems in Australia and the end point royalty financing of Australian crop breeding, is the frequent dominance of a single variety (or handful of varieties). In the case of wheat, a grower will often sow the variety with the highest yield or highest prospective gross margin. As long as the variety and its load meet receival specifications, its actual functionality to an end user is not fully valued. For example, if a grower produces a load of Australian Prime Hard wheat that is exactly perfect for ramen production and delivers it to their nearest APH receival point, they will be paid the same price as some other APH load that only just meets receival specifications and may, in fact, be somewhat less suited to ramen production.

In a bulk setting, this inability to fully reward grain parcel functionality has a few consequences. Firstly, farmer adoption of functionally novel varieties within the bulk grade system is inherently constrained due to blending and co-mingling of many grain parcels. Secondly, in some situations, a variety is so dominant that the parent grade can become little more than a proxy for the variety. Thirdly, and most importantly, because crop breeding is funded by end point royalties, crop breeders are encouraged in a bulk system to generate new varieties that are high-yielding whilst just meeting grade specifications. The result is often the widespread dominance of a single variety or a small group of varieties rather than the provision of a portfolio of varieties with a range of functionalities for different end uses or products.

The intense search by crop breeders for the next dominant variety means their breeding programs likely contain some advanced lines with some unique or superior functionalities but there is no path to market in a bulk system for these lines. However, containerisation and/or closed loop marketing arrangements offer a means to extract value from these unique advanced lines, so they need not be stranded or be biological assets invariably discarded or under-utilised. Containerisation and/or closed loop arrangements can increase the biological diversity of a region's grain production and increase the diversity of market opportunities for grain producers and crop breeders.

### **Reward for protecting grain quality from reduced handling**

One main difference between bulk handling and containerisation of grain is the frequency of handling and mingling. In a bulk handling system, grain more frequently risks being damaged and co-mingled as it moves through the supply chain from farm to bulkhead, from bulkhead to train or truck, then into port storage before being exported via large conveyors. To minimise the risk of damage most bulk handlers have invested in handling equipment that is less damaging (e.g. use of conveyor belts rather than augers; and instituting maximum drop heights). Nonetheless, in general, containerisation involves less co-mingling and damage to the grain from repeated handling. Some pulses, for example, are fairly easily damaged so containerisation is one option to avoid price penalties or downgrades attributable to physical damage.

### **A perceived need for greater diversity in grain supply chains**

One issue noted in the sub-section “Inadequacies in the bulk grain supply chain” was that in some regions, grain producers opt for selling some of their grain through containerisation to lessen their dependence on the services of the dominant or sole bulk grain handler. In some situations, farmers feel exposed to the risk of monopoly behaviour by a sole or dominant bulk grain handler or the monopsonistic behaviour of a dominant bulk grain buyer. Provision of container packing services by independent traders helps expose grain producers to a different suite of potential buyers and enlarges the competition for farmers’ grain; thereby dissuading bulk grain service providers and bulk grain buyers from engaging in anti-competitive behaviour. Strategic siting of container packing services by independent traders can also allow some farmers and related multi-commodity businesses to access multicommodity freight services (e.g. rail freight services) to their commercial advantage.

As a generalisation, any increase in the number of buyers intensifies competition. A bulk shipment in a panamax ship may be handled by several large import buyers who then may split the cargo to supply many smaller domestic buyers. By contrast, supplying grain in containers potentially serves the direct needs of a far greater number of customers who help deliver competitive pressure on the price of that grain and who help establish niche markets and form new loyalties. It is this wider array of customers that helps diversify market opportunities whilst placing competitive pressure on grain prices.

### **Limiting the financial downside of quality or phytosanitary events**

Containerisation can limit financial losses that arise from phytosanitary events or quality disputes. In the case of phytosanitary contamination in a bulk shipment, this can be particularly challenging if the issue is identified by AQIS via examination of samples, which are taken at regular, prescribed intervals during loading.

For example, the identification of a single live insect on the proscribed list triggers a cascade of actions aimed at identifying the source and examining the samples to establish whether the issue is isolated or widespread. Regardless of the nature of the contamination and who discovers it, once identified, the silo, tank or stack in question will almost certainly be removed for investigation, with the shipper unable to load as planned and then needing to quickly undertake a methyl bromide application and swap to an alternate supply. Depending on the contract terms in place for the shipment in question and other factors such as availability of replacement stocks and the shipper’s ownership of additional stock within the network, the issue could have minor or larger financial consequences.

In the case of containers however, unless the contamination is distributed throughout the cargo, the initial volume knocked out of loading is often limited to that container or its associated storage no longer being accessed. Hence, the downside commercial risk associated with phytosanitary events or quality disputes is often less in container supply chains compared to bulk grain supply chains. A grower who exports containerised grain or fodder manages the biosecurity risk by having their own Biosecurity – Authorised Premises and fumigation contract and biosecurity export documents specific to their shipment, whereas the grower who delivers into a bulk system entrusts the processes and management of the bulk handler.

## Access to empty containers

Ease of access to containers facilitates containerised grain exports.

Australia is a net importer of containerised goods. This results in a surplus of empty containers normally being readily available in main container ports like Melbourne, Brisbane or Botany. Because shipping companies normally try to avoid handling empty containers, the prices of accessing empty containers and their backhaul rates often encourage grain and fodder containerisation.

In regions like Victoria and New South Wales with their large populations and resultant large demand for goods imported via containers, a surplus of empty containers is usually constantly available. This facilitates the export via containers of certain pulse crops, seeds and fodder. Moreover, there is a greater frequency of container ships arriving and leaving the main ports of Melbourne and Botany which enhances the potential speed and reliability of serving containerised grain and fodder customers out of these main ports. Due to the volume of incoming containers into these main ports there is often greater availability of 20ft containers but only 25 per cent of 20ft containers are typically food grade suited to containerised grain exports.

Victoria, in particular, is well-placed to maintain a potentially vibrant trade in containerised grain and fodder (see Table 2). Another technical aspect that favours the export of containerised grain in places like Victoria where a surplus of empty containers is commonplace is the weight-bearing capacity of container ships. Explaining further and drawing on Prentice and Hemmes (2015), a typical 5000 TEU container vessel has a maximum gross carrying capacity of approximately 49,000 tonnes, or approximately 9.8–10.5 tonnes per TEU. This is a function of the vessel's buoyancy and carrying capability.

Based on the dimensions of a standard 20ft container, these ships can carry a maximum per-cubic-foot loading of approximately 6.5 kilograms per cubic foot (kcf). The challenge with loading bulk commodities into containers is that their densities are greater than the average lading threshold of 6.5 kcf. Accordingly, shippers would say a container ship of grain would "weighout" before it "cubed-out".

Explaining further, a standard 20ft container typically accommodates about 21 tonnes of grain, often filling much of the available space in the container. At the higher end of this range is wheat, which normally weighs in at an average of 23 tonnes per 20ft container. If it is assumed that a 5000-TEU container ship is available to load, then the weight profile of these loaded containers would only permit 2140 to be taken aboard; a load factor of just under 43 per cent. In this case having an ample supply of empty containers to ship back to where those empty containers are needed is a great advantage, because the ship's cargo can then comprise containers laden with wheat plus a complementary cargo of empty containers; thereby facilitating the export of the containerised grain. Ultimately, 1.34 empty TEUs would need to accompany every TEU loaded with wheat in this case. This ratio of 1.34 is derived as follows for a typical 5000-TEU vessel:

*Vessel's Net Tonnage: (NT) = 49,226 tonnes*

*Vessel's Container TEU Capacity: (T) = 5000 TEUs*

*Standard lading per TEU: (SL) = 9.84 tonnes*

*Wheat lading per TEU: (WL) = 23 tonnes/TEU*

*The maximum number of loaded wheat containers (MC) that could be carried are:*

$MC = (NT/WL) = (49,226 \text{ tonnes} / 23 \text{ tonnes}) = 2140 \text{ loaded wheat containers.}$

*The load factor (LF) per container ship is:*

$LF = (MC/T) = (2140/5000) = 0.428$

*The empty-to-loaded container ratio (ELR) is:*

$ELR = ((T - MC)/MC) = ((5000 - 2140)/2140) = (2860/2140) = 1.34$

To efficiently access empty containers requires information-sharing and activity coordination between track owners, shipping lines, stevedores, rail operators, freight forwarders and grain packers. The current status of containerised supply chains in Australia suggests there is inadequate information-sharing and coordination.

## The disadvantages of grain containerisation

Having outlined the situations and motivations where embracing grain containerisation is likely to be commercially appealing, it is important to also describe the challenges and pitfalls facing businesses that engage or propose to engage in the containerisation of grain and fodder.

### Cost of container supply chains relative to bulk supply chains

During 2020 and 2021 the main factors affecting the relative commercial attractiveness of the containerisation of grain and fodder, by far, has been the execution risk and supply chain costs associated with containerisation. The per tonne costs of the container supply chain versus its bulk grain alternative, in many cases has led to either a cessation or reduction in use of containerised grain supply chains over these years. Contraction or expansion of this cost spread is a major determinant of container demand for grain export.

That said, not all containerised freight is sensitive to this spread, as below a certain total tonnage, bulk freight cannot currently be a viable option. Hence, certain very niche or specialty grain markets remain the realm of containerisation, albeit consumer resistance to paying high prices eventually lessens the demand for these niche products. Before reaching that price point of consumer resistance, however, often the increased freight and handling costs are passed back along the supply chain but ultimately lower the farm-gate price offered to farmers which lessens the farmer's incentive to then grow these specialty crops.

### Access to empty containers

As previously stated, ease of access to containers can be either an advantage or disadvantage depending on the magnitude and consistency of that ease.

In less populous regions like Western Australia or South Australia, container availability is less assured, despite these regions regularly producing large exportable surpluses of grain. Moreover, container ships arrive and leave the main ports of Fremantle and Adelaide less frequently compared to Melbourne and Botany which reduces the potential speed and reliability of serving

containerised grain and fodder customers out of these ports in WA and SA. In these ports access to food grade 20ft containers for grain export is especially important as often trucking capabilities at receiving ports are better geared to handle 20ft rather than 40ft containers. Also, even within many parts of Australia, road transport regulations limit the weight of grain that can be loaded into a 40ft container for subsequent road transport. This weight restriction for 40ft containers, however, is less an issue for fodder exports due to the lesser density of fodder (see [Appendix 1](#)).

Access to food-grade 20ft containers is especially important as some importing countries are not able to easily handle 40ft containers and so have a strong preference to receive 20ft containers.

Wherever regional availability of containers is less and wherever frequency of access to container ships is less, then the commercial attractiveness and growth prospects for containerised exports is constrained. Hence, states like WA and SA face a more constrained future for containerised grain and fodder exports than Victoria.

During the COVID pandemic, and even in its aftermath, availability of 20ft food grade containers at many of Australia's container ports has been problematic and so bookings cannot be easily made. Moreover, even where containers might be available, shipping lines may limit their sailing dates or routes to key containerised grain markets, such as the sub-continent or Middle East.

### Need for proper business planning and access to expertise

If a farmer seeks commercial involvement in grain or fodder containerisation, then one of the main messages from interviews with current farmer participants in grain containerisation is the need to conduct proper business planning and to ensure appropriate expertise is available to the business. In their rush to activity, often farmers underinvest in business planning, due diligence, and business governance. For example, if a farmer opts to establish a container packing facility, then often the resulting sales of containerised grain are Delivered Container Terminal (DCT) contracts that provide the farmer with no security for payment given that the bills of lading are issued to the DCT buyer (i.e. the firm that has booked the freight). Once the containers are delivered to the terminal, they are under the control of the DCT buyer, and



the seller has limited recourse in the event of non-payment by which time the containers may well have left the country. Hence, undertaking due diligence assessment of potential DCT buyers is essential. Often to lessen these sorts of risks, many farmers instead directly deliver their grain to a separate container packing business.

Proper business planning helps ensure that capital purchase and labour-hiring decisions are properly thought through to display commercial merit. Due diligence in assessing third party risk and market opportunities helps prevent bad or costly decisions. Designing, communicating and monitoring business and operational processes is also essential to deliver organisational safety and the required documentation to facilitate commercial activity.

Often external experts or people with experience in the marketing of containerised grain and fodder are best brought into the business to avoid costly mistakes or oversights. Entry into the trade of containerised grain and fodder requires a farmer to be exposed to many risks outside their control. Exposure to third party risk is ever present. Unfortunately, some businesses succumb to money illusion where an enticing high price causes the delivery of containerised product, only then to find they are not paid for the product or are not fully paid.

Farmers are also exposed to the actions of others in their containerised grain supply chains (e.g. shippers and stevedores). Farmers have limited or no control over the actions of these other service providers. Being aware of how vulnerable their container trade business is to the actions of others outside their control can help contingency plans to be prepared and implemented, when necessary.

In some grain-producing regions of Australia, such as WA, where domestic market opportunities are limited, and the bulk supply chain is relatively cost-efficient, then many farmers opt mostly to send grain into the bulk system. This simplifies their grain management tasks and is attractive to time-pressed crop producers. That said, there are farmers in other regions that do not like being solely reliant on a single commercial bulk grain handler and so support grain containerisation to inject some competitive pressure in grain handling.

Although various organisations offer basic training and education for potential exporters, the many tasks and difficulties faced by containerised grain exporting business are rarely addressed in sufficient detail.

Grain Trade Australia (2018) produced a useful technical guideline for container packing and will run, if there is sufficient demand, 2-day courses that cover the basics of packing operations.

### **Need to avoid over-capitalisation**

Another main message from interviews with current farmer participants in grain containerisation is the need to avoid over-capitalisation. As shown in recent years, the profitability of exporting grain and fodder can be subject to much uncertainty and volatility. Accordingly, to prevent under-utilisation of assets and to ensure a sufficiently attractive return on capital, it is vital to avoid over-capitalisation. Being able to cease or scale back container trade operations in response to market realities is crucial to the viability of many businesses. Having a capital structure appropriate to the vagaries and volatility of the container trade is a pre-requisite for business success.

### **Need for Minimum Residue Limit (MRL) monitoring**

In markets with tight chemical residue tolerances the co-mingling of grain that occurs in a bulk system provides a dilution factor that ensures MRLs are rarely breached. By contrast, in container supply chains with some grain being supplied directly ex-farm, with no access to dilution, the risk of breach is greater. Even in a farm silo or bulkhead that on average tests below MRL thresholds there maybe pockets that when packed into a container result in subsequent detection and rejection; and the associated reputational damage.

More countries are applying MRL protocols. Yet it is extremely difficult at any container grain packing site to segregate product until MRL testing is complete. Thorough MRL testing adds to the costs of containerisation and can delay the process of containerisation.

# Grain containerisation versus bulk grain

## The nature and cost of bulk grain supply chains

### Introduction

White *et al.* (2018) divide bulk grain export supply chains into three main types (Figure 14). In the traditional supply chain, the grain is delivered by the farmer to a nearby receival point where it is stored and subsequently transported to port by rail and road. At the port, grain is aggregated and shipped. In a more direct supply chain, the grain is delivered by the farmer to port from farm storage for direct loading. In the third main type of supply chain, the farmer stores grain on-farm then sends it to domestic users. A recent analysis of harvest logistics in Australia suggests that this third type of supply chain may become increasingly popular among farmers, especially those in states outside of Western Australia (WA) (Kingwell *et al.*, 2020).

In all states, other than WA, farmers no longer retain controlling shares in the ownership and operation of their major bulk handling supply chains. The organisations who own key components such as up-country receival sites are reducing the number of those sites and consolidating their operations into larger more efficient facilities that, whilst adding to some farmers' transport costs, are generating improved turn-around times to assist in harvest velocity. Economies of scale and excessive maintenance costs, as facilities age and no longer meet safety standards, are some of the factors driving rationalisation of receival sites. Moreover, farmers have invested in larger harvesting equipment, headers and trucks, to increase the speed of harvesting and reduce weather damage risk. Combined with increasing crop yields, the ramifications are that bulk handlers need facilities to more rapidly receive and store grain, and then outturn it more quickly. Farmers are also building on-farm storage capacity to help match their enlarged field harvest capacity.

Wheat and barley deliveries to traditional bulk handling companies on the east coast are typically to access early cashflows at harvest and pay suppliers of services. Some other crops like pulses are delivered to container packing facilities for export.

The costliness of Australia's bulk grain supply chains affects the international cost-competitiveness of Australian grain. Bulk grain supply chain costs represent between 32 and 36 per cent of the FOB (Free on Board) price of Australian wheat that is internationally traded. Moreover, these bulk grain supply chain costs are often more expensive than some of Australia's wheat export competitors like Ukraine and Argentina (White *et al.*, 2018). The challenge for Australian grain exporters is that Australia's competitors continue to boost the efficiency of their supply chains by investments in rail, road and port infrastructure and, given less climate variability, are often able to more reliably supply customers year on year; although this advantage is weakened by uncertain policy intervention by the governments in some exporting countries and, in the case of the Black Sea region, by recent conflict and sanctioning actions. Significant advances in milling technology also allow flour mills to manage quality outcomes more effectively across different wheat types in their blend so a lesser quality of grain from some of Australia's competitors can be more easily and frequently used.

One of Australia's wheat export competitors is Canada. It has invested in high throughput 150 rail car upcountry sites and materially added to its west coast port terminal capacity. New facilities and upgrades to existing port facilities in the Port of Vancouver have expanded its capacity from 29mmt to 40mmt/annum for an average 23–25mmt export program. Improved upcountry rail loading sites and introduction of high-performance trains now allows Canadian unit trains to be up to 15,000 tonnes, an increase of 4400 tonnes per train (White *et al.*, 2018).

Argentina is renovating its rail system, investing US\$2.8b which will reduce its supply chain costs (Kingwell & White, 2018). Ukraine has received a US\$560 million loan to upgrade or rehabilitate its road network (Kingwell *et al.*, 2016b) but war and restoration in Ukraine will weaken its cost-competitiveness in 2022 and 2023; and perhaps even in subsequent years.

These above-mentioned investments contribute to the grain export prowess of these countries and ensure these countries will likely remain strategic threats to Australian wheat exports (Kingwell *et al.*, 2016a; Kingwell *et al.*, 2016b; Kingwell & White, 2018). To keep pace with these competitors, it is imperative that the supply chains of Australia's wheat industry are increasingly cost-efficient.

In addition, the environmental sustainability of grain supply chains is likely to become an issue of increased importance (Kingwell, 2021). The cost of being carbon neutral, for example, has not yet been introduced in supply chain costs but could in future years. It is known, for example, that the principal provider of grain supply chain services in WA, Cooperative Bulk Handling (CBH), monitors greenhouse gas emissions across its supply chains, and all bulk handlers are by law required to report their greenhouse gas emissions.

The owners and operators of much of the bulk export supply chain infrastructure, post-farm gate, are also dominant grain traders. Owning and operating supply chain infrastructure helps these businesses to execute grain sales and gives them spatial intelligence about the quantities and qualities of grain available for purchase. Perhaps it is therefore unsurprising that two of Australia's principal grain handlers, Cooperative Bulk Handling (CBH) and GrainCorp over the last decade have increased their combined share of Australia's bulk export of grain from 30 per cent a decade ago to around 50 per cent (Figure 13) in recent years.

However, if the example of CBH is typical of Australia's other main grain handling and grain marketing entities (i.e. Viterro and GrainCorp) then a main portion of their business profits stems from the grain handling and storage arms of their businesses rather than grain marketing (Table 4). The inference from data in Table 4 is that grain trading in Australia is highly contested and that for main grain handlers like CBH their principal source of net profit is from storage and handling.

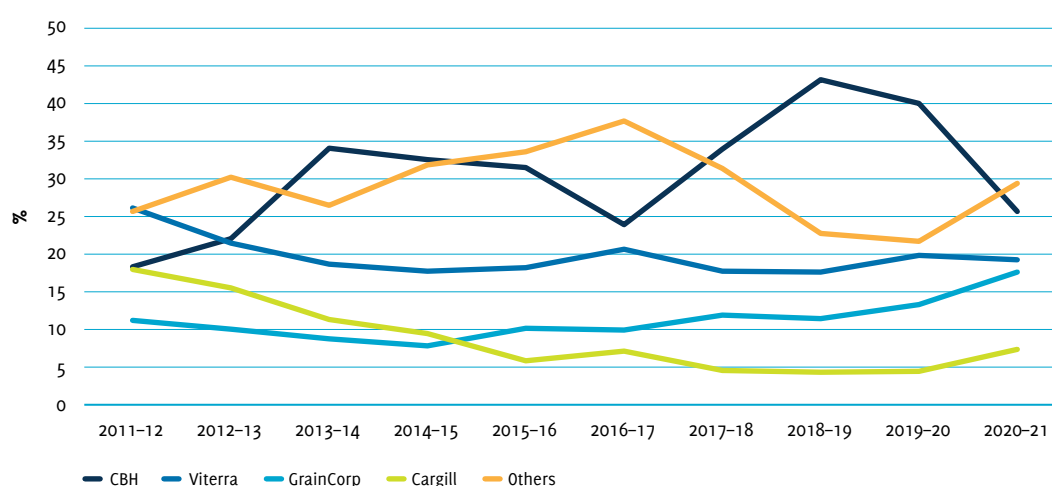


Figure 13. Company shares of bulk grain exports from Australia: 2011-12 to 2020-21

Table 4. Sources of net profit for the CBH Group: 2016–17 to 2020–21

	2020–21	2019–20	2018–19	2017–18	2016–17	5-yr average
<b>Tonnes received (mmt)</b>	15.1	9.8	16.4	13.3	16.6	<b>14.24</b>
<b>Net profit source (\$m)</b>						
Grain storage and handling	44	-11	100	45	98	<b>55.2</b>
Marketing and trading	77	12	-119	3	10	<b>-3.4</b>
Grain processing	14	8	-15	-7	8	<b>1.6</b>
Other		2	4	-7	-25	<b>-6.5</b>
<b>Net profit source (\$/t received)</b>						
Grain storage and handling	2.91	-1.12	6.10	3.38	5.90	<b>3.44</b>
Marketing and trading	5.10	1.22	-7.26	0.23	0.60	<b>-0.02</b>
Grain processing	0.93	0.82	-0.91	-0.53	0.48	<b>0.16</b>
Other	0	0.20	0.24	-0.53	-1.51	<b>-0.32</b>

Source: Based on published data in the CBH Annual Report 2021 (CBH 2021d).

The ACCC produces and publishes annual bulk grain monitoring reports (e.g. ACCC, 2021). These reports detail the nature and concentration of export activity and capacity allocation at Australia's bulk grain port terminals. Table 5 displays supplementary data from the ACCC (2021). Since 2010–11, additional bulk grain export facilities have been built, mostly in states other than Western Australia. These new facilities have increased the export options for grain traders and grain producers but in years of low volumes of grain production become under-utilised assets that potentially raise the unit cost of grain export.

Since 2010–11 a few trends have emerged regarding the use of facilities and market shares among grain traders. There are more new and smaller grain export port facilities. In 2020–21 grain exporters shipped a record amount of bulk grain

from 28 facilities across Australia. However, fewer exporters are using each port, with an average in 2020–21 of below five exporters per port, compared to eight in 2011–12: mostly reflecting a consolidation in the number of grain exporters. Worth highlighting is the marked reduction in the number of exporters using GrainCorp facilities since 2010–11. Also the number of exporters using Viterra facilities since the early 2010s has noticeably declined.

The next sub-section outlines the approach taken to estimate the current public tariff rates of bulk grain supply chains in Australia and to then compare those tariff rates against those reported in previous studies by Stretch *et al.* (2014) and White *et al.* (2018).

Table 5. Number of bulk grain export facilities and the number of grain exporters using PTSP<sup>#</sup> facilities: 2010–11 to 2020–21

	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21
National average per facility (all PTSPs)	7.94	8.29	7.35	7.78	5.57	5.92	5.04	3.38	3.19	4.50
CBH average	8.75	10.0	8.75	10.75	10.25	10.25	9.25	9.00	8.75	8.25
Viterra average	7.60	7.40	9.20	11.40	8.60	7.60	8.20	5.60	6.00	7.00
GrainCorp average	8.00	8.00	5.57	4.86	4.29	6.00	4.29	1.86	1.43	3.86
Number of facilities*	18	18	18	19	23	24	25	25	28	28

Notes:

<sup>#</sup> PTSP = Port terminal service provider – the owner or operator of a port terminal facility that is used, or is to be used, to provide a port terminal service. The averages are not weighted by the size of the facilities.

\* Port Adelaide Viterra is counted as two facilities (Inner Harbour and one for Outer Harbor).

Source: ACCC (2021) Based on PTSP loading statements; ACF Shipping stem and market share reports.

## Methodology

The approach of White *et al.* (2018) is followed to assess supply chain tariff rates<sup>2</sup>. This approach allows a node-by-node comparison of grain supply chains across Australia. Figure 14 shows an overview, as mentioned previously, of the three categories of bulk grain export supply chains: Traditional, Direct and On-farm. On-farm storage is not considered here.

All tariff rates from harvest 2020–21 (hereafter 2021) are compared with previous data. Where data is available for harvest 2021–22 (hereafter 2022) those datasets are included. Historical charges were expressed in 2021 constant value terms using CPI values (ABS 2021) and charges in 2022 assume a cost inflation of 3 per cent.

Public tariff prices published by Australia’s main grain handling and storage service providers are used where available. Road and rail freight data published by CBH for WA and Vitterra for SA are used and compared against previously published data based on distances to port. Rates are compared with previous years for sites where historic datasets exist (see Appendix 2 and Appendix 3).

These rates are close to the market rates for execution given they are ‘guaranteed’ rates as part of export efficiency agreements for delivered port supply chain costs. However, for the eastern states (Vic, NSW and Qld), the road/rail freights used are similar to the location differentials published by Grain Trade Australia (GTA) as a freight cost approximation. This approach is the same used by Stretch *et al.* (2014) and White *et al.* (2018), making our findings comparable to those found in these previous studies. GTA publishes each year the location differentials for all states (see Appendix 3). However, location differentials are not charges but are an instrument to facilitate transfer of grain between traders. When they were first developed, location differentials reflected actual freight costs, as most grain was moved by rail, but over time the cost difference between road and rail has widened due to advances in high-performance trucks with net weights up to 70 tonnes per truck (White *et al.*, 2018).

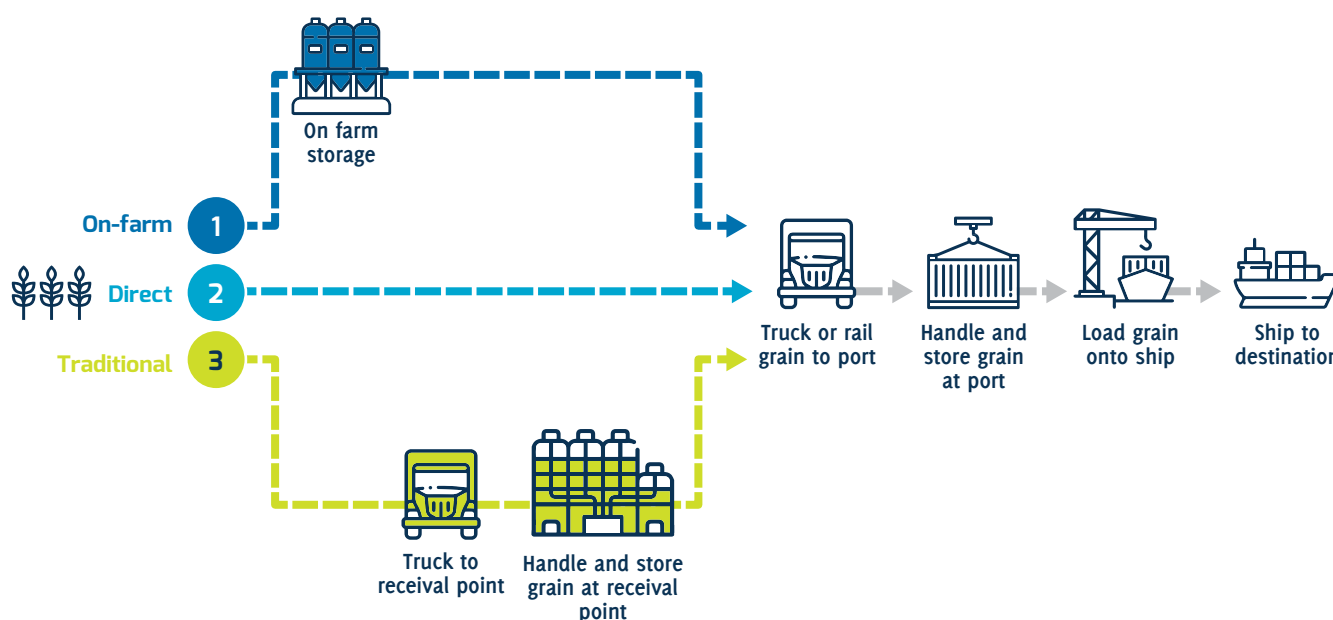


Figure 14. Overview of the types of supply chains

Source: Adapted from White *et al.* (2018).

<sup>2</sup> This section of the report outlines a study supervised by Professor Ross Kingwell and mostly undertaken by Mr d’Abbadie, a Master of Agricultural Economics student at the University of Western Australia in 2021.

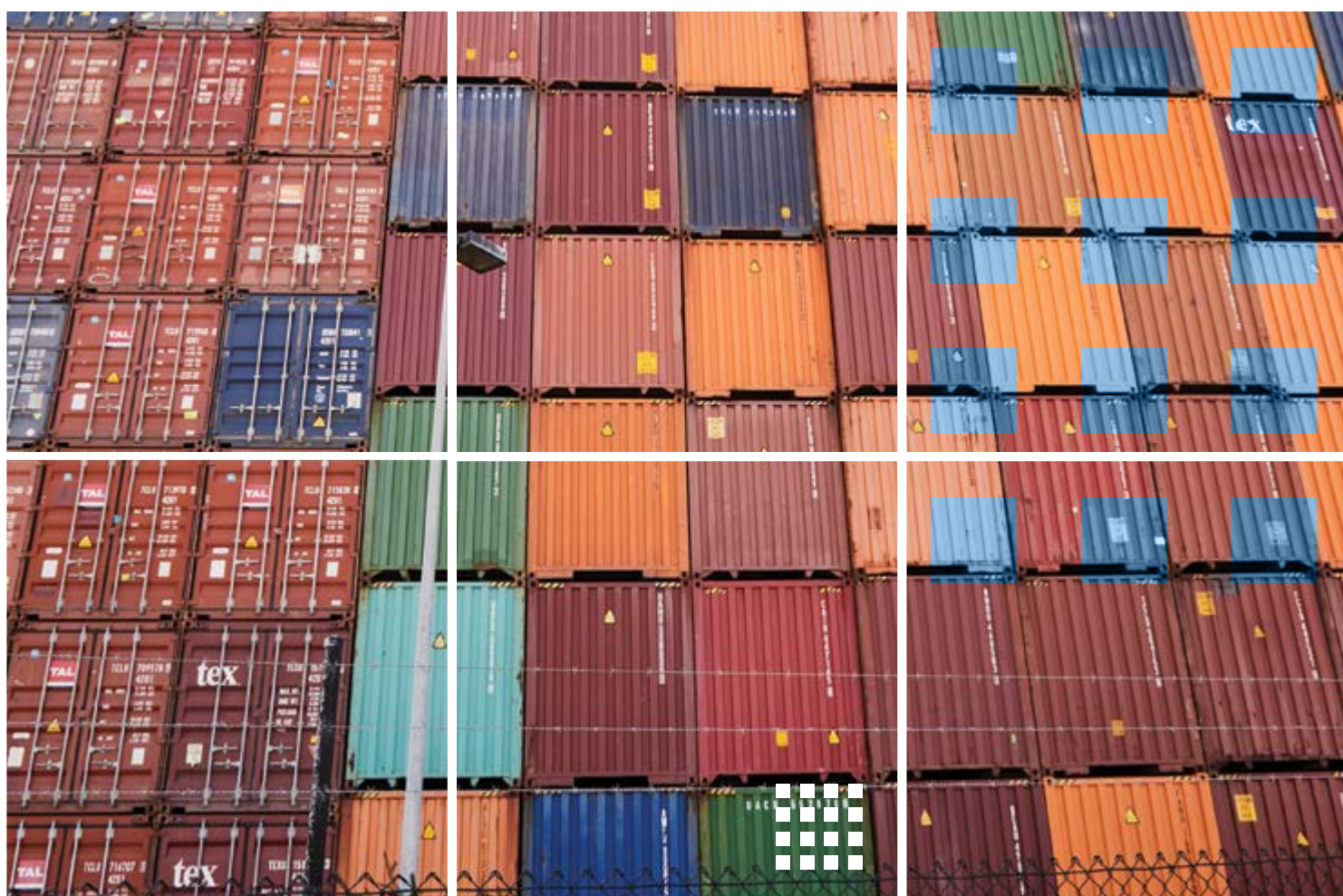


Warehouse storage costs were obtained from public tariff rates published by service providers (see [Appendix 3](#)). The fees' names and purposes vary between service providers. Consequently, we use the names and definitions given by White *et al.* (2018). GTA has published the main major providers' receival sites across Australia, and those same sites are used here following the methodology of White *et al.* (2018).

Port loading charges were obtained from the service providers' port terminals and ports services agreements (see [Appendix 3](#)). All these reports are public reports published by the handlers and port authorities. From the ports' public information is obtained the wharf fees and other miscellaneous port fees. Stevedoring charges were obtained from the port terminal agreements and port schedules. To be consistent and comparable with previous studies, we use the names for port charges as described by White *et al.* (2018). However, after receiving expert advice the miscellaneous port costs and wharf

fees were separated from the stevedoring charges, given they are paid to different service providers or in the case of stevedoring can be an internal cost to the bulk handling company.

Ship freight rates were derived from the Baltic Exchange (2021) and were considered to be the averages from January 2021 to June 2021. This is the peak shipping period for grain exported from most Australian ports. The relevant shipping routes considered are detailed in [Appendix 4](#). The fuel cost was the IFO 380 global average bunker price published by Ship and Bunker (Ship and Bunker, 2021). In 2021 and 2022 shipping costs have increased due to the ramifications of COVID-19 pandemic, combined with an increased demand for dry bulk shipping.



## Results and discussion

### Truck and rail freight

A comparison of freight costs versus distance, for CBH and Viterra, is shown in Figure 15. This figure shows all the published freight rates for 2021. The freight rates in the Viterra network to port are higher than the freight costs in the CBH network for the same distance. This finding is consistent with that of White *et al.* (2018). The variation in Viterra's freight rates also is higher than for CBH. This difference in variation is similar to the variation difference found by White *et al.* (2018). In that report, they argued that this variation could be caused by the geography of SA and the road and rail mix between the different export zones (e.g. Eyre Peninsula in SA is 100 per cent road). Nevertheless, on average, growers from SA pay between \$5.40 to \$6.30/tonne more than WA growers for freight over equivalent distances. The lower rate in WA could be due to the greater economies of scale in WA, for example running longer 60 wagon trains. Another reason for this difference, especially for larger distances (i.e.: larger than 200km) is that a larger proportion of freight at this distance is by train in WA (approximately 60 per cent). However, the difference between CBH and Viterra's freight charges is surprisingly constant even at short distances. In those short distances (i.e. lower than 200km), rail and truck transport rates are relatively consistent. Additionally, the trucking

costs in WA and SA should be similar as the main components of truck costs are labour and fuel, which are similar in both states and truck combinations are also similar given road network capacity.

In recent years, Viterra has changed its freight logistics on the Eyre Peninsula to 100 per cent by road trucks, as rail lines have been closed due to a lack of viability in upgrading. A larger size of trucks is allowed on the roads – up to 55–70 tonne net payload on road trains (at harvest) and AB triple trucks (site to port delivery). The geography of the peninsula supports relatively straight and flat roads. Rail is more costly due to the rail system not covering multiple commodities, unlike the case in eastern SA. Plus, the rail system is an old narrow-gauge 16-tonne axle load which limits wagon sizes and weights. This all makes road transport preferable. Viterra contracts road transport operators for an overall volume from each site for a defined period, as distinct from what happens on the east coast of Australia where road rates are negotiated more on a spot basis. The Viterra contracts provide more consistency for road freight operators which allows for lower road rates on confirmed tonnes.

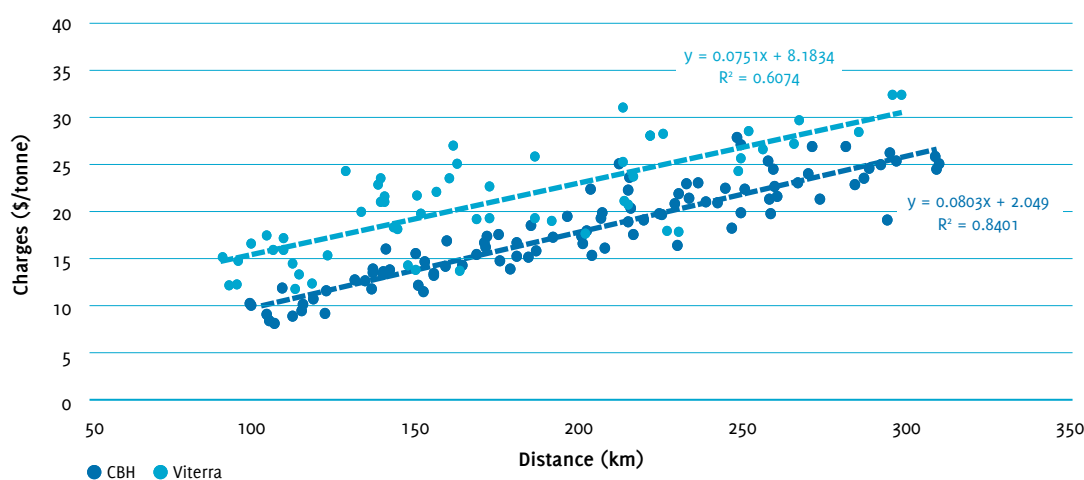


Figure 15. Comparison of CBH and Viterra freight charges for 2021

Figure 16 illustrates freight charges versus distance for CBH and Viterra in 2022. CBH, on average, has lower freight costs than Viterra but the difference has lessened in 2022. However, Viterra still displays a greater variation in its charges around an underlying linear trend. The difference in costs between CBH and Viterra is \$3.50/tonne for freight distances below 100km from port, and \$1.70/tonne for freight distances beyond 300km from port.

Adjusting prices to 2021 equivalent prices, the freight rates have reduced over time for Viterra and CBH, as shown in Figure 17 and Figure 18. For Viterra, its real freight charges have reduced between 2013 to 2022, by 11.1 per cent for 100km and by 23.9 per cent for 300km. In short, the longer the distance, the greater the reduction in real charges. This could imply that greater efficiencies were derived from reducing fixed costs than variable costs.

CBH's freight charges have similarly decreased greatly since 2011, although 2022 is a large reversal to the charging trend. Charges have increased from 2021 to 2022 by 19.0 per cent for 100km and by 10.1 per cent for 300km. The reasons for this increase could be a mix of short and long-term factors. The short-term factors mainly arise from the COVID-19 situation that has fuelled a labour shortage in WA, including a shortage of higher qualified drivers for PBS vehicles, and has increased the cost of labour.

Contemporaneously, the expected large grain harvest in 2022 has increased the demand for trucks and rail services. Finally, the increase in fuel costs in 2021 has placed upward pressure on freight costs. Over time, with growing crop sizes, the road-rail mix has changed with more road services being required to transport grain from farms and fill the flexible export task. These trends place upward pressure on freight rates. Additionally in 2021 CBH entered into a new rail contract with Aurizon with additional rail capacity (2 new unit trains) and more reliability requirements built into the supply contract. A further business structure influence is that CBH, as a cooperative, relies on retained earnings to reinvest in its business, to fund acquisitions and maintain increasingly tighter lender requirements for a large cash trading book. Increasing service charges within their network operations is one mechanism to maintain a healthy balance sheet. Viterra in the same period has still operated under the same take or pay rail contracts for its eastern region export shipping, whilst road transport is solely used on the Eyre Peninsula for its grain export task.

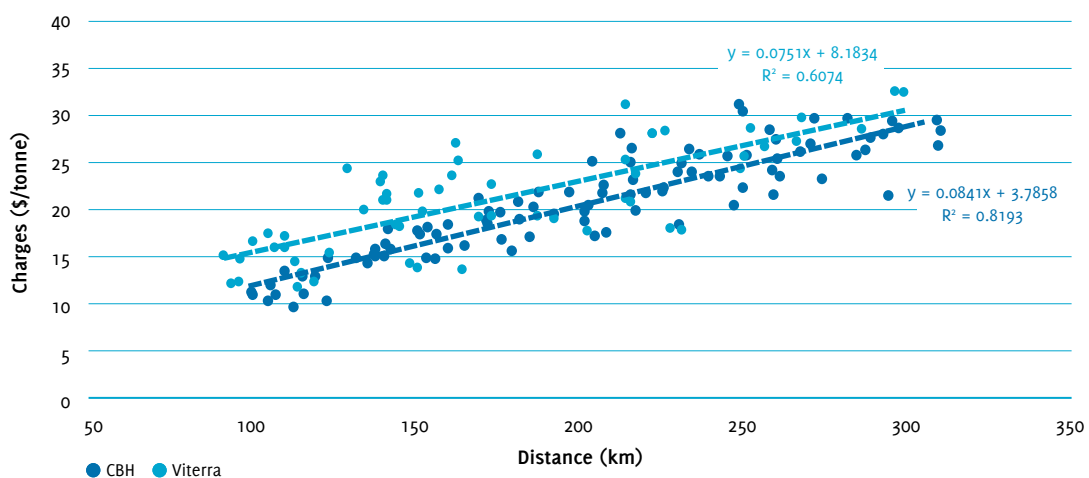


Figure 16. Comparison of CBH and Viterra freight charges for 2022

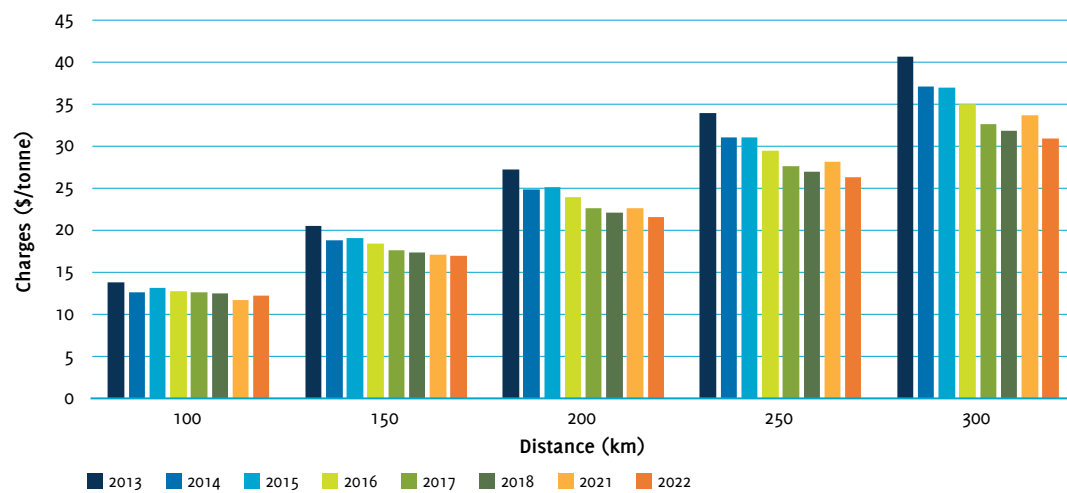


Figure 17. Viterra average freight charges, adjusted to 2021 equivalent prices based on changes in the Australian CPI

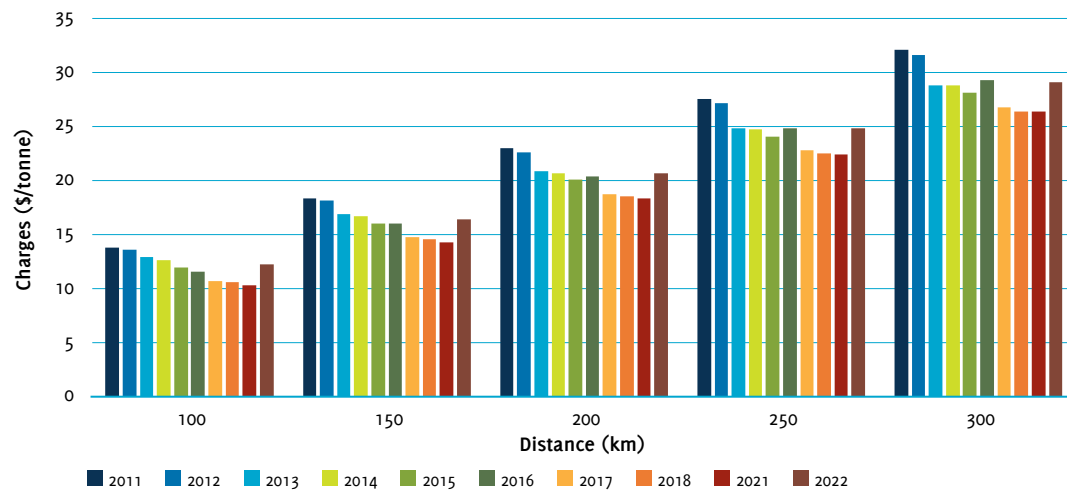
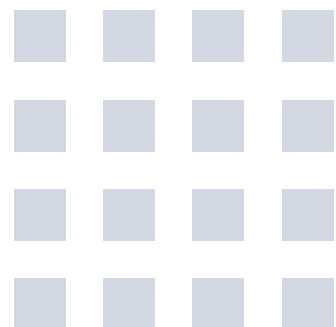


Figure 18. CBH average freight charges, adjusted to 2021 equivalent prices based on changes in the Australian CPI



### Warehouse Storage

The reduction in the number of receival sites is shown in [Table 6](#) for different states. The results show a reduction in the number of receival sites in 2022 of around 7.8 per cent compared to 2018. In general terms, the trend of fewer receival sites, and simultaneous investment in larger more efficient “primary” sites, has continued for more than 20 years. Most service providers flex the number of sites open based on harvest size (i.e. “flex” sites only operate in above-average years or where specific segregations for barley and canola are required for domestic consumers). Viterro has more than halved its number of receival sites. In the eastern states, major bulk handlers continue to face greater competition from private storage providers and on-farm storage due to the higher proportion of grain going to the domestic market.

Most bulk handlers are now investing in larger, more efficient receival sites that offer the flexibility to receive all the different types and grades of grain, so growers do not need to rely on temporal, or even long-term, on-farm storage. GrainCorp, for example, has unveiled plans to build 2mmt tonnes of new storage capacity as part of an upgrade of its grains receival network in eastern Australia. This investment is on top of a previously announced investment by GrainCorp in 2021 to commit to a 1.5mmt expansion of additional storage.

Table 6. Change in the number<sup>a</sup> of major providers’ receival sites

State	Grain Handler	Year				
		1998	2010	2018	2021	2022
NSW	<b>GrainCorp<sup>b</sup></b>	265	173	91	110	120
	Cargill GrainFlow <sup>c</sup>	nd <sup>d</sup>	10	11	8	6
	Other	nd	nd	42	46	50
Vic	<b>GrainCorp</b>	257	73	44	43	44
	Emerald Grain	nd	4	7	4	4
	Cargill GrainFlow	nd	4	4	4	4
	Other	nd	nd	17	20	20
Qld	<b>GrainCorp</b>	87	36	23	31	31
	Cargill GrainFlow	nd	4	4	2	2
	Other	nd	nd	5	8	8
SA	<b>Glencore/Viterro/ABB</b>	116	114	103	53	53
	Cargill GrainFlow	nd	4	4	4	4
	Other	nd	nd	1	5	8
WA	<b>CBH</b>	200	197	178	158	137
	Bunge	nd	nd	2	3	3
<b>Total</b>		<b>925</b>	<b>619</b>	<b>536</b>	<b>499</b>	<b>494</b>

Notes:

- (a) The number of sites open each year may be less than the total number of sites provided, depending on the size of the harvest.
- (b) The grain handler in bold font is the region’s principal grain handler.
- (c) The first listed entity for each grain handler is the entity’s current owner.
- (d) nd – no reliable data.

Source: See [Appendix 3](#).



The costs of handling and storage for the major service providers are shown in [Table 7](#) for 2021. In general terms, the costs vary between providers for each service. With the exception of WA, the total charges vary between 21.22 to 24.07 \$/tonne. In WA, its lesser charge of \$17.90/tonne might be explained partly by its cooperative nature. A co-operative does not seek to maximise profit for shareholders. Rather its main objective is to efficiently provide services for its farmer members. CBH also operates a network primarily geared for grain export, so grain flows mostly in one direction, to coastal ports. CBH controls which grain is delivered to port for export customers.

Being solely in charge of a large storage and handling network, CBH controls the number of sites open each day and therefore can manage daily outturn costs and thereby help lessen its fees. Also, new operators in the WA market like Bunge are forced to compete against the CBH model which helps keep overall prices down. Growers located in areas where CBH and Bunge compete claim that the returns from selling to CBH or Bunge are similar. CBH's lower upcountry receival and storage fees are translated directly into higher prices received by growers.

**Table 7. Upcountry receival and storage fees for three months charged by the major providers of grain storage services in 2021<sup>a</sup>**

		CBH	Bunge	Viterra	Cargill GrainFlow SA	Cargill GrainFlow NSW/Vic/Qld	GrainCorp	Emerald
Receival at upcountry-storage	\$/tonne	9.15	10.80	13.17–14.68 <sup>b</sup>	10.02	10.05	10.04	12.50
Storage for three months <sup>c</sup>	\$/tonne	0.00	0.00	4.95	4.04	4.31	4.19	4.95
Shrinkage rate	%	0.50	0.50	0.60	0.60	0.70	0.70	0.70
Shrinkage & dust cost <sup>d</sup>	\$/tonne	1.25	1.25	1.50	1.50	1.76	1.75	1.75
Outturn fee	\$/tonne	7.50	0.00	3.35	7.03	5.10	8.09	3.00
Discount <sup>e</sup>	\$/tonne	0.00	0.00	0.60	0.00	0.00	0.00	0.00
<b>Total cost</b>	<b>\$/tonne</b>	<b>17.90</b>	<b>12.05</b>	<b>22.37–23.88</b>	<b>22.59</b>	<b>21.22</b>	<b>24.07</b>	<b>22.20</b>

**Notes:**

- (a) Fees listed are for standard services provided by each provider. Specified standard services can vary between providers and extra charges may apply for some services. The names and purpose of each type of fee vary between service providers. The names we have used to identify the fees here may be different from the names used by the service provider.
- (b) Receival fees for Viterra vary between major wheat (\$13.17) and minor wheat (\$14.68) sites.
- (c) Up until season 2021 CBH did not charge for storage until 1 October after the harvest. However, in 2021–22 CBH introduced a \$2/t fee for grain held in its storage after August 1, 2022. For other providers of upcountry storage, the charges for three months' storage have been estimated based on an assumption of who owns the grain for those three months, given there are different storage charges for growers and accumulators. The charges are calculated assuming that 45 per cent of grain delivered by growers to warehouse storage is sold to accumulators after the first month, 70 per cent after the second and 80 per cent after the third.
- (d) Based on a conservative grain price of \$250/tonne.
- (e) Viterra provides a discount of \$0.6/tonne to the fee charged to users of its export select service. Rebates provided by CBH have been excluded.

Source: See [Appendix 3](#).

Figure 19 lists the upcountry and receival tariff rates in different years for the main bulk handling service providers in Australia. In 2021, compared to 2018, Viterra and GrainCorp increased their costs by 2.1 per cent and 14.8 per cent respectively. The main driver of GrainCorp's cost increase was the increases in their receival upcountry fee and outturn fee by 35.7 per cent and 21.5 per cent respectively, whilst the inflation over this period was only 7.8 per cent. In the same period, GrainFlow and Emerald recorded increases in nominal prices of 5.9 per cent and 5.7 per cent, respectively, but these increases were less than inflation in the period. By contrast, CBH reduced its public tariff rates during 2018 to 2021. The reduction was due to a nominal fall in the receival upcountry fee by 15 per cent to \$9.15/tonne. However, the receival upcountry fee for the 2021–22 harvest has increased by 12 per cent, up

to \$10.25/tonne. Outturn fees for CBH have not changed since 2017 and will continue to be \$7.5/tonne in 2021–22. In comparison, Viterra, GrainCorp, and GrainFlow have increased their upcountry and receival charges by 3.4 per cent, 3.8 per cent and 4.2 per cent, respectively. These figures are higher than the expected inflation of 3 per cent in 2021–22.

In 2021–22 Emerald Grain changed the way in which they separately charge for receival and outturn services, bringing their outturn fees closer in alignment to similar CBH and GrainCorp charges but being more expensive than charges applied by Cargill or Viterra. However, the overall upcountry receival, storage and outturn fees of Emerald Grain display an consistent upward trend in 2021 dollar terms, since 2019–20.

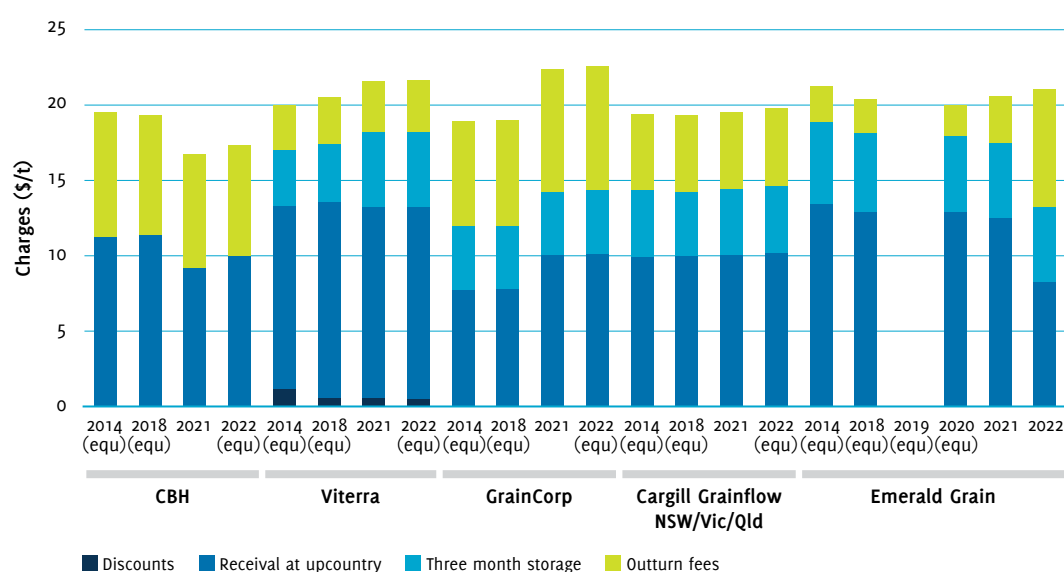


Figure 19. Upcountry and receival charges in 2013, 2017 (adjusted to 2021 equivalent prices based on changes in the Australian CPI), 2021 and in 2022 (where available; adjusted to 2021 equivalent prices based on inflation of 3 per cent in 2022) of the major providers of grain storage services

Note: In SA, charges are based on major wheat sites and outturn by rail. The discounts provided by Viterra have been subtracted from the receival upcountry charge. For CBH, the outturn fee is derived from the proportion of the export shipping fee allocated to the storage and throughput fee when this charge was created in 2017. Cargill GrainFlow fees only relate to NSW, Vic, and Qld. Three-month storage has been estimated using the method in Table 7.

Source: See Appendix 3.

### Port Loading

All bulk grain export terminals and mobile loaders operating at a berth across Australia are required to comply with the requirements of a port access code (*Port Terminal Access (Bulk Wheat) Code of Conduct 2014* – henceforth the Code) and are monitored by the Australian Competition and Consumers Commission (ACCC). In their last report, the ACCC notes the Code is still applicable to all port operators either fully or on an exempt basis and that this provides flexibility to the service providers (ACCC, 2021).

Table 8 lists the 2021 export charges for the six major grain ports. The port terminals operated by Quattro and NAT during the period did have a fully integrated supply chain from country to port, such as for GrainCorp, Vitterra or Emerald. Quattro and NAT customers however buy and move grain through the GrainCorp and Cargill networks as well as independents like CHS Broadbent and ex-farm. Their public tariff rates are set at a similar level to the larger integrated networks; however, they most likely provide incentives for tonnes of throughput to certain customers. In other words, the vertical integration of GrainCorp, Vitterra or Emerald, does not imply a difference in fees charged.

Table 8. Fee<sup>a</sup> components of port charges at six major grain port terminals in 2021

		CBH Kwinana	GrainCorp Port Kembla	Vitterra Adelaide Outer	Emerald Grain Melbourne	Quattro Port Kembla	NAT Newcastle
In-take fee	\$/tonne	0.00	2.07	4.00	6.00–8.00 <sup>b</sup>	4.00	6.00
Vessel nomination	\$/tonne	0.00	8.00	5.00	8.00	8.00	8.00
Vessel loading	\$/tonne	10.55	9.97	14.55	7.50	7.60	8.00
Storage	\$/tonne	0.00	0.00	0.00	0.00	0.00	0.00
Inspection	\$/tonne	0.35	0.33	0.26	0.25	0.25	0.50
Wharf fees	\$/tonne	1.90	2.74	2.58	2.78	1.12	1.03
Stevedoring charges	\$/tonne	0.60	0.38	0.00	0.00	0.32	0.50
Shrinkage and/or dust factor	%	0.25	0.30	0.00	0.00	0.00	0.00
Shrinkage and dust cost <sup>c</sup>	\$/tonne	0.63	0.75	0.38	0.00	1.00	0.50
Total Cost	\$/tonne	14.03	24.24	26.77	24.53–26.53	22.29	24.53

**Notes:**

- (a) Fees are listed for standard services by each service provider. Specified standard services vary with each provider and extra charges may apply. The name and purpose of the fee varies between service providers. The names we have used to identify the fees may be different from the name used by the service provider.
- (b) Intake fee varies between rail (lower figure) and road (higher figure).
- (c) Based on a conservative grain price of \$250/tonne.

Source: See [Appendix 3](#).

To illustrate how charges have changed, [Figure 20](#) presents the total fees in terms of constant 2021 dollars for the major service providers operating at the most important grain export ports. Following [White \*et al.\* \(2018\)](#), the dust and/or shrinkage costs have not been included as their percentages have not changed and their cost depends on the price of the wheat. The charges listed are standard fees. From the ports listed in [Figure 20](#), only Vitterra's port is fully regulated by the Code. From this analysis, no conclusion can be drawn about the imposition of the Code and any resultant difference in charges (the Code does not prescribe prices, only the need for fair and equal access). This same finding was observed by [White \*et al.\* \(2018\)](#).

From 2018, port tariff rates have changed unequally across Australia. While CBH, GrainCorp and Emerald have reduced their tariff rates, Vitterra has increased them. CBH port charges in Kwinana have reduced 14.3 per cent from 2018 to 2021. However, for 2022, there is an increase of 5.1 per cent for CBH. GrainCorp's tariff rates have remained constant between 2018 and 2021 but will decrease by 1.5 per cent for the next harvest. Emerald's port tariff charges have decreased in 2021 dollar terms consistently since 2017–18. Vitterra increased its port charges by 5.5 per cent between 2018 and 2021 and a further 2.0 per cent increase applies for 2022. The main cause of this increase is a higher port wharfage fee of 0.5\$/tonne, which is not under the control of Vitterra.

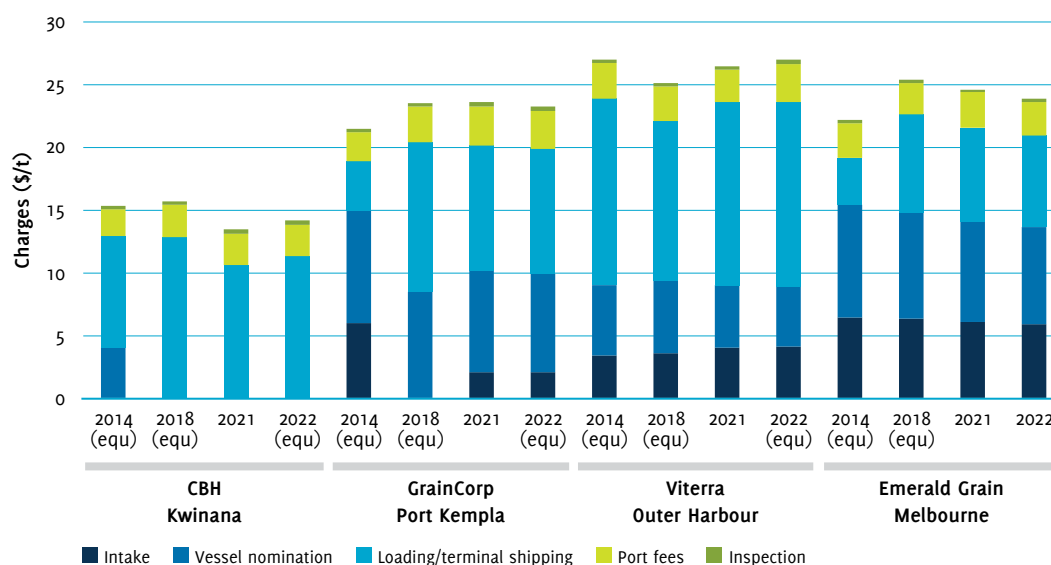


Figure 20. Port tariff charges in 2013, 2017 (adjusted to 2021 equivalent prices based on changes in the Australian CPI), 2021 and in 2022 (where available; adjusted to 2021 equivalent prices based on inflation of 3 per cent in 2022) for major port service providers in Kwinana, Port Adelaide, Port Kembla, and Port Melbourne

Source: See [Appendix 3](#).

### Ship freight

The main drivers of shipping costs are the cost of hiring the ship, the cost of its fuel and the distance travelled between ports. [Figure 23](#) illustrates the estimated costs for shipping grain from Australian ports, Vancouver, Canada, Odessa, Ukraine, and Rosario, Argentina to Asian ports in late 2021. The proximity of Kwinana port to southeast Asian countries, and thus a shorter total daily hire, provides a competitive advantage with respect to exports to those destinations. The difference is about 7–8 \$/tonne compared to other Australian grain export ports. However, all Australian grain export ports still have a competitive advantage by around \$5/tonne compared to the Canadian and Ukrainian supplying ports. When the distance to the market starts to equalize, any advantage of proximity lessens. This is the case for destination north Asian ports (Japan, China, South Korea) with the origin ports being Vancouver, and the destination south Asian port of Yangon, Myanmar, with the origin port being Odessa.

On average the shipping rate per thousand kilometres in 2021 is around \$3.49/tonne.

White *et al.* (2018) indicated the cost was \$1.96/tonne per 1000km in 2021 equivalent Australian dollars. Hence, current bulk shipping rates have increased by 78 per cent. Although the exchange rate has not varied materially from 2018, the cost of fuel has increased significantly in that period, fewer new vessels have been constructed and vessels have been required to meet new emissions standards by fitting scrubbers to their vessels which have increased costs. The fuel price follows crude oil prices, so it is difficult to find efficiencies in this area. Due to the COVID-19 pandemic, ship hire costs also have increased significantly across most routes.

Moreover, demand for bulk freight vessels has greatly increased in 2021, placing upward pressure on freight rates. Many major global economies in 2021 announced stimulus packages with emphases on infrastructure projects that stimulated demand for iron ore and coal and resulted in a lift in demand for bulk sea freight. When combined with the regular demand for bulk agricultural exports, the overall increase in bulk sea freight demand has led to a lift in dry bulk sea freight earnings since mid-2020 and throughout 2021 ([Figure 21](#)).

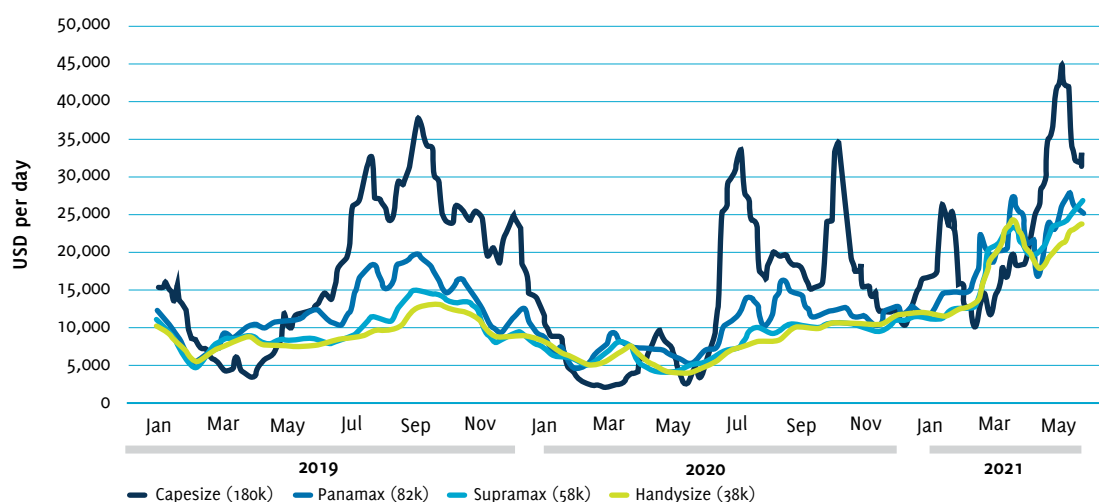


Figure 21. Dry bulk freight earnings: 2019 to 2021

Source: *Sand* (2021).



Despite the growth in ship revenues the estimated growth in the size of the dry bulk fleet is lessening (Figure 22). The restricted growth is pushing up prices of second-hand bulk vessels as is the higher cost of new vessel construction,

principally due to higher prices of steel and the cost of more fuel-efficient engines and associated technologies. The ramification of these trends is that bulk sea freight rates are poised to remain high over the next few years.

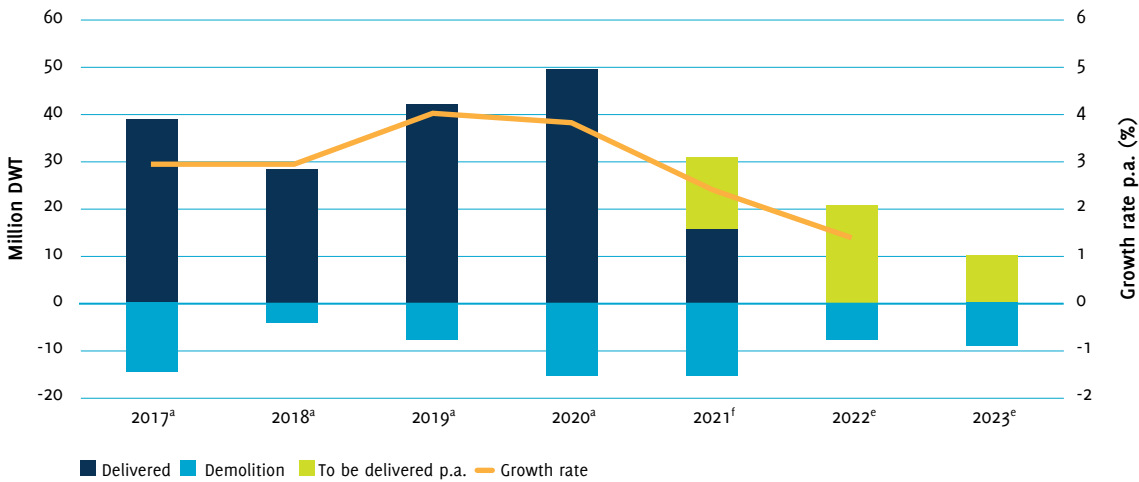
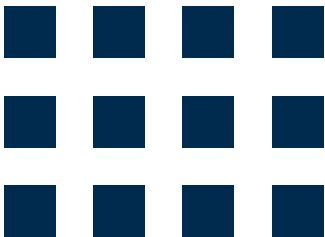


Figure 22. Dry bulk fleet growth: 2017 to 2023 (estimated)

Notes:  
a = actual. f = forecast. e = estimate which will change if new orders are placed.  
The supply growth for 2021–23 contains existing orders only and is estimated under the assumptions that the scheduled deliveries fall short by 10 per cent due to various reasons and 30 per cent of the remaining vessels on order are delayed/postponed.  
Source: Sand (2021).



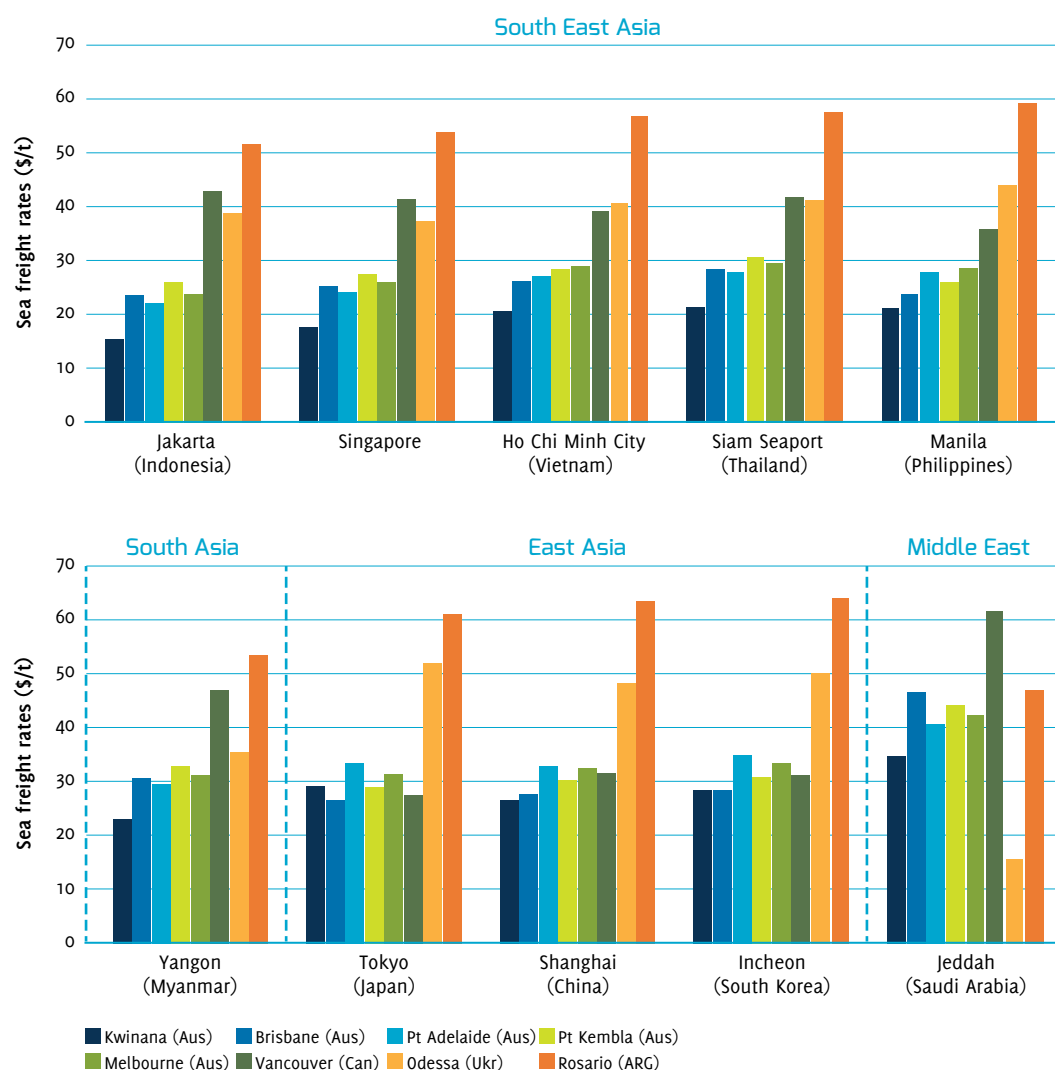


Figure 23. Estimated sea freight rates to major Asian and Middle East ports in 2021

Source: See [Appendix 2](#) and [Appendix 3](#).

### Total supply chain costs

Figure 24 lists the total charges (freight, warehouse storage and port loading) of the major grain bulk handlers in Australia. The only service provider who has reduced its real tariff rates is CBH. Other bulk handlers have maintained or increased their tariff rates. For GrainCorp and Emerald, it is important to note that their freight cost estimates do not represent the actual rail or road rates used to calculate site-based cash prices for growers. Although the location differentials and freight charges for GrainCorp were similar for 2015, location differentials were higher than the actual freight rates for GrainCorp in 2018 (White *et al.*, 2018). As the freight rates for GrainCorp and Emerald are not public, GTA location differentials are used. Making public their charges would increase competitiveness and help reduce the whole charges of the supply chain.

The increase in tariff rates to customers may increase the profits of bulk handlers. CBH, being a co-operative, enables any decreases in its costs to be passed on to its grower members. CBH's costs may have reduced because of greater volumes of grain produced that allow unit costs of storage and handling to be lowered in a predominantly export-focused network. The question arises as to why the other bulk handlers have not also decreased their tariff rates. There is evidence that lower fees are possible in some circumstances. In the case of Vittera, it could be argued that the recent increase in port competition with the use of mobile ship loaders by competitors Cargill and Semaphore in Adelaide Harbour and T-Ports at Lucky Bay on the Eyre Peninsula have caused their tariff rates to fall over the last decade. However, the increase in charges in the rest of Vittera's supply chain may indicate that the bulk handler is

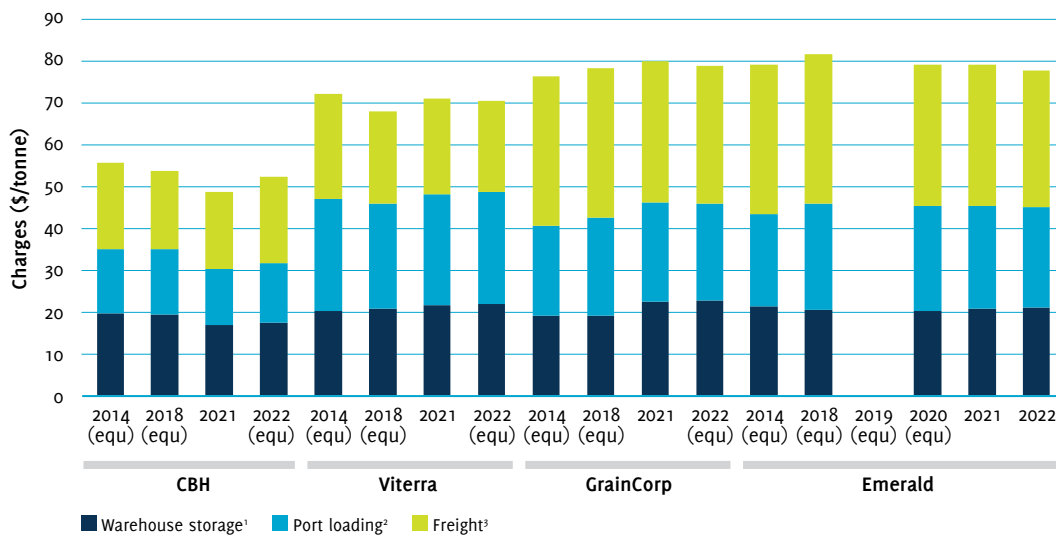


Figure 24. Freight, warehouse storage and port loading charges in 2013, 2017 (adjusted to 2021 equivalent prices based on changes in the Australian CPI), 2021 and in 2022 (where available; adjusted to 2021 equivalent prices based on inflation of 3 per cent in 2022) of major service providers

#### Notes:

- (1) Freight is based on a distance of 200km. CBH and Vittera publish an average price for freight services. Costs for GrainCorp and Emerald are estimated using the GTA location differentials for each year.
- (2) Based on the published charges of each service provider.
- (3) Based on the port loading charges for Kwinana — CBH, Outer Harbour — Vittera, Port Kembla — GrainCorp, and Melbourne — Emerald.

increasing differential pricing across its network to fund competition strategies against new competition whilst trying to maintain its profits. In addition, in the eastern states, the increase in tariff rates for GrainCorp, Cargill and Emerald may be expected because drought in 2017–18 and 2018–19 caused low volumes of grain harvests so no efficiencies from economies of size were available. This was not the case for WA and SA.

Climate conditions affect the harvest size and thus size economies for service providers. Notably, fobbing costs for GrainCorp vary by up to \$5/tonne from Queensland to Victoria due in the main to a lower average export task and higher production variability. Their charges largely reflect the size of the grain harvest. CBH have profited from larger harvests in recent years. However, up until season 2021 eastern states and SA have not had the same luck. The small size of some of their harvests could be the reason for the higher costs in those states. Another effect that could underpin the reduction of costs of bulk handlers could be the increased scale and efficiency of larger sites which offer greater throughput, intake and outturn efficiencies.

These differences in charges imply that growers in WA receive a larger income per tonne for the same crop grade compared to growers in eastern states and SA. In general, grains are sold on free on board (FOB) terms. Thus, the difference in the cash price on any day for export grain should in theory be the difference in ship freight between the ports.

Differences in charges from the farm to the port impact directly on the profit of the growers. For similar situations (e.g. same grade and quality), growers in WA may receive up to \$22.19/tonne at a receival site more than growers in SA in 2021 and may receive up to \$18.17/tonne more in 2022. This has huge implications for the profitability of grain production on farms.

## Concluding remarks

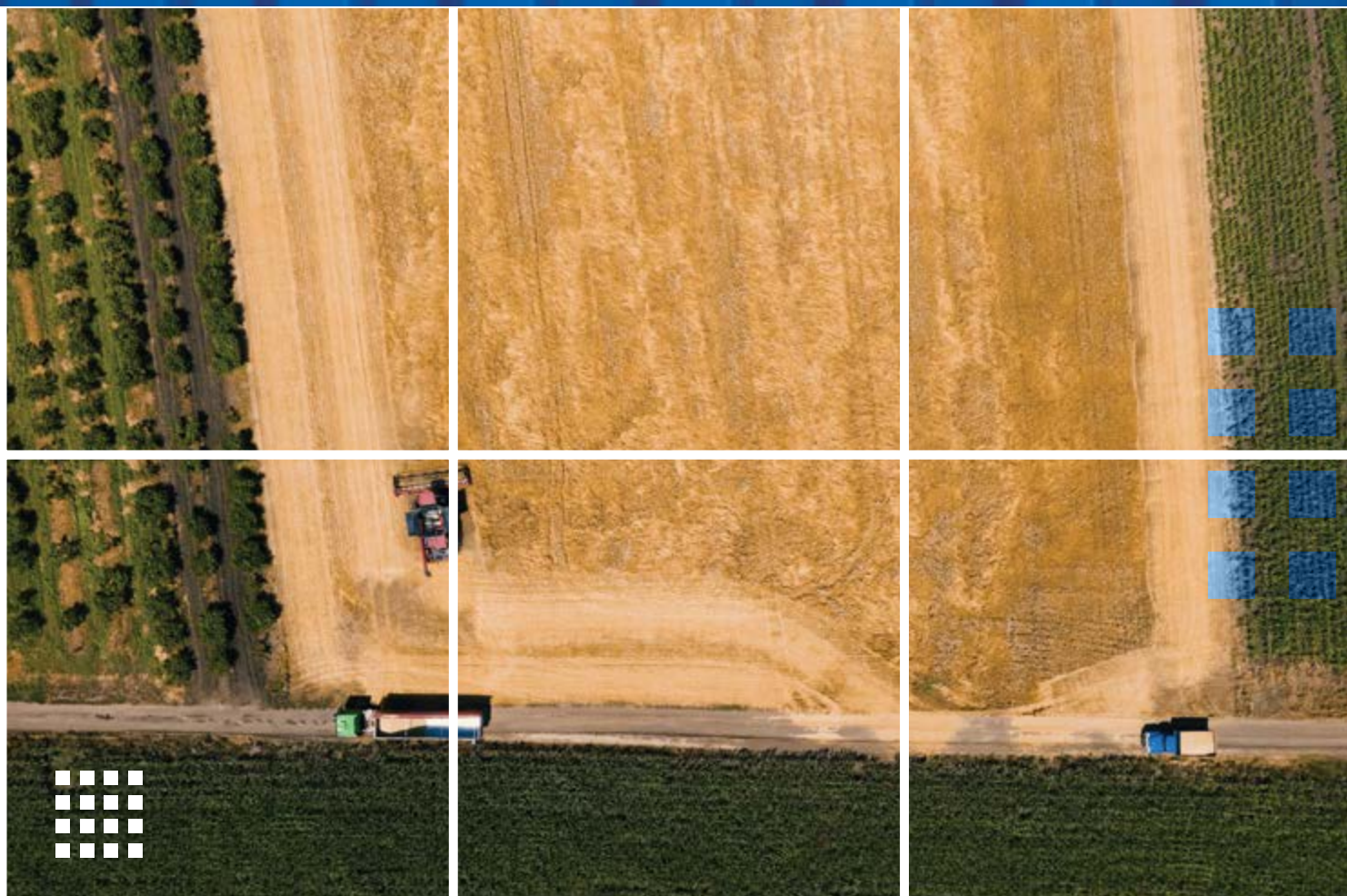
Overall, since 2014–15, grain supply chain public tariff rates across Australia mostly have slightly increased or decreased in real terms, with the service provider, CBH, displaying both the largest decrease in its real costs and remaining consistently the nation's leader in providing the least costly grain supply chains.

The lower the costliness of a grain supply chain, the higher the farm-gate price that can be offered to grain farmers. Not included in the analysis of costs are rebates provided by CBH to its grower cooperative members. A cautionary note, however, concerning CBH is that they have increased their charges substantially for the 2021–22 harvest to help maintain their ability to invest in capital upgrades to the network and to retain improved transport reliability. Yet their supply chain costs still place them in first position as the provider of the nation's cheapest export grain supply chains.

The difference in export supply chain charges between the service providers in each region affects the relative profitability of grain production across Australia, especially where there is also a lack of competition between traders for export grain. This study has revealed the nature of the differences in charges between these service providers and offered explanations for the observed differences.

To further lower the costliness of bulk grain handling, storage, freight, and port services in Australia requires a raft of investment, regulatory, technology and competition enhancements which could be the subject of further study.





## The nature and cost of containerised grain supply chains

The flow of grain from farm to packers and then on to ships for delivery to international customers involves accessing a range of services as mapped out by SEPWA (2011) (see [Figure 25](#)). Although the key activities are simple to state; place the grain or fodder into containers and deliver those containers to international customers, the detail embedded in those actions can be challenging for any new entrant, and the various steps in the supply chain have associated business risks. Although the names of some agencies mentioned in [Figure 25](#) may have changed (e.g. AQIS) the key actions featured in the schematic remain central to the process of containerised grain export. An updated information manual describing the current processes for grain export via containerisation is available from SAGIT (see McKay, 2022). That manual was produced as part of this review of containerised grain export supply chains.

The fact that more farmers or groups of farmers do not engage in the sale, via containers, of their farm products is one indicator that the activity is both challenging and risky. Those containerised grain or fodder traders who have persisted tend to be those capable of best managing the array of downside risks that can characterise the trade in these commodities. Nonetheless, there are over 100 grain container packing businesses in Australia ([Table 9](#)). Each has its particular set of supply chains, each with a particular cost structure. Hence, comparing the nature and costs of the components of containerised grain supply chains is difficult, especially as the container packers are private businesses with no incentive to reveal their cost profiles. By contrast there are only a handful of bulk grain storage and handling businesses across Australia and the prices of their services are often more visible to their users.



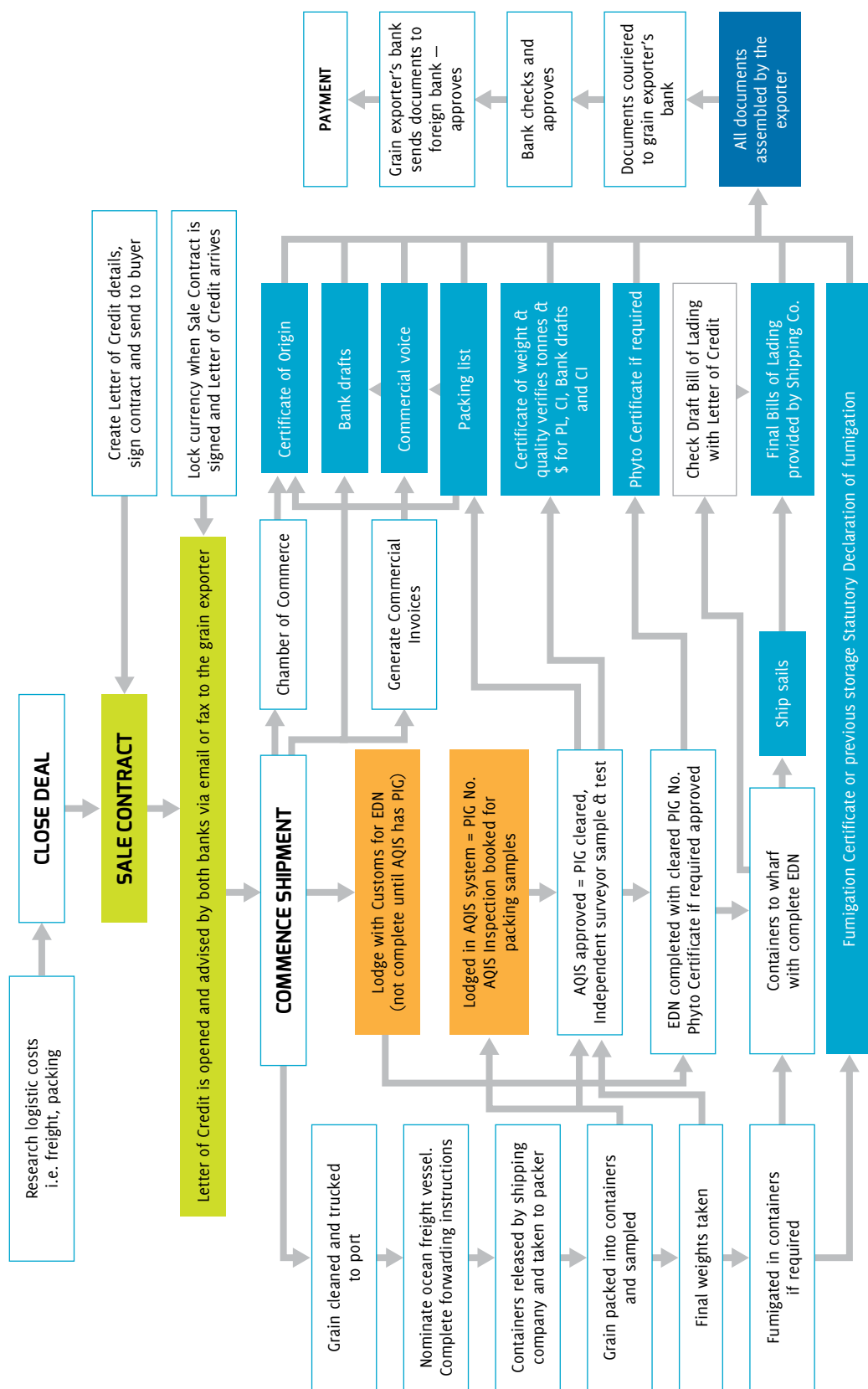


Figure 25. Key activities in the export of containerised grain or fodder  
Source: SEPWA (2011) The grain container export process: Findings from a trial shipment conducted by PASE and SEPWA in 2011.

Table 9. Distribution of grain packers across Australia in 2021

State	Number of grain packers
WA	12
SA	17
Qld	22
Vic	26
NSW	27
<b>Total</b>	<b>104</b>

Since de-regulation of grain marketing in the 2000s, farm businesses have become responsible for the marketing of their grain. Although some farm businesses do employ grain marketing advisers or develop their own marketing plans, many farmers still simply sell for cash at harvest. For many farmers the challenge of successfully growing an array of crops and managing the logistics of seeding and harvest is sufficiently stressful. Hence most farmers see no attraction in enlarging their business activity into the venture of selling their farm's grain or fodder via containerisation.

The SEPWA (2011) report tracked a new venture of exporting grain in containers out of the port of Esperance. The report, although a decade old, remains informative about the steps and risks involved in selling grain via containerisation (Figure 25). For example, establishing a working business relationship with a potential customer is often crucial for long term trading success. Conducting background checks and using trial shipments is often essential to limit the exporter's business risk exposure. Knowing up-front the likely logistics costs and trade terms is also essential if profit margins are not to be compromised. A more detailed description of the required current steps for exporting containerised grain is available from SAGIT (McKay, 2022).

Regarding trading terms, in September 2019, the International Chamber of Commerce released Incoterms 2020, that describes the commonly applied rules and standards that underpin many grain marketing contracts. These contracts define the obligations of the seller and the buyer. By illustration, trading terms for containerised grain, including their CFR price and ocean freight, are commonly stated internationally in USD. Hence, any exporter of Australian grain or fodder needs to be aware of AUD:USD exchange rate relativities, as well as supply chain costs and risks when engaging in transactions.

Moving containers from up-country packing locations down to port requires cost-efficient transport. Some operators (e.g. Fletchers International) rely on multi-commodity access to rail services to achieve freight cost efficiencies. Many other operations rely on road transport. For example, a review of container operations involving the Port of Melbourne (2021) revealed an increased use of road freight at the expense of rail freight. High Productivity Freight Vehicles (HPFVs), truck combinations that exceed 26 metres or have a mass greater than 68.5 tonnes, are increasingly used in Victoria.

The HPFV approved network was expanded to better connect major freight routes to major ports and create interstate links. Consequently, a rapid uptake of HPFVs vehicles ensued due to their ability to carry more containers, especially 40ft containers. HPFVs, such as super B-doubles, carry up to two 40ft containers. Use of super-B doubles between stevedores, transport depots, and importers/exporters consequently also has increased. Indicative containerised grain supply chains in Victoria and southern NSW, underpinned by road services, are shown in [Figure 26](#).

A key component of containerised grain supply chains are logistic operations at the container port, including:

- i. moving a container from an empty container park, where it is hired, to an exporter, where it is packed.
- ii. transport of the packed container directly or indirectly to the stevedore for export as a full container.

- iii. moving of containers to and from empty container parks and customers for the packing of exports and return of unpacked import containers. Often there are direct movements of empty containers between the port and empty container parks. In some instances, the function of empty container parks is captured by storage areas in stevedore terminals whereby empty containers are returned after unpacking direct to the container terminal, and similarly the reverse with empty pickups for export packing.

In the case of the Port of Melbourne the key road-based logistic operations that underpin the export of containerised grain are shown in [Figure 27](#) whilst [Figure 28](#) shows components of the road and rail logistic activities.

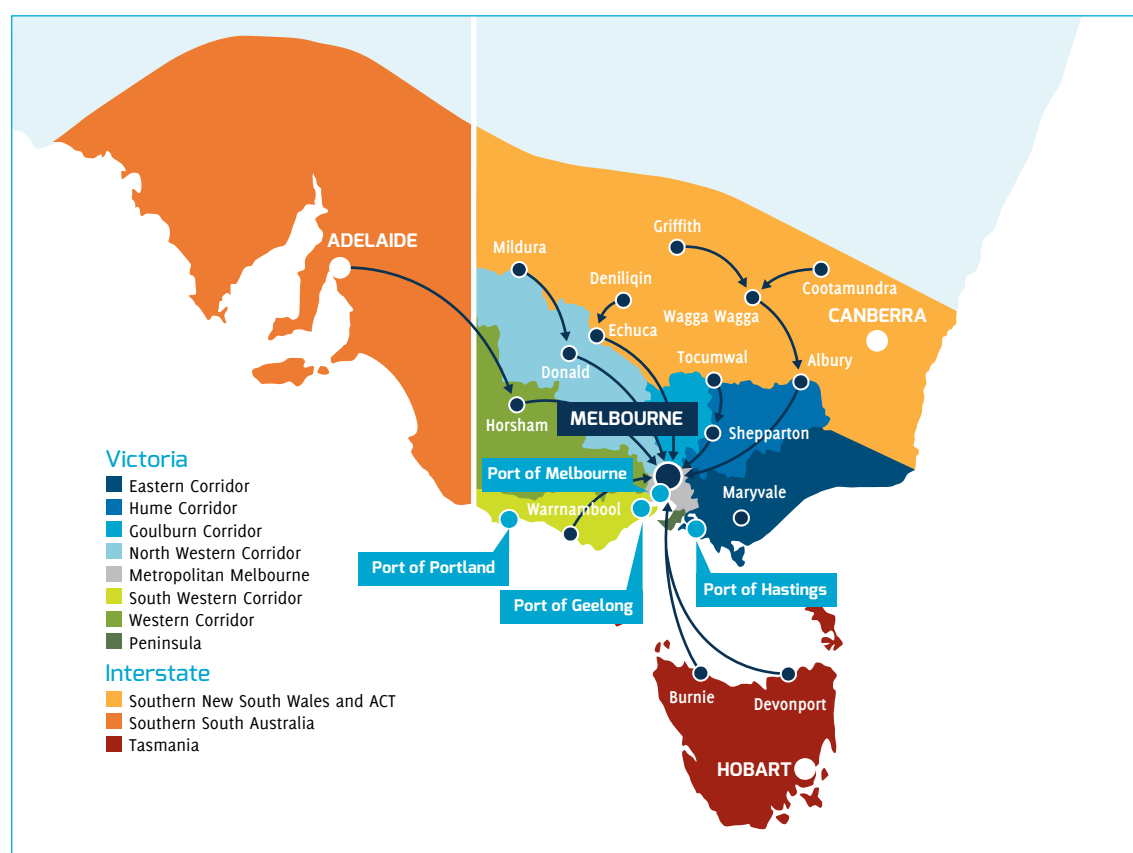


Figure 26. Indicative containerised grain supply chains involving the Port of Melbourne  
Source: Port of Melbourne (2021).

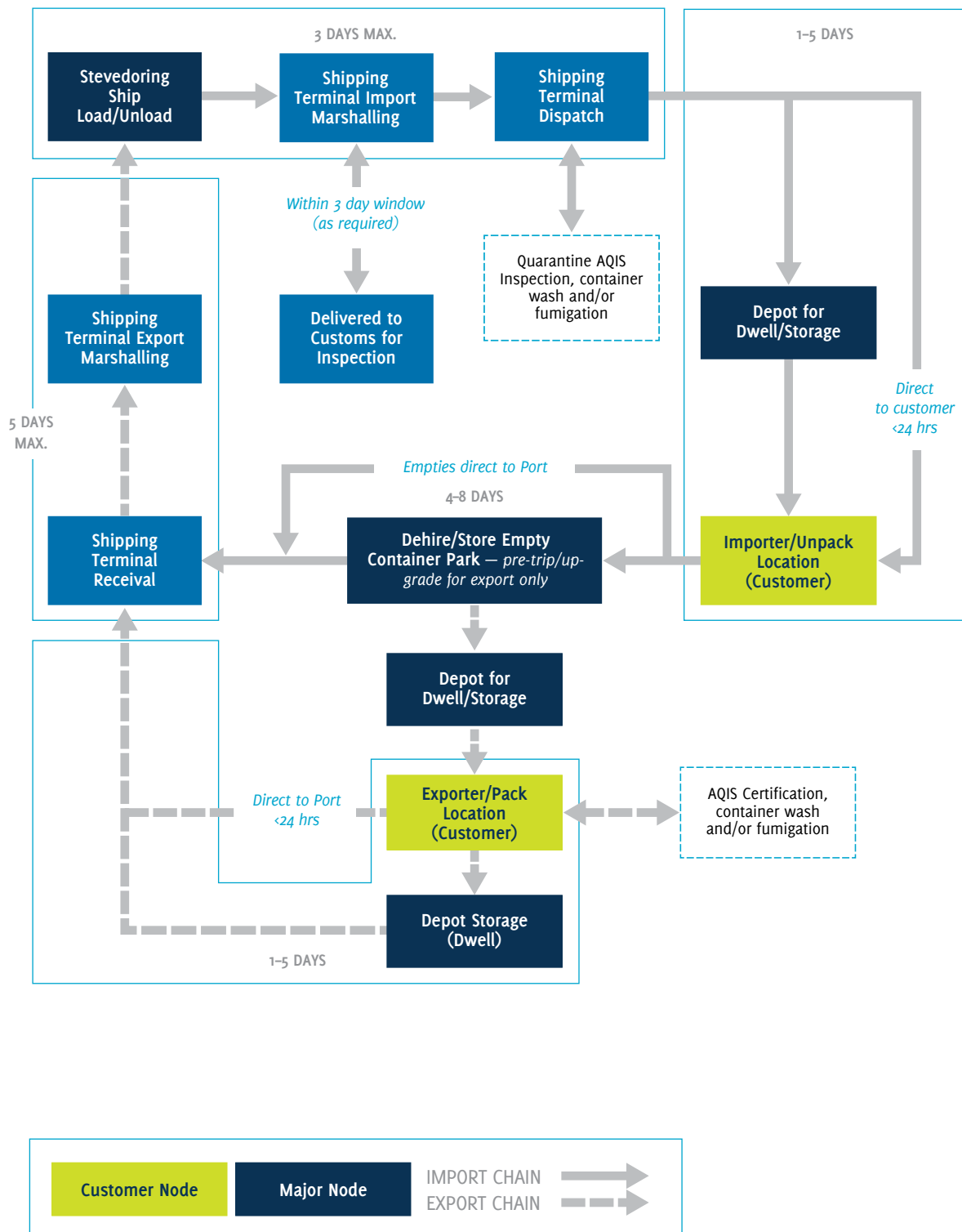


Figure 27. Containerised grain road-based logistic activities at the Port of Melbourne  
Source: Port of Melbourne (2021).

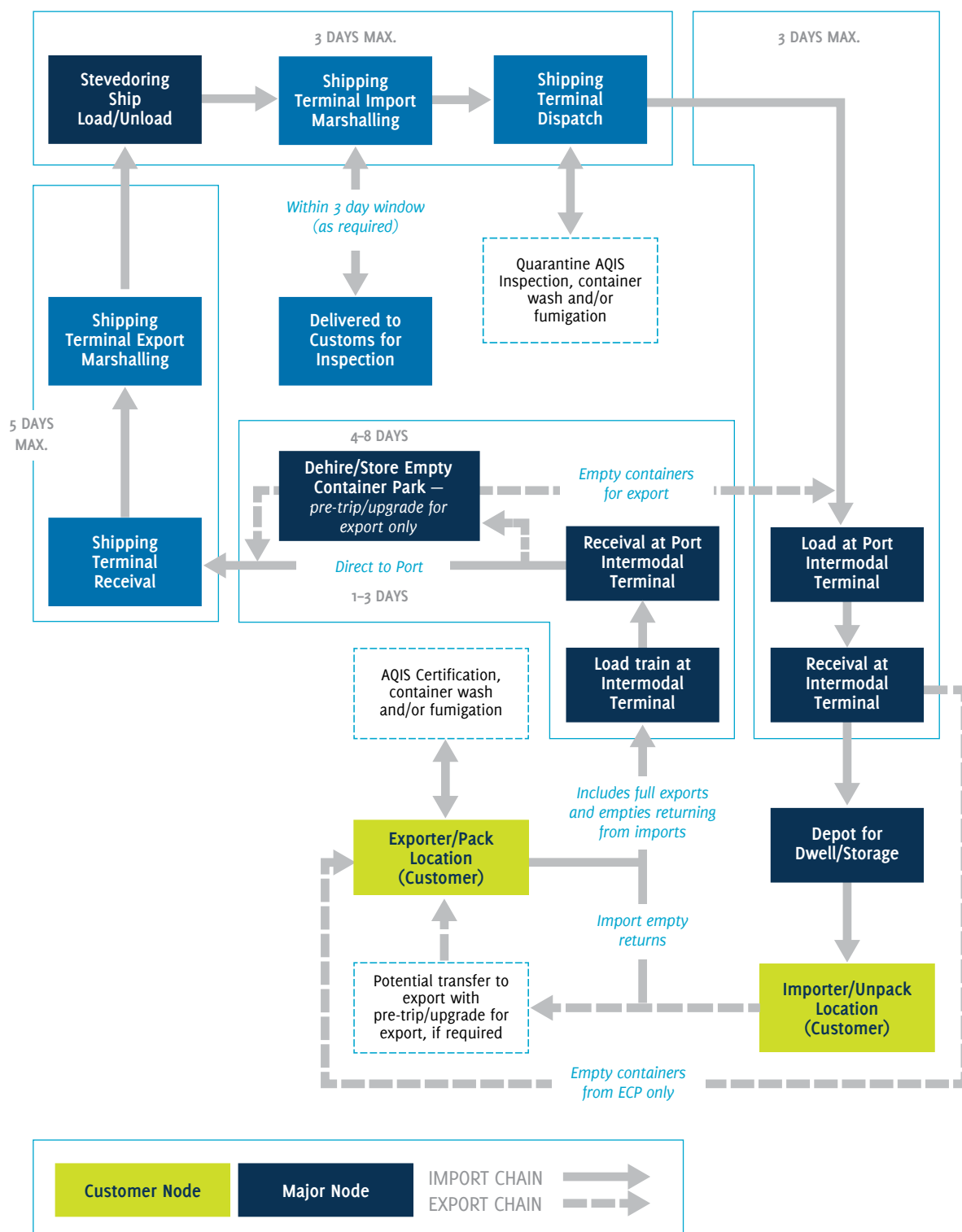


Figure 28. Containerised grain rail and road logistic activities at the Port of Melbourne  
Source: Port of Melbourne (2021).



In Australia there are essentially three main types of containerised grain supply chains as displayed in [Figure 29](#). The main differences between the supply chains are who packs the container and where the container is packed. Packing can occur on farm or at a regional packing centre or at port. The farmer can be responsible for the packing or can use the services of a contract packer or can sell their grain or fodder and deliver it directly to a commercial export packer with facilities upcountry or at port.

There are also three main methods of physically packing grain into a container, as described by Shipping Australia (2012). The weight of grain loaded into a container is a function of the size of the container (20ft or 40ft), the maximum allowable cargo weight of the container and the bulk density of the grain. The precise formula is:

*Maximum cargo weight (container rating minus tare) = maximum bulk density of grain x maximum volume of the container.*

Hence, for example, a typical 20ft container with a rating of 30 tonne and tare of 2.4 tonne with volume of 33m<sup>3</sup> (=330 hectolitres (hL)) can in theory be fully loaded with any grain of a bulk density up to 83.6 kg/hL. However, for safety and spillage reasons, a bulkhead or liner with metal bars needs to be placed in front of the container door, so usually only 23 to 26 tonnes of grain are loaded into a 20ft container.

The main grains exported from Australia have bulk densities less than 83 kg/hL. For example, the bulk densities of oats, barley, wheat and lupins respectively are 50, 65, 75 and 78 kg/hL. In contrast to 20ft containers, 40ft containers cannot be almost fully loaded with grains like wheat or lupins, due to weight restrictions (usually around a 29 tonne maximum), but can be fully laden with fodder that has a much lower bulk density. Hence, when container supply chain costs are converted into per tonne costs, a range of costs is likely, dependent on what grain is being moved through the supply chain and which size of container, 20ft or 40ft, is mainly used.

The main components of the supply chain costs associated with a containerised grain supply chain in Australia are listed in [Table 10](#). Underpinning the ranges of costs in [Table 10](#) are key assumptions that 20ft containers are used, the grain has been stored on farm for 3 months, the grain conveyed is packed to a limit of 24 tonnes in each container, the distance the grain needs to travel from farm eventually to port is 300 kilometres, 250 containers are packed each year and the containers are shipped to a South East Asian port.

The per tonne costs of containerised grain supply chains, prior to ocean freight charges, are not greatly different from the costs of Australia's bulk grain supply chains (see [Figure 24](#)). However, it comes as no surprise to most export containerised

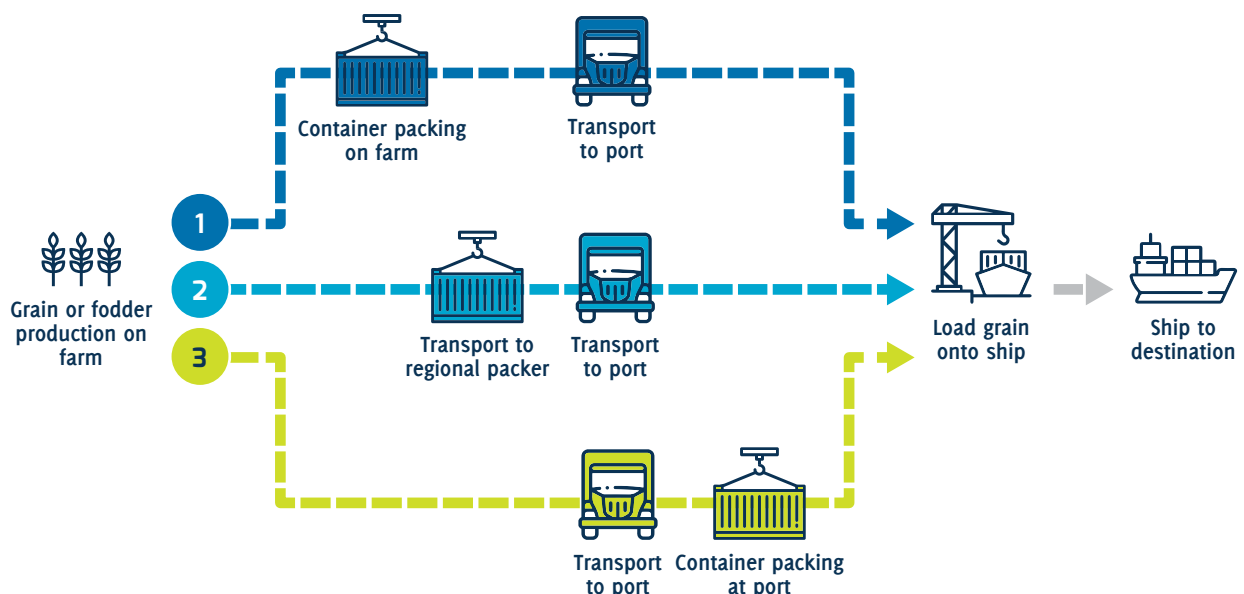


Figure 29. Three main types of containerised grain supply chains

Table 10. Indicative cost components of a containerised grain supply chain in Australia

Activity	Cost (AUD/t)	
	On-farm packing	Intermodal regional packing
On-farm storage for 3 months	4	4
Amortised cost of capital investment in packing plant <sup>a</sup>	20	–
Site compliance <sup>a</sup>	3	–
Amortised cost of labour <sup>a</sup>	17	–
Packing fees <sup>a</sup>	–	30
DAWE fees	1	2
Liners <sup>b</sup>	3	4
Fumigation	8	6
Transport to port <sup>c</sup>	46	30
Port fees	6	9
<b>Sub-total</b>	<b>108</b>	<b>85</b>
Ocean freight	241	241
<b>Total delivered to destination port</b>	<b>349</b>	<b>326</b>

Notes:

(a) The intermodal packing plant's capital, site compliance and labour costs are main components of the packing fee.

(b) Approximately 50 per cent of all containers require fitting with liners.

(c) The difference in freight costs are due to mode choice (road versus rail) and mass limits on routes.

grain and fodder participants that by far the main cost component of the containerised grain supply chain is sea freight. Its cost exploded during 2020 and 2021 (Figure 30 and Figure 44) with some rates more than quadrupling, leading to the massive increases in profits being announced by container shipping lines. The divergence in price trends between bulk grain and containerised grain sea freight rates in 2020 continued into 2022 greatly eroding the profitability of containerised grain and fodder exports.

Yet the costs of containerised sea freight are outside the control of Australian containerised grain and fodder exporters and so ceasing or curtailing of grain and fodder exports via containerisation has been widely observed across Australia since early 2020. The escalation in sea freight rates has exposed how vulnerable is the container trade to these rates; yet in previous years it was the commercial attractiveness of low sea freight rates for containers (Figure 30) that attracted entrants into this export trade.

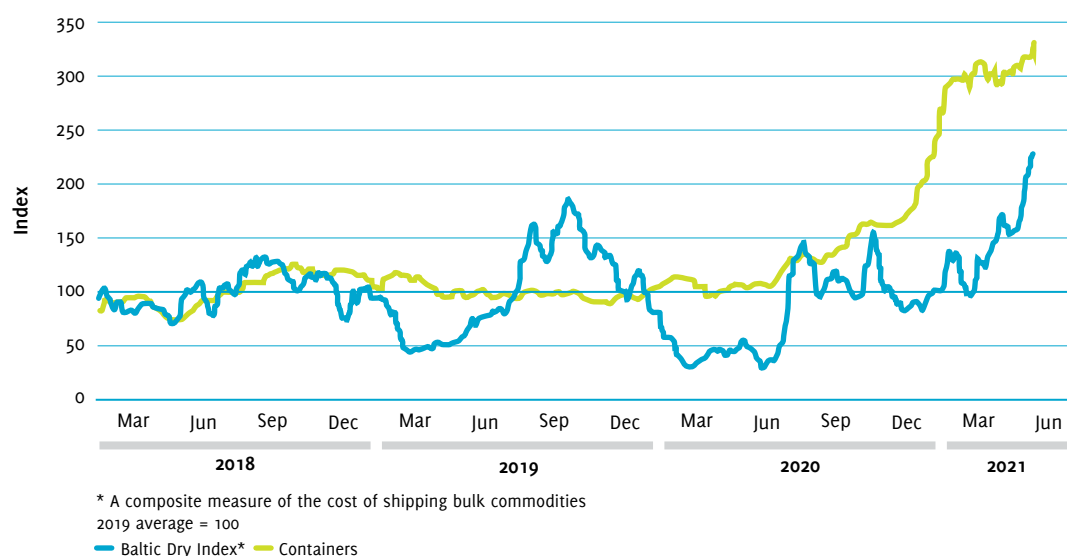


Figure 30. Global shipping prices

Source: RBA (2021).

## Tips for success

In the process of preparing this report, discussions were held with several businesses engaged in the sale of containerised grain and fodder and a handful of case study operations were examined. The case study participants, when reflecting on their lessons learned from their years of experience in containerised trade, often highlighted the following as ingredients for success:

**i. sound corporate governance, planning, budgeting, and communication.**

Often farmers are 'doers'. However, being physically busy does not ensure commercial success. Rather it is vital to plan a venture, to prepare budgets, to establish sound governance of any investment and activity, and to daily communicate across the business.

**ii. proper documentation.**

Providing required documentation to the range of entities associated with the export of containerised grain and fodder is essential yet is often more time-consuming and exacting than many farmers anticipate. In large commercial operations it is often worth hiring people with the requisite skill and knowledge to provide this documentation.

SEPWA (2011) also stressed the need for proper documentation saying: "All documents must be absolute letter perfect to avoid discrepancies, delays and even rejections." (p. 7).

**iii. self-education and out-sourcing.**

Marketing grain and fodder via containerisation often means learning a new set of skills and acquiring new jargon. At times it is more sensible for the farmer, as an investor in this new venture, to bring in expertise to facilitate and de-risk that investment and its associated activity. On other occasions it may be more sensible for the farmer to acquire those skills, such as training to become an Authorised Officer.

**iv. identifying better use of existing capital (e.g. grain storage, rail and vehicle assets).**

In farm or corporate businesses that are already sufficiently large or complex, there is often an efficiency gain and value-adding opportunity that grain containerisation can achieve. Containerisation can allow more efficient use of grain storage facilities, or better use of rail and road transport assets.

**v. the need for nimbleness.**

The vagaries and costliness of containerised grain and fodder operations often requires its stakeholders to be commercially and practically nimble in executing sales or stepping out of the market when third-party or execution risks become too large and/or margins too small. On-farm container-packing operations are often best based on a low capital footprint that lessens the capital at risk when market downturn or disruption occurs.

**vi. know your comparative advantage.**

Bluntly summarised by one case study participant was this comment: "If you can't be better than the neighbour down the road you can't survive". Each farm business has a range of strengths and weaknesses. Knowing what you are good at, and by inference what you are less good at, may uncover if grain containerisation is a likely sound commercial fit for any particular farm business.

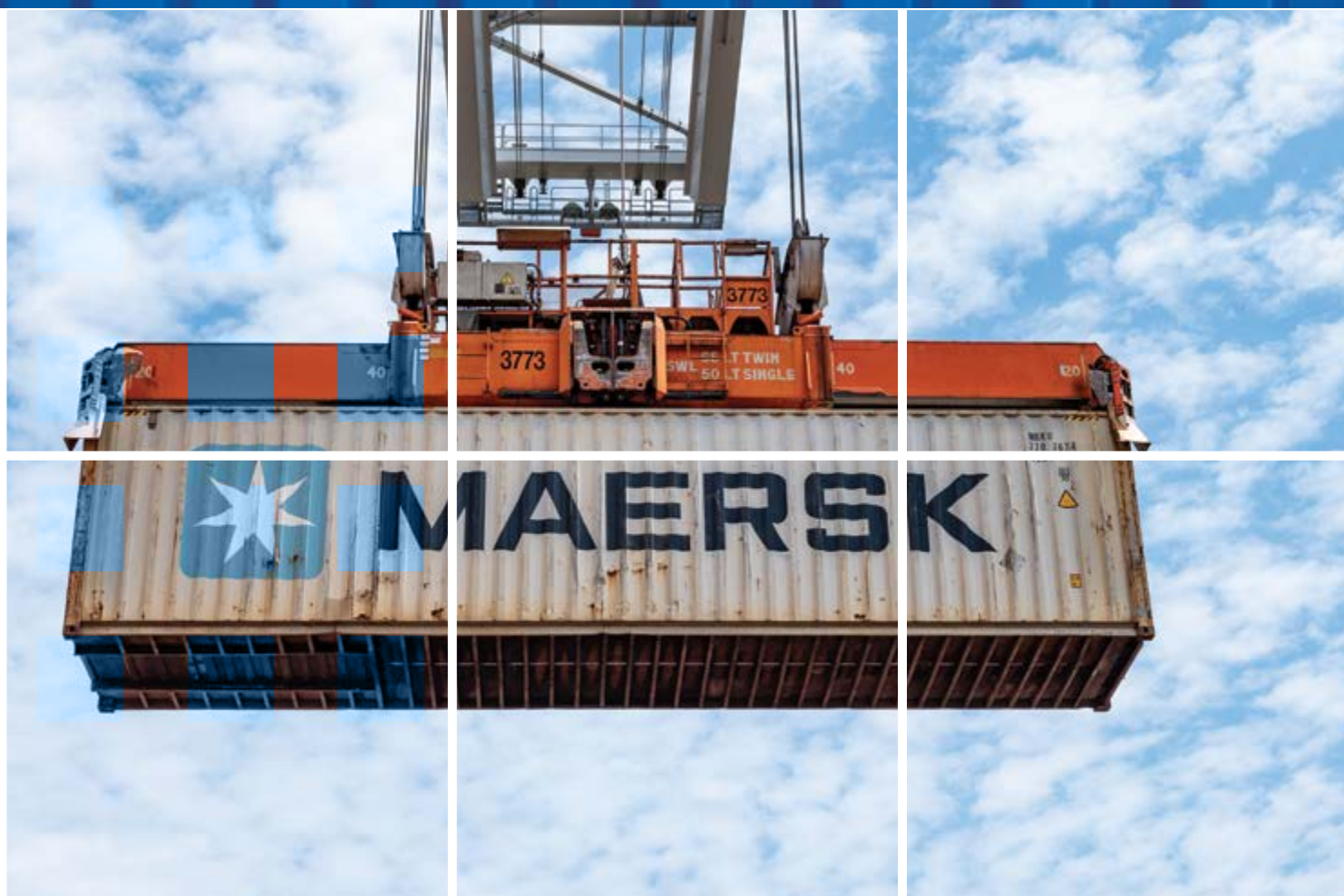
The above list of ingredients for success reveals that commercially viable containerised grain and fodder export operations are not simple operations to establish and maintain. Although packing grain or fodder into a container is not difficult, it is all the other tasks of proper documentation, risk assessment, planning and oversight that are essential to support success. The realistic and candid above-mentioned comment from one case study participant is a useful summary of the challenge facing farmers considering engaging in container operations: “If you can’t be better than the neighbour down the road you can’t survive”.

Nonetheless, however, it is important to note that, despite all the difficulties each case study participant experienced during 2020 to 2022, they all had very positive assessments that grain containerisation would play an important strategic role in the future of Australia’s grains industry and in their particular business operations.

There is merit in this view as scores of new large container ships are under construction to become available in late 2023 but mostly in 2024 and subsequent years. This enhanced supply of shipping capacity should drive down sea freight rates for containers and make the export of containerised grain and fodder, that depends on backhaul rates and a surfeit of empty containers, to be once again commercially attractive to Australian exporters.







## Issues and problems in the containerised export of grain

### Altered competitive power along the supply chain

Amalgamations and agreements between various shipping lines (Table 11) now mean that three separate shipping alliances account for around 90 per cent of the global container trade. Four companies (Maersk, MSC, COSCO-OOCL and the CMA CGM group) account for two-thirds of global TEU trade. As a result of their dominance, these carriers have increased their bargaining power, often at the expense of other players. Price pressure from shipping lines has contributed to a downward trend in quayside revenue across the container industry in Australia (ACCC, 2020).

Table 11. Market shares of three main shipping alliances in 2021

Alliance	Carriers	Global market share (%)
2M	Maersk	19.6
	MSC	19.1
	<i>Sub-total</i>	38.7
Ocean Alliance	COSCO-OOCL	14.1
	CMA CGM	14.1
	Evergreen	6.4
	<i>Sub-total</i>	34.6
THE Alliance	Hapag-Lloyd	8.4
	ONE	7.4
	Yang Ming	2.9
	<i>Sub-total</i>	18.7
	<i>Total</i>	92.0
	<i>Others</i>	8.0

Source: Statista (2021) and Chambers (2021).



Shipping lines have stated to the ACCC (2019) that container stevedoring prices in Australia are among the highest in the world. Hence, the shift in bargaining power towards the shipping alliances has limited quayside pricing increases by stevedores. However, as discussed later, stevedores have simply reacted by imposing greater landside charges on those with a weaker bargaining position such as farmers who rely on being able to export their grains and fodder from their nearest container port. The higher landside charges ultimately mean lower prices are offered to farmers for their grain and fodder that is intended for export in containers at these ports.

The spot rate for a 40ft container to the USA from Asia topped USD20,000 in 2021, up from less than \$2,000 a few years earlier. The reduced availability of container shipping capacity and port congestion, however, has meant that longer-term rates in contracts between carriers and shippers in 2021–22 are now an estimated 200 per cent higher than in the previous financial year, signalling elevated prices for the foreseeable future. Economists warn that persistently high transportation prices will stoke inflation and impede economic recovery. Ocean-freight carriers have generated estimated profits of \$150 billion in 2021 – a nine-fold annual jump after a decade of relatively low returns.

The jump in shipping profits and the greater concentration of shipping ownership have highlighted, especially in the USA, shipping lines' immunity from antitrust laws. Current shipping laws in the USA date back to 1916, an era when goods were loaded on ships by net and crane. At the time, the US government, seeking to encourage a USA-owned nascent domestic commercial fleet, exempted carriers from antitrust laws, but required them to report any pricing agreements to regulators. While shipping laws in the USA have been reformed over the years, the last major update was in 1998, despite the US Department of Justice consistently pushing to remove the antitrust immunity, arguing that it was no longer justified and undermined a free-market economy at a time when the shipping industry was undergoing a wave of consolidation with American carriers being taken over by foreign entities.

Regulators from the USA, EU and China met in September 2021 and determined there was so far no evidence of anti-competitive behaviour in container shipping. Subsequently in November 2021, the White House voiced its concern at the industry's consolidation, saying "this lack of competition leaves American businesses at the mercy of just three alliances". The White House called on the Federal Maritime Commission to "use all of the tools at its disposal to ensure free and fair competition." A bi-partisan bill came into law in late 2021 that initiated reform of US shipping laws. It gives the Federal Maritime Commission greater authority, prohibits carriers from discriminating against American cargo, and gives businesses more power to challenge carrier fees. But even that bill stops short of targeting carriers' antitrust immunity. In Europe, the shipping companies' exemption from anti-competitive rules is set to be reviewed again in 2024. The European Commission has commented that it is "closely monitoring the container shipping industry and is aware that there have been large price increases."

Associated with formation of shipping alliances has been a decline in the number of carriers serving the Australian-Asian trade (Figure 31). Relative to other key international ports, the number of carriers serving Australian ports is low (Figure 32), lessening the range of choice of carrier for Australian exporters, particularly at smaller container ports such as Adelaide and Fremantle.

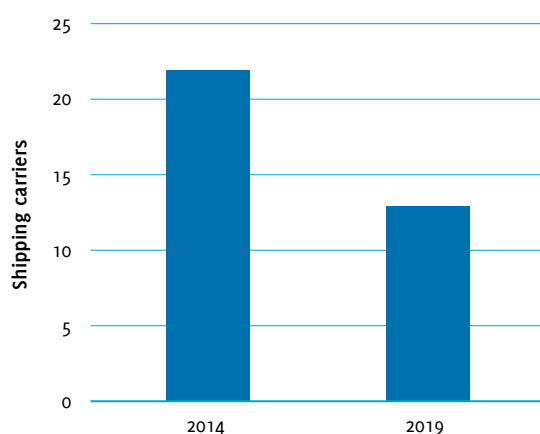


Figure 31. Numbers of shipping carriers serving Australian-Asian trade in 2014 and 2019  
Source: GTA (2022).

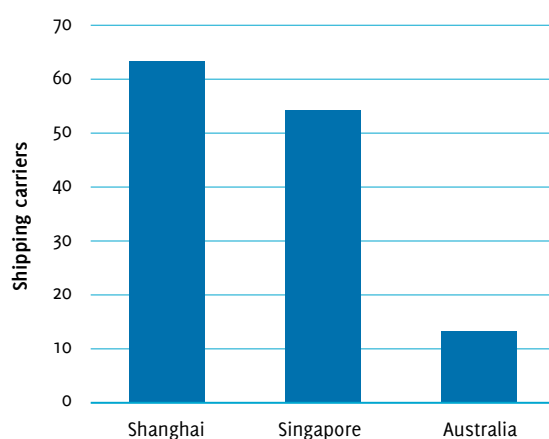


Figure 32. Number of shipping carriers serving Shanghai, Singapore and Australia in 2020

Source: GTA (2022).

The shipping alliances listed in Table 11 maintain fleets comprised of owned and chartered vessels (Figure 33). These vessels berth at a range of container terminals at key Australian ports. Two-thirds of Australia's container export trade passes through container terminals in Sydney and Melbourne (Figure 34).

In Melbourne, VICT's highly automated system and location at Webb Dock gives it better access to larger container vessels. As a result, VICT has increased its national market share at the expense of DP World and Patrick. At most ports there are at least two stevedore companies that service the shipping alliances (Figure 35). These stevedore companies have experienced a weakening in their bargaining power in their interactions with shipping lines, due to the amalgamations and agreements between shipping lines.

Contemporaneously, some stevedores at some container terminals have experienced substantial hikes in property-related costs in the lead-up to and following port privatisations. Since 1998, 4 of the 5 largest container ports in Australia have been privatised. Port owners have imposed higher rents whilst state governments and industry associations have demanded infrastructure upgrades to deliver greater efficiencies for transport operators collecting and receiving containers.

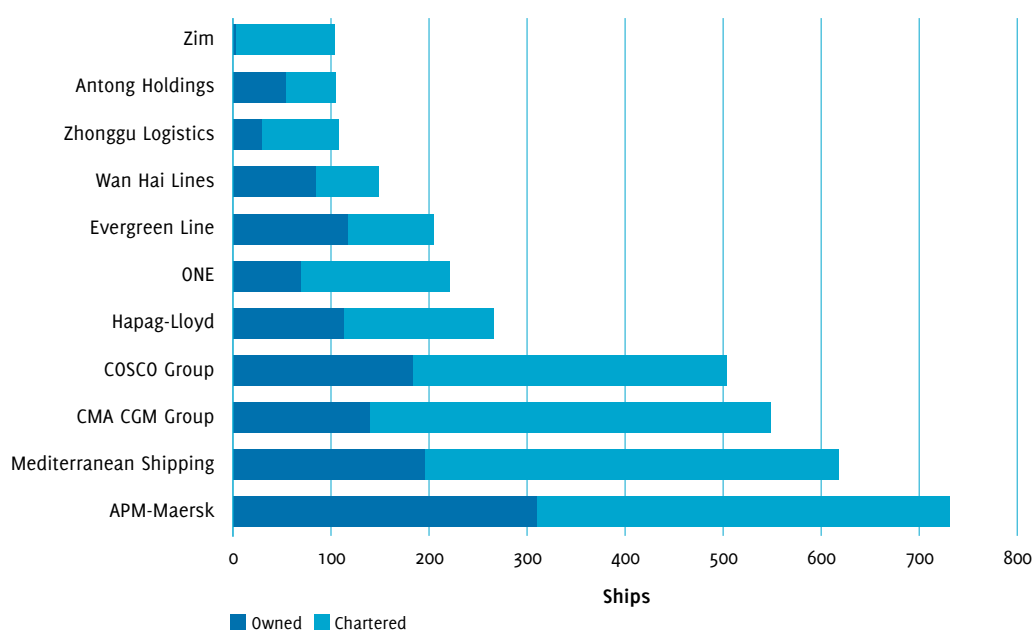


Figure 33. Leading container ship operators — owned and chartered ships in 2021

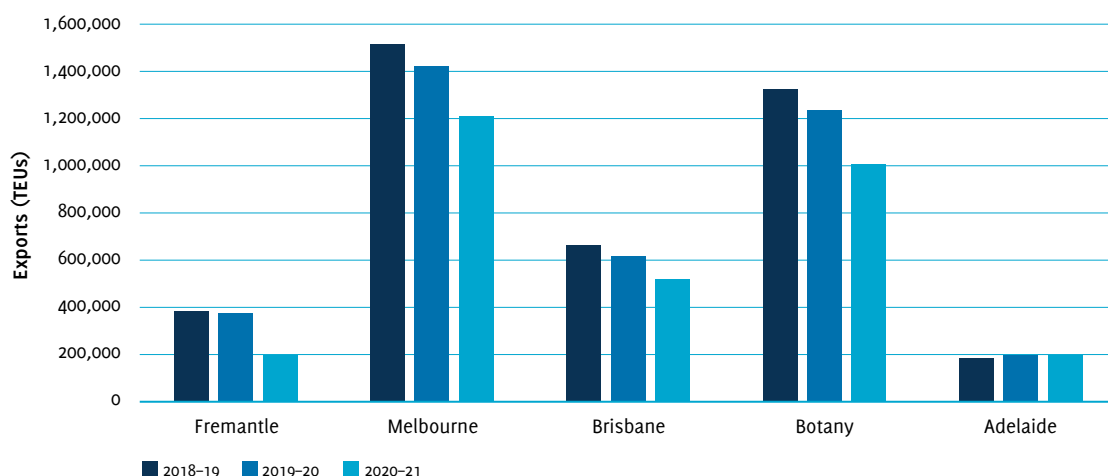


Figure 34. Port shares of container handling volumes



Figure 35. Container stevedores at Australian monitored ports

Source: ACCC (2020).

Container terminal operators have been required by their landlords to invest in infrastructure to improve the efficiency of cargo throughput on the landside. The result of this investment is intended to directly benefit truck and train service providers, with more efficient loading/unloading, less paperwork, and less waiting time. The combination of efficiency gains in lift rates, greater labour productivity, combined with some erosion in their bargaining power with shipping lines, have caused an erosion in stevedores' quayside

revenues since the mid-2010s (Figure 36).

In response, stevedores have imposed on truck and train operators unanticipated large increases in terminal access fees (Figure 37). Formerly called infrastructure charges, terminal access fees are charges applied to trucks and trains for dropping off or picking up laden or empty containers at the terminal.

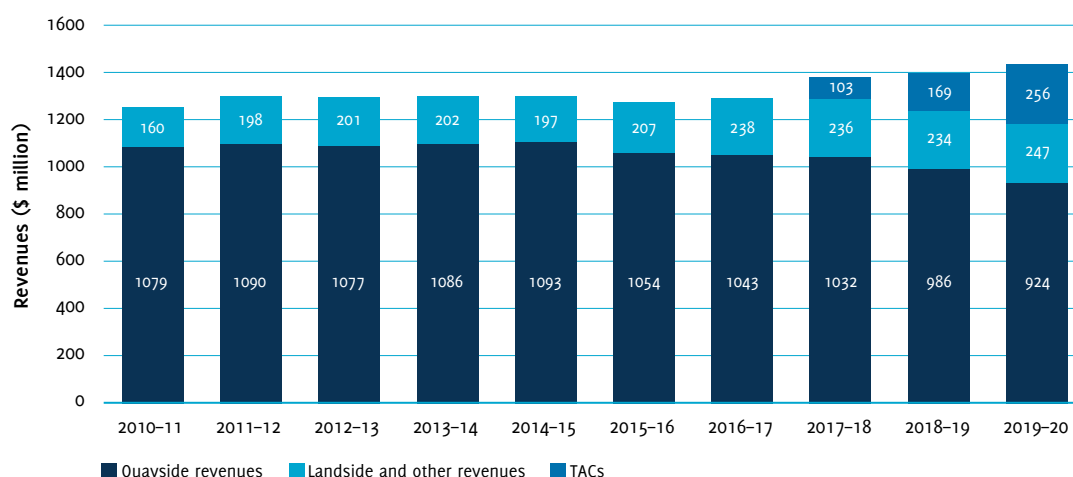


Figure 36. Stevedores' revenues across Australian monitored container ports (in real 2019-20 dollars)

Source: Abstracted from [www.accc.gov.au/media-release/stevedores-revenues-grow-despite-largest-drop-in-container-volumes-in-a-decade](http://www.accc.gov.au/media-release/stevedores-revenues-grow-despite-largest-drop-in-container-volumes-in-a-decade).

Stevedores significantly increased their terminal access fees in 2019-20, 2020-21 (Figure 37), and again in 2021-22, despite concern from both industry stakeholders and some state governments. For example, DP World announced that from May 2021, at its Brisbane, Sydney and Melbourne terminals, its charges per full container would be as follows:

**Export Containers: \$89.50 at Brisbane, Sydney, and Melbourne.**

**Import Containers: \$124.00 at Brisbane; \$126.60 at Sydney; and \$139.20 at Melbourne.**

Terminal access fees were either non-existent or just a few dollars in all ports other than Brisbane prior to 2017 (see Figure 37). Stevedores at the three largest ports of Melbourne, Sydney and Brisbane now have charges in 2021 exceeding \$120 per TEU for imported goods in containers. Figure 37 charts the large rapid increases in these charges since 2018, a period of very low cost and wage inflation in Australia.

From 2020 most stevedores began applying lesser terminal access fees for containers bound for export. This was in response to views that the charges had a more notable impact on exporters, especially primary producers exporting lower value products such as containerised grain for a world market.

Currently, the only port at which stevedore terminal access fees are noticeably less than in other ports is Fremantle. In January 2021 Fremantle Ports concluded negotiations with Patrick and DP World over new leases for the two existing container terminals at the port. The 10-year leases included guaranteed investments by Patrick and DP World to upgrade port facilities and their equipment, an equalisation of berth lengths between the two stevedores, incentives to improve landside and quayside performance and the reporting of performance KPIs. An agreed structure on infrastructure charges also limited the rate at which the two stevedores could increase their terminal access charges.

Across the five main container ports in Australia, stevedores collected \$256 million in revenues from terminal access fees in 2019-20, 51.9 per cent higher than in the previous year. In 2020-21, due to further increases in terminal access fees, stevedores' revenues increased even further.

The escalation of terminal access fees is causing stevedores to earn a growing proportion of their revenues from users of their services who have limited responses to those charges. The outcome is that importers and exporters are paying higher charges to ship their goods and ultimately those higher transactions costs weaken Australia's international export competitiveness and force domestic consumers to pay more for imported goods.

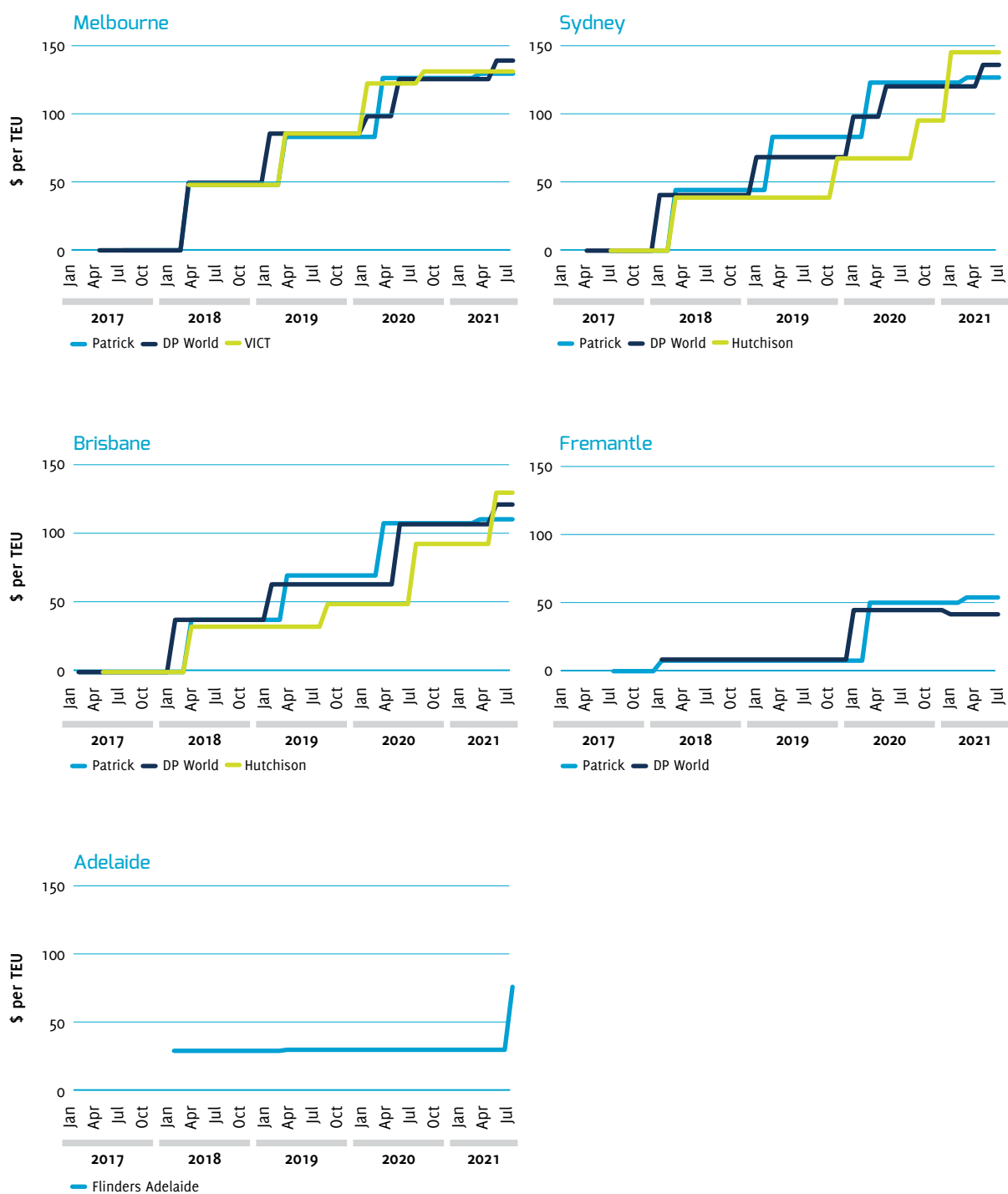


Figure 37. Stevedores' terminal access charges for container imports at key ports since 2017



Although the ACCC (2019) accepted that increases in infrastructure charges were of concern and worthy of consideration by policy makers, The ACCC reckoned it had no power to determine stevedores' charges and that the key issues were beyond the scope of the ACCC's monitoring mandate at key container terminals.

Stevedores have pointed to reasons for their increases in terminal access fees, including:

- i. falling prices being charged to shipping lines because of both greater competition between stevedores and a stronger bargaining position of shipping lines following industry consolidation.
- ii. sustained and significant increases in their property-related costs.
- iii. their need to maintain adequate returns required to recover past investments and justify future investments in quayside and landside terminal facilities.

Important to note is the ACCC's (2020) finding that stevedores' revenues and profit margins increased overall in 2019–20, despite the global pandemic causing the largest contraction in container volumes in a decade. Clearly, the higher charges for terminal access were a key contributor to those increased revenues and profits. The then ACCC Chair Rod Sims has commented that: "excessive terminal access charges will nullify the benefits of greater competition between stevedores in providing services to shipping lines. However, any regulation of these charges is a matter for state and territory governments."

The State Government of Western Australia, via Fremantle Ports, is one of the few state governments that has acted to limit the large escalation in terminal access fees charged by stevedores. The statements in 2020 by the then ACCC Chair Rod Sims infer government failure is widespread in all states, other than WA, concerning regulation of terminal access charges. The ACCC (2021) observe that stevedores' land rents have grown rapidly following privatisation of the largest container ports in Australia. It is worth noting that at the Port of Fremantle which remains under public ownership, stevedore terminal access fees are noticeably less than in other ports (Figure 37).

Because shipping lines contract with a single stevedore for cargo, and because there are few stevedore companies at each port, there is little competition in providing landside services. Such a situation calls for price and service monitoring and greater regulation, otherwise price gouging is highly likely.

It is not just terminal access fees that have been subject to cost escalation. Stevedores charge for other services (e.g. VBS administration fees, registration fees) and they also impose a range of penalties including, no show fees, late arrival fees, reconnection fees, and chain of responsibility overweight fees. These penalties may or not be commensurate to the actual dislocation or business costs generated. Listed tariff schedules reveal that many penalties and fees, besides terminal access charges, have steeply increased over the last handful of years, suggesting these fees may not be justifiably linked to business losses actually incurred.

More generally, it is worth noting that Canada, a containerised grain competitor to Australia, has introduced legislation to increase the transparency and ease of regulating its grain supply chains. In May 2018, Bill C-49, the *Transportation Modernization Act*, became law, causing the introduction of reciprocal penalties into Service Level Agreements. It provided the Canadian Transportation Agency with inquiry powers on systemic or emerging rail freight issues under guidance from the Minister of Transportation. It defined adequate and suitable service and made other changes to promote railway investment in rolling stock.

A key outcome of Bill C-49 was the development and monitoring of rail service performance indicators. The Bill ensured that Canada's grain supply chains would be monitored transparently and effectively and key players would be held accountable for their performance.

Rod Sims, as the then outgoing chair of the ACCC Chair, in an address to the National Press Club on 23 February, 2022 made several general and specific comments about anti-competitive abuses of market power in the Australian economy and some comments are relevant to the export of containerised grain. In general, he noted that "Perceptions of unfairness and inequity will see faith in a market economy eroded" and that

“The Australian economy suffers from high levels of market concentration.”

More specifically, Sims noted that: “Australia is currently facing supply and logistics challenges. I think these are made worse by the industry concentration that we have and by our infrastructure bottlenecks. We need to address this through competition law to prevent anti-competitive abuses of market power and through general infrastructure reform.” His comments would seem supportive of inquiries into terminal access fees and collaborative international inquiries into ownership concentration of container shipping and abuse of market power.

Mr Sims added that: “We seem to focus on how much we can sell infrastructure assets for in Australia rather than having our infrastructure benefit the wider economy.” This last comment is especially relevant to port privatisation in Australia that has not been accompanied by relevant state or federal government monitoring and oversight. Again, this is a clear case of government failure and commodity importers and exporters, including many Australian grain producers, pay the price for this government failure.

As an example of guarding against anti-competitive market power, Sims gave the example of the case of the Port of Newcastle versus the Port of Botany that, at the time of writing, is on appeal before the full Federal Court of Australia. The NSW Government privatised Port Botany and Port Kembla in May 2013 and entered into agreements, known as Port Commitment Deeds, with the new port operators for a term of 50 years. These deeds obliged the State of NSW to compensate the operators of Port Botany and Port Kembla if container traffic at the Port of Newcastle was above a minimum specified cap. Accordingly, the ACCC alleged that entering into these deeds likely prevented or hindered the development of a container terminal at the Port of Newcastle, thereby substantially lessening competition.

Another 50-year deed was signed in May 2014 when the Port of Newcastle was privatised. This deed required the Port of Newcastle to reimburse the State of NSW for any compensation paid to operators of Port Botany and Port Kembla under the Botany and Kembla Port Commitment Deeds. Again the ACCC alleged that the reimbursement provision in the Port of Newcastle Deed was an anti-competitive consequence of the Botany and

Kembla Port Commitment Deeds, and it made the development of a container terminal at Newcastle uneconomic.

This sequence of events underpins Mr Sims’ comment that “We seem to focus on how much we can sell infrastructure assets for in Australia rather than having our infrastructure benefit the wider economy.” Given how important export industries are to the long term economic health and diversity of Australia’s economy, it is a lamentable sign of government failure that the expediency and dictates of current budgetary difficulties blinker government decision-making regarding strategic long-lived assets. The cost of such government failure is borne by grain producers and the wider economy.

The unevenness in market powers across a supply chain is not a phenomenon unique to Australia. The Federal Maritime Commission, a key regulator in the USA, observed that, regarding international shipping, few private parties have filed complaints seeking reparations. They comment that “shipper (and trucker) concerns about retaliation, litigation costs (both in time and money), and attorney fee liability are important disincentives” (FMC, 2021). To combat retaliatory behaviour the Commission recommended broadening anti-retaliation provisions to better protect complainants. Fines for unlawful behaviour have been potentially doubled and a greater range of informational and financial support measures introduced to encourage affected parties to lodge formal complaints.

Similarly, in 2021 a diverse group of agricultural groups across Canada joined to force government action over container availability and cost escalation in container shipping. The group advocated for:

- Greater transparency and clarity into how the Canadian container supply chain was functioning within the context of a global container shortage;
- Identification of domestic legislative or competition law remedies and law changes that would correct shipping line behaviour;
- Engagement with global partners and authorities to develop appropriate regulation of shipping lines

The fact that greater regulation and scrutiny powers of government agencies was seen as the preferred and effective action to address issues of cost escalation and disruption in both Canada and the USA is perhaps a strong signal to Australia that a similar solution is applicable in Australia. Already in Australia, there is evidence that greater regulation of container ports can cause efficiency gains. For example, the Port Botany Landside Improvement Strategy led to the establishment in 2014 of the Cargo Movement Coordination Centre (CMCC). The CMCC has enhanced the coordination of supply chain activities at Port of Botany and Port Kembla. Truck turn-around times within the Port of Botany precinct fell from up to five hours to under 30 minutes, due to enforcement of mandatory standards for road carriers and stevedores. Those standards came into force in 2010 and were updated in September 2021 (i.e. the Ports and Maritime Administration Regulation 2021). Further regulatory changes are mooted for later in 2022. A proposed change is to switch from booked slots starting on the hour to truck booking slots starting every half hour, with the slots continuing to be an hour in length but overlapping with adjacent time zones. This proposed change aims to spread out truck arrivals and reduce queueing at the start of each time zone. The CMCC is an illustration of the benefits of coordination and targeted enforcement of regulation.

Another long-standing regulation and policy issue affecting investments in least-cost grain paths is the inherent inequalities in transport mode pricing. The Productivity Commission's 2006 report into road and rail freight infrastructure pricing (Productivity Commission 2006) revealed that road freight operators were at a distinct cost advantage compared to above rail operators. Road operators did not pay an equivalent proportion of the costs of constructing and maintaining the road network compared to prices paid by above rail users for access to below rail services. Although some

policy and regulatory changes in the aftermath of the Productivity Commission's report have occurred (e.g. formation of the National Heavy Vehicle Regulator in 2013), those changes have not fully remedied the inequity in access charges, and so cost differentials persist (Table 12). Accordingly, further reform of transport regulations and policies is required to form national standards and support least cost corridor networks.

The National Heavy Vehicle Regulator (NHVR) administers the Heavy Vehicle National Law, which applies in all Australia's states and territories except the Northern Territory and Western Australia. After July 2022, Transport for NSW is transferring to the NHVR 340 staff plus the heavy vehicle regulatory services formerly provided by Transport for NSW. The intention is to facilitate the national regulation of heavy vehicles and make their use safer and more efficient. The focus of further regulatory reform involving heavy vehicles should be to improve and protect the nature of least-cost grain paths and networks. This is a key task as the heavy vehicle supply chain comprises around 165,000 businesses that are responsible for the movement of much of Australia's annual grain production.

Any review of service provision and the exercise of market power along containerised or bulk supply chains should include a review of not just of international shipping but also domestic shipping. The interstate flow of grain and fodder via shipping services should be included in any examination. Such flows are especially important in periods of regional drought where grain is exported from regions of surplus to regions of deficit (ACCC, 2019; Kingwell, 2020). Being able to cost-effectively transport grain and fodder across large distances within Australia is obviously of national economic importance during prolonged periods of regional drought.

Table 12. Rail and road freight access charges from 2012–13 to 2020–21

Port	Compound average annual growth (%)	Total increase (%)
Road user charges (B-double)	0.3	1.4
Rail access charges	2.2	22.3
Road freight index	2.2	21.7
Rail freight index	4.9	54.4

Source: Pacific National (2021).

## Disruptive flow-on effects of COVID

When the COVID epidemic quickly unfolded in early 2019 the volume of container imports, supplied mostly from China, initially declined as widespread fear or loss of employment curtailed people's expenditure. In 2019 was the largest annual decrease in container volumes in over a decade. By the end of March 2020, manufacturers in China had resumed operations and imports were returning to normal levels, although this was met with a reduction in demand for some containerised goods as the pandemic reached Australia.

Some shippers reacted to the reduction in demand by implementing 'blank sailings', which is where a scheduled trip does not go ahead. Noting that ordinarily the export of empty containers is the main export item at Australian container ports, these blank sailings contributed to congestion at container parks in both Melbourne and Sydney and forced some parks to close, adding to import fees, and also causing delays for exporters. In early 2020, Maersk announced a suspension of their Asia-Australia YoYo service until the end of the year due to poor market demand. By April 2020, international carriers operating in global supply chains put a record 13 per cent of their container ship fleet on idle due to the initial impact of COVID on trade demand. Ships were taken off key routes, anchored and effectively shut down. In terms of capacity, this translated to a reduction in the container freight availability of around 3 million TEU.

TEU volumes handled by stevedores at the five main container ports in Australia declined in July–December 2019 and in January–June 2020, by 4.1 per cent and 4.3 per cent respectively, relative to the same periods in 2018–19. In July–December 2019, Sydney showed the largest decrease (9.3 per cent). In January–June 2020, disruptions due to the COVID-19 pandemic were evident at all ports, with Sydney and Melbourne experiencing decreases in container handling of 8.8 per cent and 7.8 per cent respectively. In July–December 2019, the number of container vessels handled by stevedores declined in the five ports, by 4.7 per cent compared to July–December 2018. The largest decreases occurred in Fremantle (11.8 per cent) and Adelaide (7.7 per cent).

Some shipping lines imposed new congestion charges of up to USD 350 per standard container at Port Botany in Sydney and some shipping lines delivered cargo to other ports such as Brisbane or Melbourne and charged importers to have them trucked to Sydney.

The initial fearful response to COVID greatly curbed household expenditure. The commonly observed response in developed economies to lockdowns under COVID was that households spent less on travel, recreation, entertainment, and away-from-home eating but then subsequently increased their expenditure on household items. In households with secure incomes, savings increased, and many families upgraded their homes and vehicles (Figure 38). This altered pattern of consumption increased consumer reliance on goods imported from China, as China was the world's principal source of household goods and consumer items. Most household goods are shipped in containers.

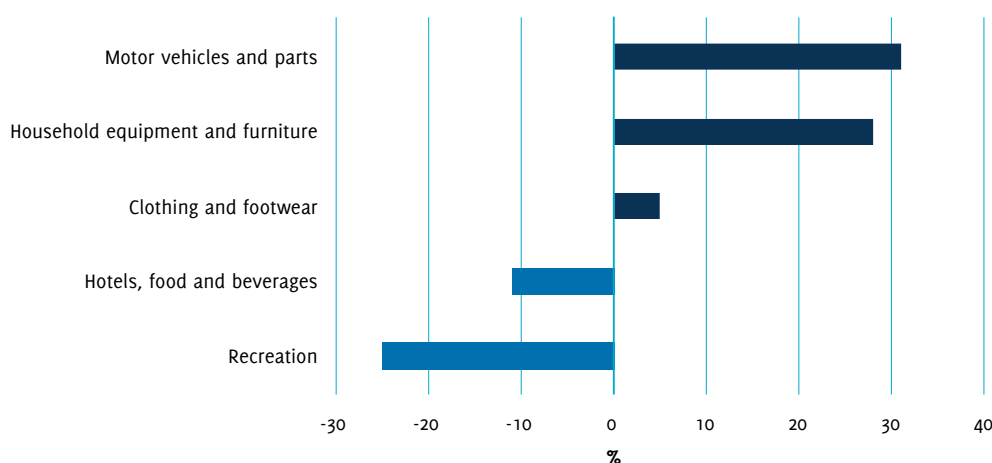


Figure 38. Percentage change in US consumer spending in 2021 (1st qtr) versus 2019 (1st qtr)

The upshot of the altered pattern of consumption was an enhanced demand for shipping containers stuffed with these consumer goods, then exported from China.

However, the flow of containers from China to other regions was disrupted by the COVID-induced partial closure of some key ports in China (e.g. Yantian, Shanghai). For example, the major container port of Yantian in China had its western terminal closed from May 21 to June 10 in 2021 due to a COVID outbreak, whilst its East terminal only worked at half capacity. This port usually

handles around 13.5 million TEU a year or about 36,400 TEU a day, making it a key gateway port on a global scale. As a result of the COVID-related impacts at this port, port congestion ensued and lowered the daily container shipping sailing capacity (Figure 39). In partial response, container lines globally blanked 298 sailings in the first half of June in 2021 (i.e. over 3 million TEU), and the number of blanked sailings remained elevated during the rest of June.

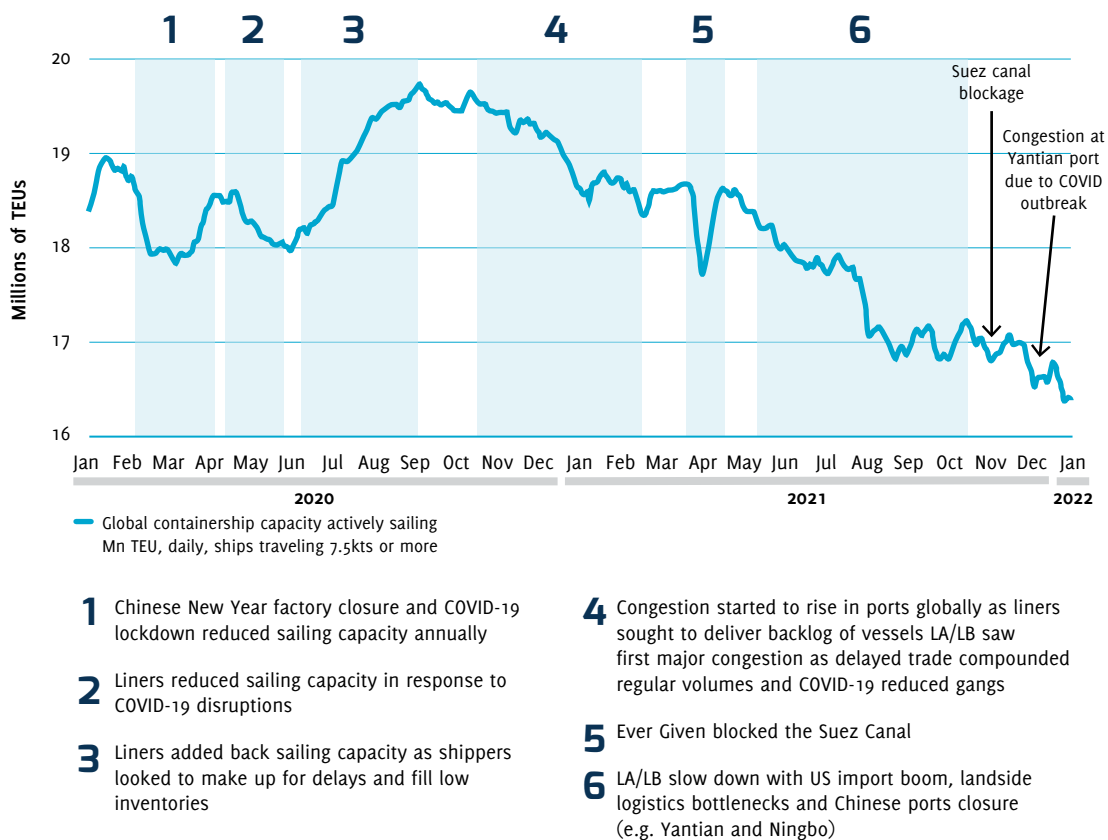


Figure 39. Daily container global shipping sailing capacity  
Source: McKinsey DeepBlue (2022).



The congestion at ports has meant container ships face delays in loading and unloading, reducing the effective sailing days of container ships (Figure 39). This congestion slows the delivery of goods from factories and farms to end consumers. Those end users or consumers who want a timely delivery of their goods pay more, as price-based rationing of container services occurs. Low margin operations such as the export of fodder usually cannot afford to pay these elevated costs of shipping and so this export trade reduces. The reduced active sailing capacity of the global container fleet has continued into mid-2022, at the time of writing this report.

Congestion during 2020–21 drove container freight rates to unprecedented levels. Drewry's composite World Container index increased to USD 8,399 per FEU in July 2021. The Drewry rate for the Shanghai to Rotterdam route increased to USD 12,203 per

FEU in July 2021 (567 per cent higher year-on-year) whilst the backhaul on the Los Angeles — Shanghai route increased to USD 1,284 per FEU. A source from Freightos said full door-to-door shipping prices in late 2021 were \$26,000 now, up from \$8,000 at the beginning of the year. Door-to-door shipping is when the item is picked up from the vendor and delivered to the recipient's door.

Congestion has not only affected container ships but dry bulk shipping as well. Port congestion, so problematic in 2021, has continued to be a serious problem into 2022 (Figure 40). Congestion at ports results in ships waiting at anchor and this incurs an expense known as demurrage. As an illustration of the increased importance of demurrage costs, CBH (2021) reported demurrage costs of \$17.3 million in 2020–21 compared to \$1.5 million in 2019–20.

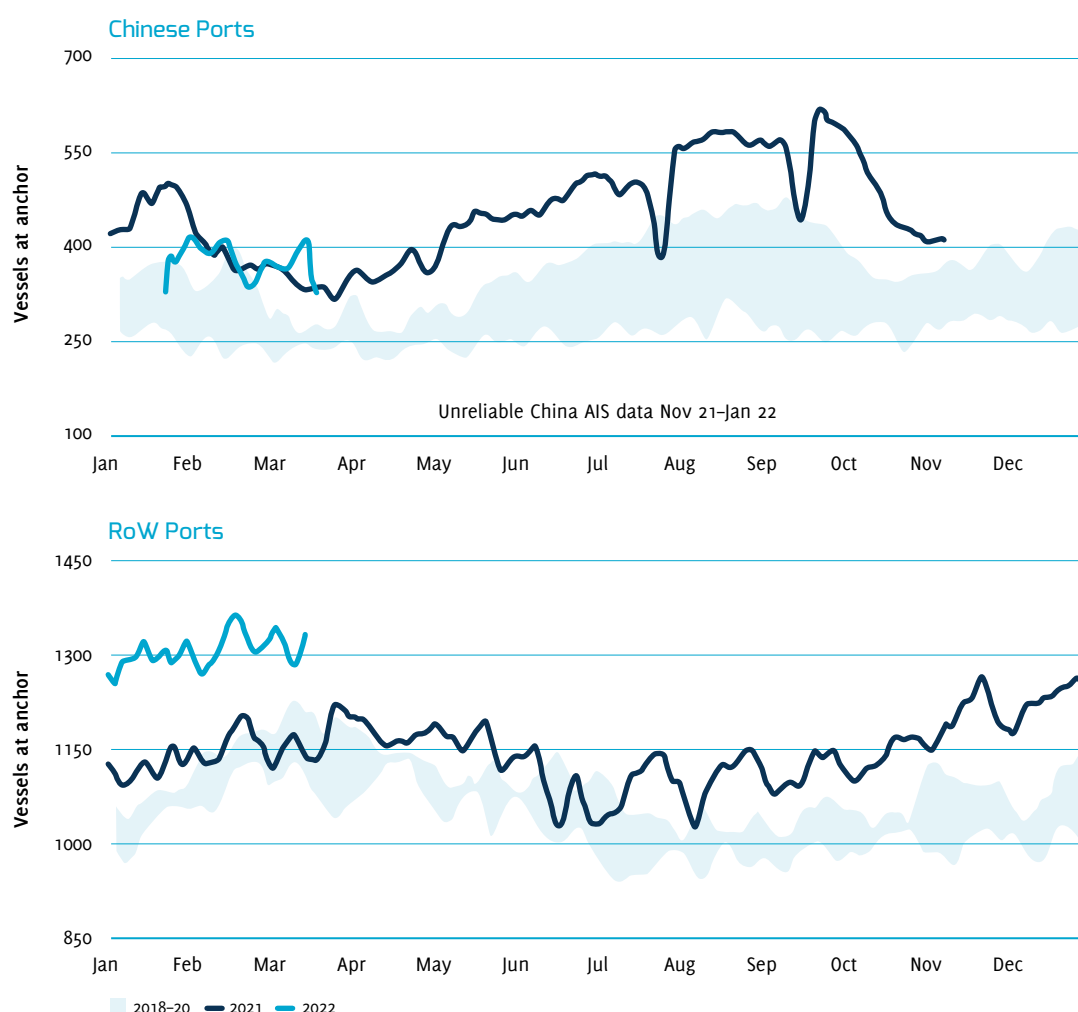


Figure 40. Congestion at Chinese ports and ports in the rest of the world (RoW)

In Australia, due mostly to the disruption costs associated with COVID, the number of container vessels visiting Australian ports has consistently declined since 2018–19 (Figure 41), reducing the availability of containers for re-export and causing a reduction in container-based exports from key Australian ports (Figure 42). The number of container ships that visited key container ports in Australia was almost 40 per cent less in 2020–21 compared to 2018–19.

The impacts of the decline in the number of container vessels visiting Australia have been lessened by the increase in size of container ships, especially with an increase in the number and share of container traffic visiting Australian ports being ships of over 8,000 TEU (Figure 43). The larger ships now visit all key container ports in Australia.

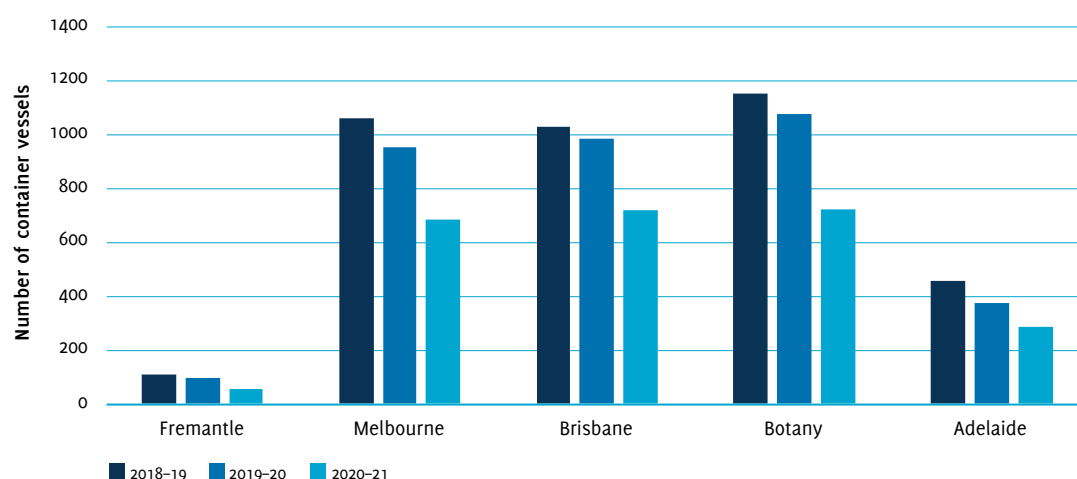


Figure 41. Number of container vessels at key Australian ports

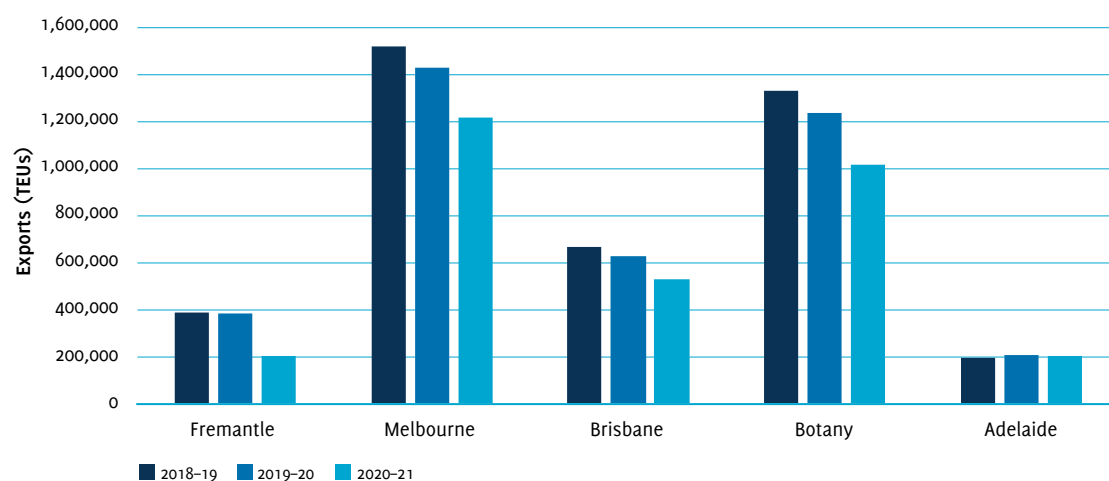


Figure 42. COVID impacts on container exports from key Australian ports

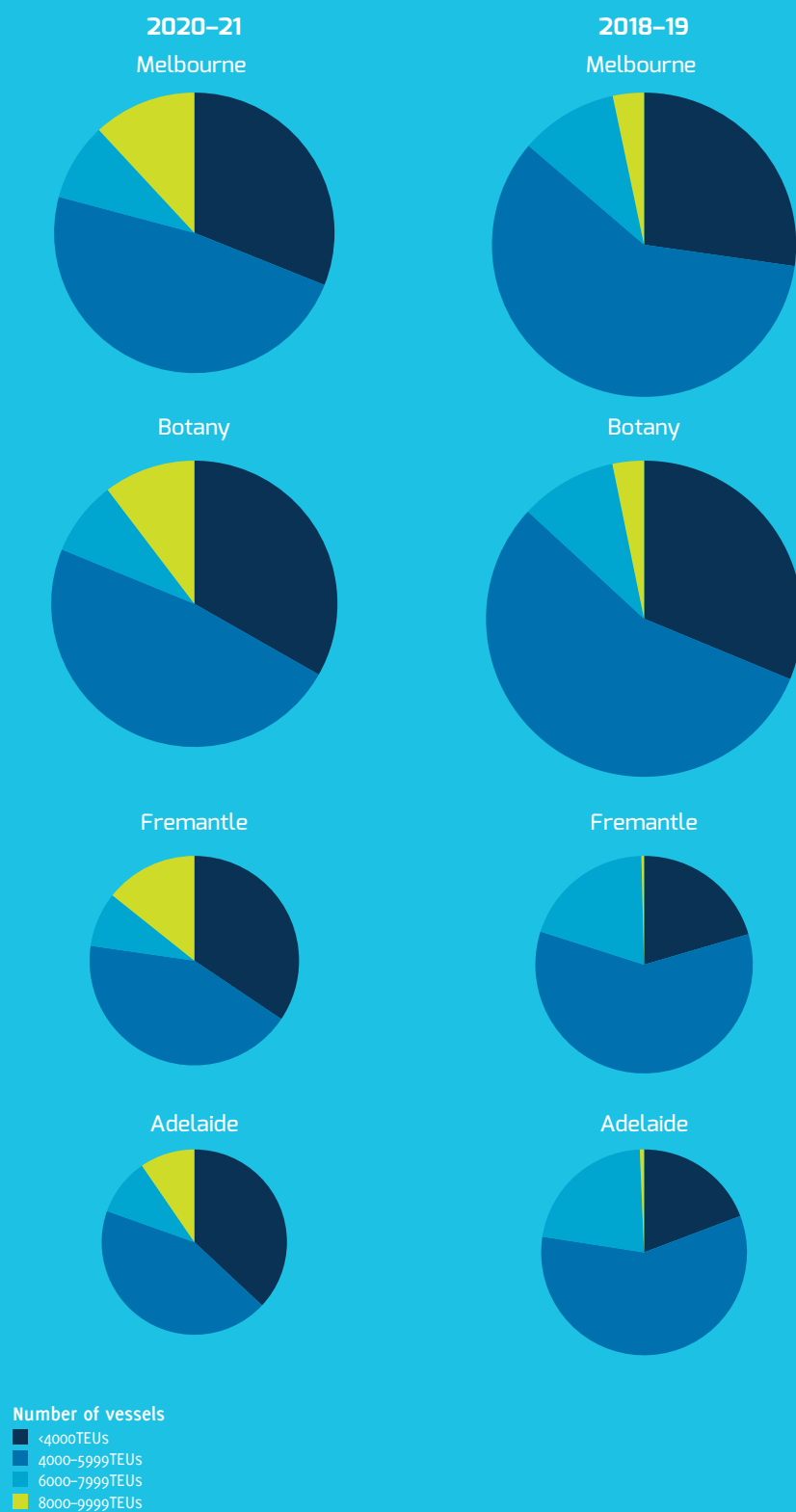


Figure 43. The composition of container ship size at key Australian ports in 2020-21 and 2018-19

As the sizes of container ships gradually increase then it is vital that Australian ports have the required infrastructure to readily accommodate larger ships to expedite the loading and unloading of their containers. To receive the larger ships, ports and terminal operators need to have sufficiently sized infrastructure such as cranes, berths, quays, large and deep enough channels, technology, rail access and sufficient labour. If port investments across Australian ports are not well-coordinated to accommodate larger ships then the situation may arise where only a few terminals will be able to service larger ships. Perversely this may constrain competition and make it commercially less attractive for a large container ship to visit Australia. This suggests that ports capable of supporting larger container ships will need to additionally ensure they have adequate rail access and ample facilities to assemble packed and empty containers and store empty containers.

Owners of container ships in recent years have experienced spectacular increases in their profits (Figure 21, Figure 30 & Figure 44) due to the reduced sailing capacity of the container fleet (Figure 39) caused in turn by port congestion (Figure 40), the altered pattern of demand for containerised goods and the reduced construction of new container ships during the 2010s. Dr Johannes Schlingmeier, CEO of Container xChange has said, “2021 was an outstanding year for the shipping industry. The staggering earnings and profits for ocean freight companies have surpassed the combined industry profits made over the whole decade. It was also a year that showed that shippers were “willing” to pay higher prices for shipping”.

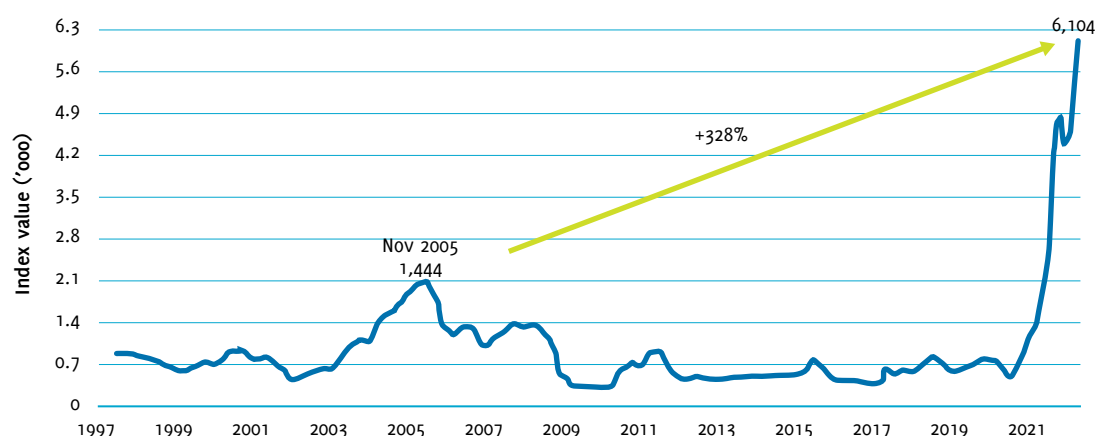


Figure 44. Howe Robinson container index

Note: The Howe Robinson Container Index represents the container market for charter rates (rental price for a container ship per day).

Source: Webinar on April 5, 2022 by Janina Lam, Howe Robinson Partners: Dry Bulk Market Overview.

The magnitude of profits earned by container ship owners has been underpinned by large increases in the cost of many freight routes for shipping containers, especially shipping containers out of China. The historic levels of profit have allowed many of the owners of container ships to place orders for new ships that will become available from late 2023 and early 2024 onwards (see a later section titled “Container ship replacement”). Eventually the supply of additional container ships and the likelihood of a deceleration in economic growth in North America, Europe and China in 2022 will eventually see the cost of many freight routes for shipping containers decline substantially from their peaks in 2021. How quickly the rates charged for shipping containers will decline is subject to much speculation (Figure 45). The most likely scenarios point to

rates rapidly falling during 2023 to levels in 2024 similar to, or somewhat higher than those observed in 2019. The red dot in Figure 45 indicates the indexed cost of containerised freight in early August 2022, suggesting a more rapid decline in the cost of sea freight is underway in 2022.

The enhanced future supply of container ships and the trend towards larger vessels should especially benefit Australia’s main container ports in Melbourne, Sydney and Brisbane. At these ports, once again, containerised grain and fodder should become attractive back freight opportunities.

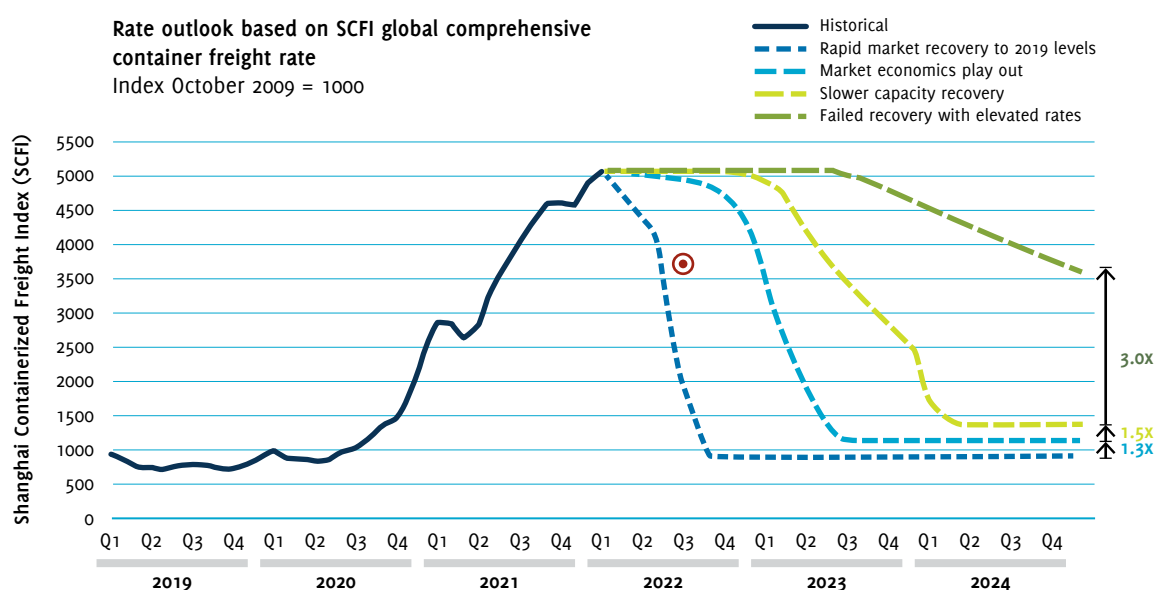


Figure 45. Shanghai Containerised Freight Index: 2019 to 2024<sup>f</sup>

Note: SCFI=Shanghai Containerised Freight Index.

Source: McKinsey (2022).



## Disruption of labour supply at port

The ACCC (2021) noted that each time a stevedore's enterprise agreement expires, the Maritime Union of Australia (MUA) and the stevedore then engage in protracted EA negotiations that create delays and congestion at Australian container ports. For example, the expiry of a number of enterprise agreements at the end of December 2020 elicited industrial action at Port Botany from early September 2020. Protest stoppages occurred at Patrick, DP World and Hutchison's Port Botany terminals. Industrial action has been observed at almost every major container port in Australia during 2021. For example, since February 2020 until the end of 2021 the Maritime Union of Australia (MUA) launched more than 220 industrial actions against Patrick Terminals. Sydney, Brisbane, Melbourne and Fremantle terminals all experienced delays for importers and exporters. Yet the MUA's assistant national secretary, Jamie Newlyn, still boldly stated: "Despite a political campaign of misinformation and interference by the ACCC, the Productivity Commission and even Scott Morrison, the Union has always sought to work cooperatively with Patrick Terminals' management on continuous business improvement to ensure job security, safety, and productivity at Patrick Terminals' four ports." (7 Feb, 2022). The MUA actions at the Patrick terminals worsened port congestion (e.g. [Figure 46](#)).

The ACCC (2021) stated "Average idle hours increased in aggregate across all 5 Australian container ports, from 9.1 hours in 2018–19 prior to the pandemic, to 13.3 hours in 2020–21. The increase in idle time at Port Botany was especially pronounced, going from 11.9 hours to 21.2 hours

over the same period. Congestion at Port Botany has deteriorated to such an extent that shipping lines are often skipping the port entirely." (p. 14).

Note that the average cost of a day's wait for a shipper is typically around \$35,000; so a 20 day average wait time translates into a \$700,000 cost. In their container stevedoring monitoring report, the ACCC (2021) note that "Market participants across the supply chain have expressed concerns to the ACCC that these industrial actions are also causing damage to many Australian businesses that are not parties to the industrial dispute. They advised industrial actions have disrupted their operations continuously over the past few years with a consequential impact on the entire supply chain." (p. 67).

It is not just labour disruption at Australian ports that affects the ease and cost of exporting grain and fodder in containers from Australia. Also creating ripple effects in Australia is the likelihood of labour disruption at west coast port terminals in the USA. Ending on July 1, 2022 is a 5-year service contract between the Pacific Maritime Association who are owners and operators of 29 USA west coast port terminals, and the International Longshore and Warehouse Union. The union has already rejected a one-year extension of their existing contract, and despite previously accepting the need for container port automation and being financially compensated for that stance, they are now strongly opposed to such automation. The prospect is for labour disruption at the key container ports on the USA's west coast towards mid-2022 until either intervention by the USA federal government or finalisation of a new agreement. Until that time there will be adverse ripple effects for the container trade in Australia.

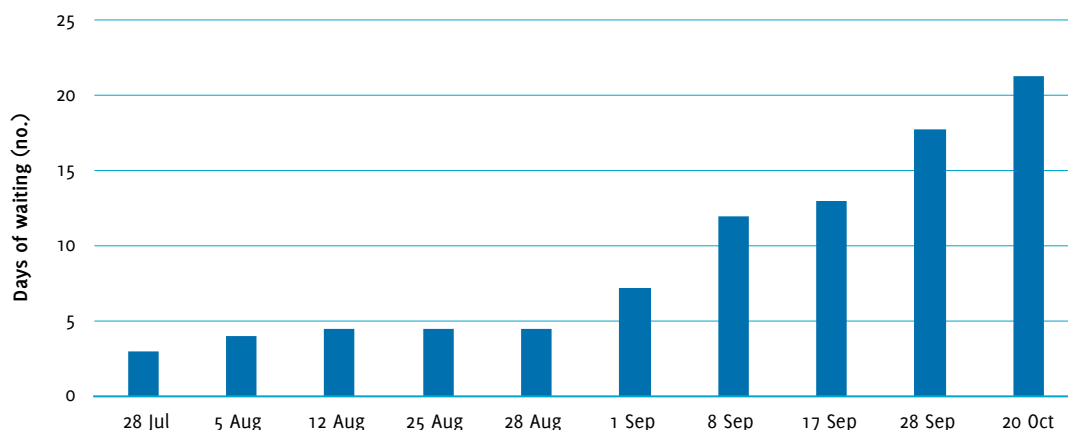


Figure 46. Port congestion at Patrick terminals in Port Botany: July 2020 to October 2020

## Inadequate supply chain investment

Wherever supply chain investments deliver subsequent benefits from cooptation or competition then such investments should be encouraged. However, as outlined in a preceding sub-section, at times useful container supply chain investments appear to have been actively and purposefully stymied. The example cited was the behaviour of the NSW Government who privatised Port Botany and Port Kembla then provided these entities with protection against any possible investments at Port of Newcastle. By preventing or hindering the development of a container terminal at the Port of Newcastle, competition and a possible enlargement of service provision was lessened.

An example of feasible investments supported by cooptation is the construction of intermodal terminals linked to the inland rail that are jointly funded by multiple users and governments that then, via competition for services, deliver regional and industry economic growth. As an illustration in the 2022–23 Budget, the national government committed up to \$3.1 billion for the \$3.6 billion Melbourne Intermodal Terminal Package that will deliver two new intermodal terminals at Beveridge and Truganina. The funding includes \$1.62 billion for the Beveridge Interstate Freight Terminal, \$280 million for its road connection upgrades, \$740 million for the Western Interstate Freight Terminal at Truganina and \$920 million for the Outer Metropolitan Ring (OMR) South Rail connection.

These two new terminals, being linked to the Inland Rail, will ensure that Melbourne's freight infrastructure has the capability to accommodate the double-stacked 1,800 metre trains that will operate on the Inland Rail. Double-stacking containers reduces the unit cost of grain and fodder transport, and lengthens the geographical market reach of these farm products.

These intermodal terminals plus others already constructed or being planned (see [www.inlandrail.gov.au/for-business/understanding-the-freight-supply-chain/intermodal-terminals](http://www.inlandrail.gov.au/for-business/understanding-the-freight-supply-chain/intermodal-terminals)) mean that, in times of drought, animal feeds can be moved further and more cheaply to better protect farm businesses and regional communities from the vagaries and economic stress of drought. Conversely, in periods of plenty, these farm products can be more cost effectively moved into export positions.

That said, a key issue affecting several container ports is adequate rail access and the potential to achieve greater efficiencies by better integrating rail into supply chains. Although rail is considered to be the most reliable and efficient land transport for large volumes of grain, especially over long distances, nonetheless, over the last decade, on average, only around 10 to 12 per cent of containers have been transported by rail to the container ports in Melbourne and Sydney. For example, in 2020–21 only 2.1, 6.1 and 15.5 per cent of containers arrived by rail at the container ports in Brisbane, Melbourne and Sydney (ACCC, 2021).

Yet, in the particular case of the Port of Botany, the NSW government supposedly planned to increase the share of rail freight at Port Botany to 28 per cent by 2021 (NSW Transport, 2018). To-date in 2022 the share of rail freight at Port Botany has averaged only 13.6 per cent.

Upcountry investments in rail can sometimes improve the efficiency of the entire supply chain. For example, upgrading the limits on axle weight capacity on short distances of track where train speed is reduced, or enlarging inadequate siding lengths, or constructing passing loops can separately or in aggregate lift the handling efficiency of the rail network.

Currently, stevedores and port owners are not strongly supportive of rail, as shipping lines pay (i.e. charge to the exporter in the Terminal Handling Charge in the ocean rate) the majority of the handling charges in road terminals (first lift off and last lift on) whereas rail terminals must be funded by rail operators (as they are the second lift away) and so are directly funded by exporters and importers.

If the split of market share of rail and trucks continues into 2030, this may double the number of trucks required, leading to road congestion on road networks servicing the ports, as well as increased emissions from road transport. Marked growth in the volume of containers passing through Australian ports is projected towards 2030 (Table 13).

The outcome of this growth in the volume of containers passing through Australian ports will be political pressure on local and state governments to lessen the congestion, accident risk and noise issues associated with more frequent truck movements. Greater investment in rail corridors, tracks capable of double-stacking, rail loops and shuttle trains are all possible required investments that will lower unit transport costs and reduce the emissions intensity of transport services (see later Figure 55). Rail freight is known to impose fewer costs on the community in terms of accidents, congestion and emissions than road. These costs are not factored into transport prices in Australia (Deloitte 2017). Deloitte compared emissions from road and rail freight and concluded that road freight produced 16 times as much carbon pollution as rail freight per tonne kilometre.

Indicative of the future, at the Port of Fremantle, rail transport of containerised grain and fodder is regularly around 20 per cent of the export volume of grain and fodder containers from the port with the rail freight being subsidised by the state government to reduce road congestion and road train noise in suburbs adjacent to the port. Moreover, a major new container port is at a very advanced stage of planning, to be positioned south of the Port of Fremantle with a far greater ease of rail and road access. However, investment

in this new port is being strongly opposed by the Maritime Union of Australia who want the less efficient Port of Fremantle to be the region's sole container port towards 2050.

The National Freight and Supply Chain Strategy (DITCRD, 2019) outlines that Australia's freight volumes are projected to grow by over 35 per cent between 2018 and 2040. Urban freight is forecast to increase by nearly 60 per cent by 2040, along with greater population density. Yet DITCRD (2019) observe that Australia's freight productivity and costs have plateaued, with little change in real freight costs since the 1990s. This impacts the competitiveness of Australian exports, including containerised grain exports. DITCRD (2019) also comment that "Urban infrastructure is reaching capacity due to road congestion (which will be around \$30 billion a year by 2030), greater noise and environmental regulation, and corridor and precinct encroachment." (p. 10).

DITCRD (2019) also identify potential savings worth \$10.8 billion from the protection and early acquisition of seven corridors in a 2016 Infrastructure Priority List, emphasising the economic importance of investments in least cost freight networks and corridors.

An additional pressure for rail investment is the trend towards larger vessel sizes which increases the need for speed and volume of loading and unloading, and places greater demands on empty container parks. The demand for empty container park space will increase as the volume of imported containers continues to grow, yet due to the cost and availability of land around each port, more cost-effective investment and management of empty container parks will be required in the future.

Table 13. Containerised trade by Australian port

Port	Annual average growth rate (%)		Trade volume ('000 TEU)	
	Forecast 2012-13		2012-13	Forecast 2032-33
	1998-99 to 2012-13	to 2032-33		
Brisbane	8.1	6.2	1070	3563
Sydney	6.5	4.5	2126	5155
Melbourne	5.9	4.8	2512	6415
Adelaide	7.7	5.4	339	972
Fremantle	6.6	5.8	670	2055
Other ports	5.7	5.1	447	1218
All ports	6.5	5.1	7165	19,377

Source: BITRE estimates.

## Labour practices at port

Ports are nationally important strategic assets. Berths, container cranes and transport facilities are expensive assets that need to be used efficiently to generate sound returns. Limitations on asset use that arise from curfews, restrictions on access or antiquated labour practices need to be remedied. Labour services at port should be tailored to user needs, not vice versa.

There are some inflexible work practices and rigidities in conditions that unhelpfully add to the inefficiency of port operations and only encourage and hasten the eventual investment switch into robotic technologies. Mismatches in opening hours of port terminals, container parks, and delivery schedules generates its own set of inefficiencies.

The ACCC (2021) describe in detail how the MUA used industrial actions in 2020 and 2021 to demand stevedores accept restrictive provisions. The ACCC found in enterprise agreements restrictive conditions that were “outside the realm of what would be considered reasonable terms and conditions in any industry.” (p. 67). The ACCC also concluded that “Overall, these provisions constrain workplace performance, reduce and distort incentives to improve productivity, reduce timeliness and reliability, and increase labour costs for a given level of activity. This has contributed to the sub-optimal performance of the nation’s major ports and added to the pandemic-induced supply constraints.” (p. 66). These are damning and serious criticisms that point to governments failing to facilitate productivity improvement, but rather supporting economic harm to the wider economy.

## Biosecurity inspection

In March 2021 new export legislation came into effect in Australia: the *Export Control Act 2020* and the *Export Control Rules 2021*. The new legislation was intended not to add regulatory burden or change export business operations. Importantly, fees and charges were not changed following enactment of the new export legislation.

Under the old and new legislation, an authorized officer (i.e., a government authorised officer or third-party authorised officer) inspects the products’ packaging (e.g., bags) and container unit to ensure they meet the appropriate standards and that there is no pest contamination. The officer inspects the grain or fodder to be exported, and assesses its associated documentation, and confirms that it:

- meets the importing country requirements
- complies with Australian export laws
- complies with all other requirements outlined on the Plant Export Operations Manual.

A phytosanitary certificate is issued that states: “This is to certify that the plants, plant products or other regulated articles described herein have been inspected and/or tested according to appropriate official procedures and are considered to be free from the quarantine pests specified by the importing contracting party and to conform with the current phytosanitary requirements of the importing contracting party, including those for regulated non-quarantine pests.”

The officer must ensure that the grain or fodder is referred to by its common name (e.g., barley, sorghum, mung beans), with no quality descriptors being allowed (e.g., milling wheat or soft wheat). If the importing country requires the product to be treated for pests, then treatment details must also be provided by the exporter.

It needs to be emphasised that the sole focus on pest identification only partially protects the export reputation of Australian grain and fodder exports. Grain or fodder quality is not assessed and so these vital characteristics of the exported products need either third-party verification, or parties adversely affected by failure to honour contract specifications need redress via GTA dispute resolution processes.

The introduction of third-party authorised officers has provided flexibility and greater assurance in the availability of biosecurity inspection for the export of containerised grain. However, to maintain the quality of their service provision and the quality of service provision by government authorised officers regular upgrade and audit of their performance is required.

Having held discussions with various persons engaged in the export of containerised grain and fodder, we have formed a view that the training of authorised officers needs regular review to ensure the form and content of training remains fit-for-purpose.

For authorised officers employed by packers their training especially needs to highlight awareness training regarding conflicts of interest, as despite being paid by the packer, the legal duty of these officers is to manage compliance with Commonwealth law rather than being compliant to their employer's immediate needs. Having stated opportunities to retain the quality of training for authorised officers, it needs to be highlighted that the work of authorised officers in recent years has been stressful due to the impacts of COVID that have reduced their staff availability and increased individual workloads.

## Availability of food grade 20ft containers

Shippers prefer to use 40ft containers as their profit margins per shipping slot are greater with 40ft containers. Currently, 20ft containers have approximately a 36 per cent global market share of all containers (Singh 2020). At Australia's main Port of Melbourne, relative to the global average, a higher proportion of 20ft containers is imported and exported (Table 14), at least for full containers, and the port regularly annually exports over 500,000 empty containers (Figure 47). This equates to about 38 per cent of all this port's containers being exported empty, suggesting availability of 20ft containers may not ordinarily be a pressing issue at this main port. However, most containerised grain exports from Australia are in 20ft food grade containers that are a subset of the stock of 20ft containers.

Table 14. Port of Melbourne import and export full container size shares in 2009 and 2019

Direction	Size (ft)	2009 (%)	2019 (%)
Imports	40	42	53
	20	58	47
Exports	40	34	47
	20	66	53

Source: Port of Melbourne (2021).

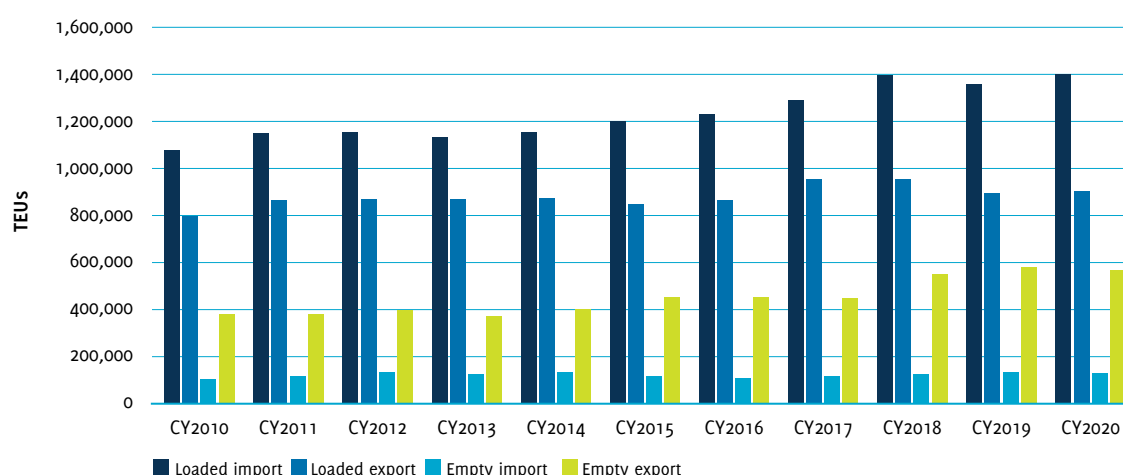


Figure 47. Container trade through the Port of Melbourne: 2010 to 2020

Source: Port of Melbourne (2021).



A food grade container requires the container to be free of obnoxious odours, with no flaking paint or rust, with no transferable stains and containing no infectible material. Hence, the seeming ready availability of 20ft containers overstates the actual availability of food grade 20ft containers. Moreover, gradually as 40ft containers become a higher proportion of the global stock of containers, it follows that also gradually, the availability of 20ft food grade containers will diminish.

The Maritime Waterline reports (Waterline 62 and 67 from the Department of Infrastructure, Transport, Regional Development and Communications) reveal a gradual decline in the proportion of 20ft containers within the stock of all containers handled in Australia (Figure 48). If this proportion eventually falls to sufficiently low levels, then 20ft containers will become less available, and the cost to convert more of those containers to a food grade level will become an additional expense for exporting. Profit margins for grain export will then become further constrained. However, it should be stressed that just because 20ft containers will become a lower proportion of the global stock of containers, does not necessarily imply a problematic availability of 20ft containers as long as the overall stock of containers imported into Australia continues to grow at a greater rate than growth in exports of containerised grain. For example, Australian ports

now handle over 8 million containers every year; five times more than 20 years ago, but the rate of increase in exports of containerised grain is also higher. Australian grain exports in containers have grown from under 1mmt in 2007 to 4.2mmt in 2020–21. That is over a four-fold increase in only 14 years so the availability of 20ft food grade containers is increasingly likely to be a pressing issue.

Due to difference in growth rates of the volume of containers imported into Australia and the volume of grain exported in containers, there needs to be industry and government monitoring of the availability of 20ft food grade containers and discussion about the most cost-effective responses to the potential structural challenge of gradual reduced availability of 20ft food grade containers.

Investing in transport modes and pathways that increase mass limits to allow greater use of 40ft containers would appear one component of a solution. Road mass limits cause most grain exporters to use 20ft containers as they can be loaded with up to 24 tonnes of grain before breaching road mass limits. However, even these mass limits mean that 20ft containers are unable to be filled completely with very dense grains. The situation is far worse for a 40ft container that is subject to equivalent mass limits.

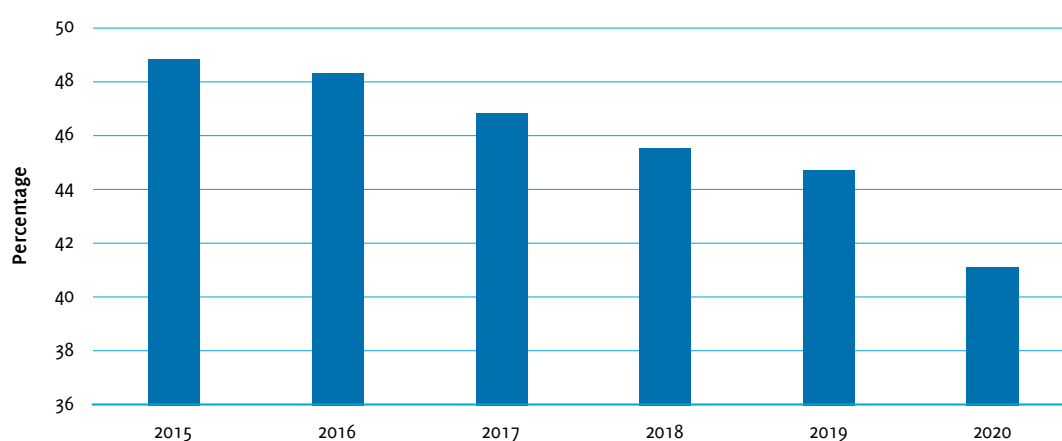


Figure 48. 20 foot containers as a percentage of all containers handled in Australia: 2015 to 2020  
Source: GTA (2022).

Aside from road infrastructure investments that allow for carriage of heavier loads, another response is to have a jointly owned service business at each main export port to solely provide low-cost refurbishment of 20ft containers to a food grade standard for grain exporters. Encouraging a joint South East Asian and Australian investment in ownership of 20ft containers is another possibility. This could be jointly beneficial as many South East Asian nations lack the landside infrastructure to accommodate 40ft containers, preferring reliance on 20ft containers.

Of some concern is the increased cost of 20ft containers. Container manufacture that principally occurs in China continues to produce huge volumes of 20ft containers so there is little likelihood of any rapid decline in the availability of 20ft containers. However, containers are now much more expensive to manufacture. For example, the cost of steel increased substantially from 2,202 Yuan/MT in early July 2016 to 5,594 Yuan/MT by May 2021. This has increased the manufacturing cost of shipping containers and meant that purchasers or owners of these new containers require higher lease prices to generate the same rate of return to their investment in these capital items.

The upshot is that there is unlikely to be a rapid return to 'cheap' 20ft containers and so profitable reliance on these containers will continue to be constrained by their cost of access and use.

To efficiently access empty containers requires information-sharing and activity coordination between track owners, shipping lines, stevedores, rail operators, freight forwarders and grain packers. The current status of containerised supply chains in Australia suggests there is inadequate information-sharing and coordination between these industry groups and this causes inefficient access to empty containers. Lack of coordination between these operators also lessens the effectiveness of the Inland Rail for the supply of empty containers across the broader port/interstate rail network.

During the COVID pandemic, and even in its aftermath, availability of 20ft food grade containers at many of Australia's container ports has been problematic, in turn making bookings difficult. Moreover, even where containers might be available, shipping lines have limited their sailing dates or routes to key containerised grain markets, such as the sub-continent or Middle East. Hence, gaining access to some key markets has proven to be a logistic difficulty.

## Market access

By far the main container trade flows centre on Asia. The transatlantic trade flows involving the Americas and Europe fade into relative insignificance when compared against the trade flows between the Americas and Asia, and Europe and Asia (Figure 49).

Australia has a small domestic manufacturing sector and so is required to import a large range and volume of manufactured goods, many of which are transported in containers. As Australia's population and per capita income has grown, so has Australia's demand for imported goods, many of which arrive in containers. Australian ports now handle over 8 million containers every year; five times more than 20 years ago.

Yet Australia's major merchandise exports (iron ore, coal, gas, grains) are bulk exports. A consequence is that Australia annually receives many more containers than it currently fills with back-loaded exports. At many Australian container ports, the export of empty containers remains a major category of container exports (Figure 47).

Availability of empty containers, especially 40ft containers for packing with oaten hay, is usually not a constraint on export operations. However, as discussed later, availability of food grade 20ft containers is likely to become a structural impediment to export of containerised grain.

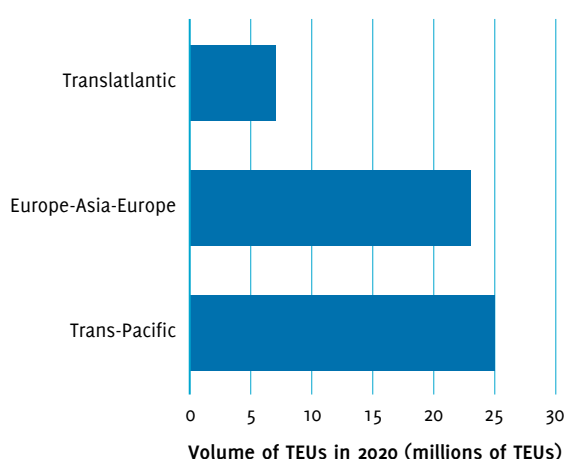


Figure 49. The volume of container trade based on main routes

More important, and what most constrains the export of grains and grain products are the supply chain costs, including the shipping costs, associated with the containerised export of these commodities; the financial risks associated with the container trade and the expense of the initial purchase of some of these commodities.

Adding to the supply chain costs and financial risk is the security of market access. Some large markets like China or India can unexpectedly be subject to restricted access. Already Australian exports of barley and oaten hay have been subject to unexpected actions by the Chinese government that, by various means, have removed access to the Chinese market for these commodities. Trading margins are typically slim for the export of containerised grain and grain products, so any small changes in supply chain costs or impediments to market access quickly erode profit margins and add financial risk to export operations.

Industry and government actions that enlarge access to new or existing markets for containerised grain and fodder is a sensible strategy and spreads market risk. Often access to a market is conditional on the industry and government policies in that target market. Through bilateral exchanges jointly involving respective government agencies and industry representative bodies it sometimes is possible to achieve trade or regulatory reform which increases access to those target markets. In the particular case of containerised grain and fodder, target markets are those with a strategic need to import grains and fodder that Australia can regularly supply, a capacity to pay for provenance and a proximity to Australia that gives Australian suppliers a freight advantage.

Growing populations and per capita wealth in East Asia, South East Asia and South Asia underpin increasing market opportunities for Australian containerised grain and fodder, mostly where end users have a preference or sole ability to receive containerised products.

## Container ship replacement

The fleet of container ships is forecast to grow 4.4 per cent in 2021 and just 2.8 per cent in 2022, significantly below demand growth projections, although high levels of newbuild are contracted for 2023. By mid-2021 there was marked variation in shippers' commitments to investments in additional shipping capacity (Figure 50). Maersk, for example, although responsible for about 20 per cent of the global TEU trade, in mid-2021 had only around one per cent of its TEU trade placed as new ship orders. By contrast MSC, that also is responsible for about 20 per cent of the global TEU trade, in mid-2021 had 22 per cent of its TEU trade placed as new ship orders.

Overall, perhaps due to the commercial uncertainties surrounding the global impacts of COVID during 2019 and 2020, few shippers opted to place new orders for ships in those years. The restricted replenishment of shipping capacity in 2019 and 2020 has fuelled the escalation shipping rates in 2020 and 2021 and high rates and high profits from shipping are destined to continue into 2022. These high profits encouraged ocean carriers to eventually double their orders for container ships by the end of 2021 (see Figure 51).

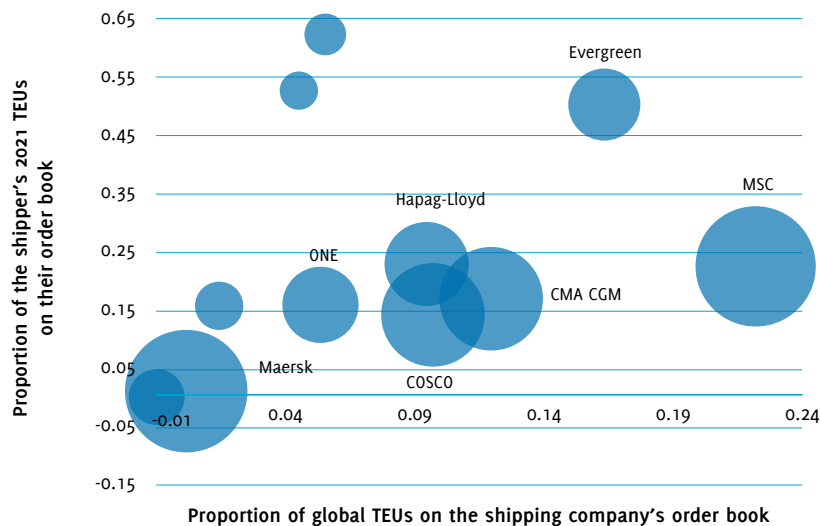


Figure 50. Variation among shippers in their investment in new ship orders

Note: The size of each bubble is the total TEUs in 2021 carried by that shipping company.

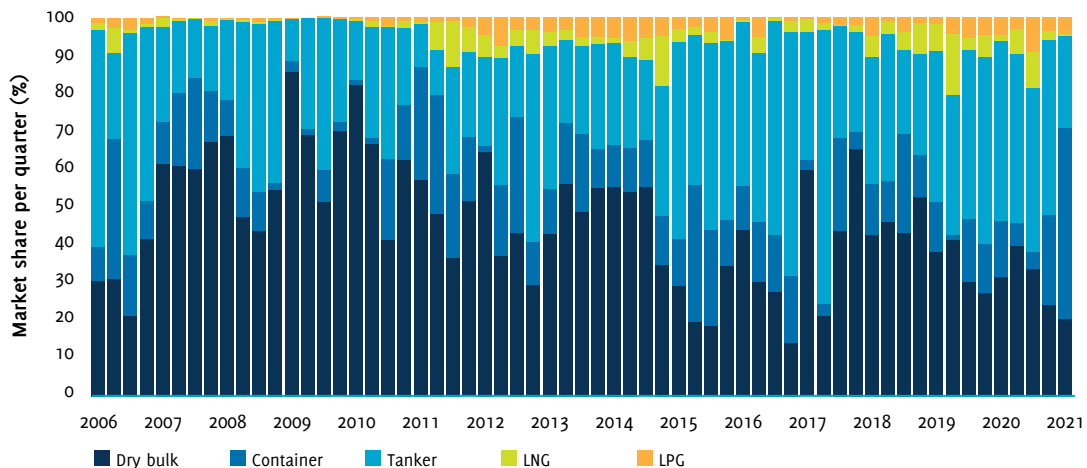


Figure 51. Total vessel orders by sea freight type: 2006 to 2021

Source: Nugent (2021).

As of early September 2021, 619 container ships were on order for future delivery. Of those, 381 were ordered in 2021 alone. In early September 2021 the container ship order book held 5.3 million TEU of shipping capacity scheduled to be added to the fleet from 2023 onwards. Yet at the start of 2021 only 2.5 million TEU was on order. Never has such a large volume of TEU been ordered in such a short time span. The magnitude of the boost to container ship construction has meant that ship-building capacity for bulk vessels is highly constrained, suggesting sustained pressure on bulk sea freight rates will continue over the next few years.

The magnitude of new orders might suggest overcapacity could be a future risk in the trade of containerised goods, but future supply requirements are clouded by new environment regulations. The Energy Efficiency Design Index (EEDI) for new ships promotes more energy efficient (less polluting) equipment and engines. The EEDI requires a minimum energy efficiency level per capacity mile (e.g. tonne mile) for different ship type and size segments. Since 1 January 2013, following an initial two-year phase zero, new ship designs need to meet their relevant reference level that is tightened incrementally every five years. Implementation of the EEDI is affecting the cost of ship construction and will likely limit ship speeds in order to lessen or cap emissions from sea transport (IMO, 2021). Hence, and so effective shipping capacity may not be as apparent as newbuild orders might suggest. However, it is not just container ships that are affected by new environmental laws. Some analysts estimate that less than 25 per cent of bulkers and

tankers will attain the required level of emissions reduction required under new regulations, placing further upward pressure on bulk freight rates as these older vessels are de-commissioned.

For new ships, the EEDI requires that energy efficiency is improved in phases such that CO<sub>2</sub> emissions are progressively reduced. During phase one that ran from 1 January 2015 to 31 December 2019, the EEDI required a 10 per cent reduction of carbon intensity below the relevant reference line for newly built ships. However, phase two runs from 1 January 2020 to 31 December 2024 and requires up to a 20 per cent reduction of carbon intensity. Phase three of the EEDI commences in April 2022 and requires an additional 10 per cent reduction, i.e., ships being built in 2025 will be required to be 30 per cent more carbon efficient than those built in between 2000 to 2010 (Standard Club, 2021).

In general, containerised sea freight is playing an increasingly important role in the international trade of goods (Figure 52). In over four decades, containerised sea trade has grown from virtual obscurity, being under 2 per cent of the global shipping freight fleet to now consistently being around 14 per cent of the global fleet. The carrying capacity of today's largest container vessels is boggling, equivalent to a 71 kilometre-long freight train solely carrying containers. Because a large proportion of the global trade in sea freight now relies on containerisation it means that any policy, regulatory, technology or investment changes that affect the cost and efficiency of containerisation are also increasingly important.

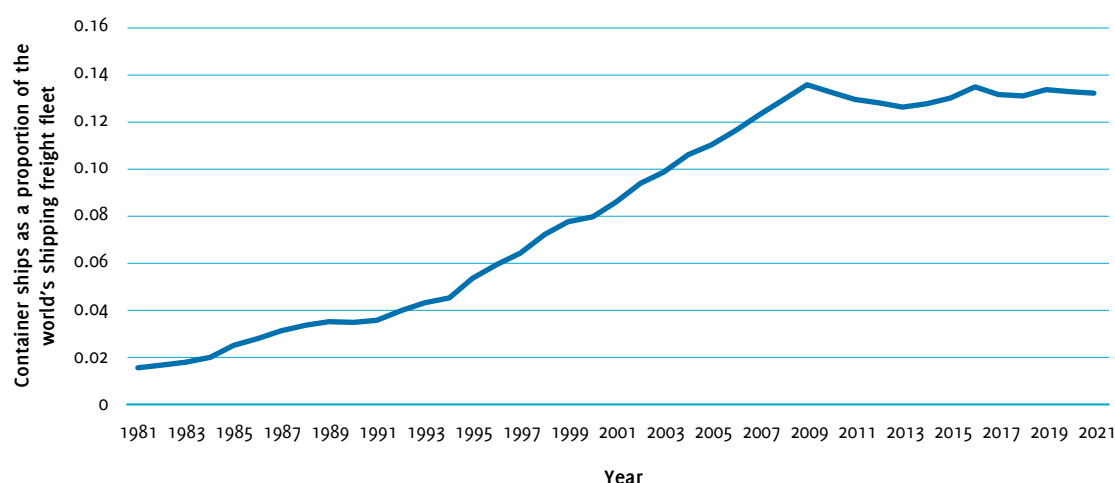


Figure 52. Container ships' share of the world's shipping freight fleet

Source: Compiled from UNCTAD data available at <https://hbs.unctad.org/merchant-fleet/>.



An investment challenge wrought by the structural shift to larger container ships is their requirement for increased channel depth and often longer berths. These smaller ship classes include coastal ships, reefer ships, or geared ships. Larger ships above 8,000 TEU have a more uniform design with little draft variations (Figure 53). The New Panamax standard was set in 2016 with the expansion of the Panama Canal to accommodate draughts around 15 metres, allowing ships with a capacity of about 12,000 TEU. Even larger capacity container ships generate their capacity by lengthening rather than widening the ship, but this requires longer berths. For instance, a 16,000 TEU ship of the Marco Polo class is about 25 per cent longer than a ship of about 9,000 TEU.

The gradual shift to larger, longer container ships, although reducing the sea freight cost per container does require complementary investment at landing and loading ports to accommodate the greater dimensions of these ships. This means

that at shallower Australian ports or at ports with restricted sizes of berths, additional investments in channel dredging or berth lengthening will be required. In some cases, larger container vessels have a draught less than 15 metres but are wider, close to 60 metres. This substantially improves their buoyancy but requires container cranes to be larger, capable of reaching across the 23 container-width of the vessel. The main limitation for draught is the Suez Canal that can only accommodate vessels with a 17 metre draught. Hence, in summary, to make more Australian ports feasible and attractive destinations for larger container ships will require additional infrastructure investments and maintenance expenditure on channel dredging. Gathering environmental approval for dredging is not a simple, nor inexpensive process as protection of marine environments receives heightened interest from a wider range of interest groups.

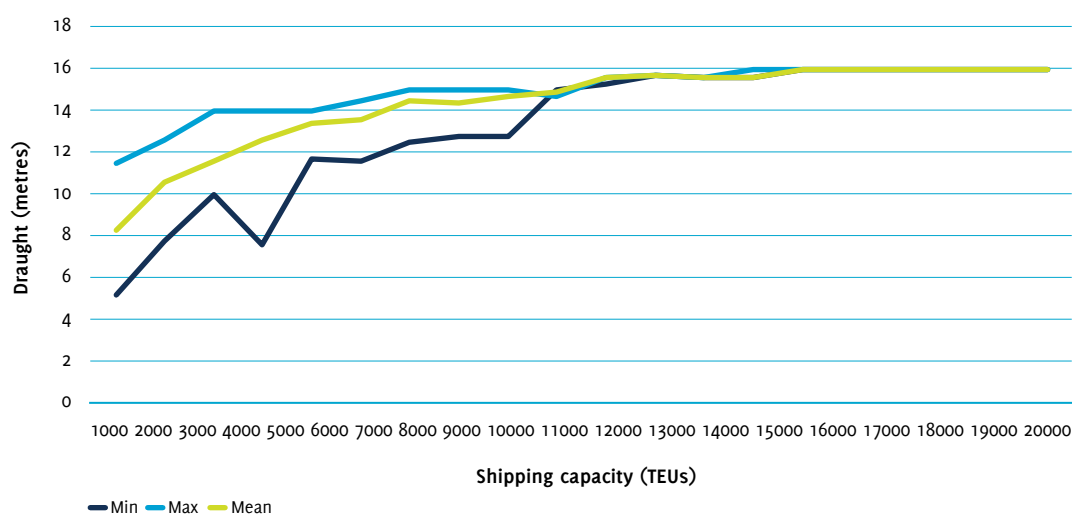


Figure 53. The relationship between container ship size and draught

## Competitor performance

Australian ports are not the only source of grain and grain products for international customers. Take the example of the Port of Prince Rupert on north-west coast of Canada. This port housed Canada's first dedicated ship-to-rail container terminal, Fairview Container Terminal (Figure 54). It is a dedicated intermodal facility, purpose-built to be a high-velocity gateway for transpacific container trade. Operated by DP World, the terminal provides shippers with a significant advantage over alternative gateways. The port handled 1.2 million TEU in 2019, and by 2022, following an expansion in its facilities, the port terminal will have an annual operational capacity of 1.8 million TEU.

The terminal features two marine berths capable of accommodating the largest container ships with direct and unimpeded access to international shipping lanes. On-dock rail adjacent to the berth provides efficient intermodal operations to build trains up to 3,660 metres.

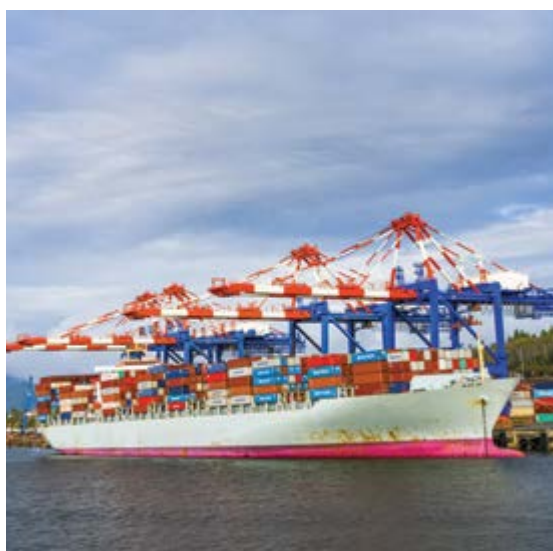


Figure 54. Fairview container terminal at the Port of Prince Rupert, Canada

Integrated scheduling and real-time communications between the shipping line, DP World, and Canadian National Rail result in unparalleled terminal velocity and efficient transfer of containers between vessels and trains. The Port of Prince Rupert serves as an outlet for containerised grain produced in the Canadian prairies. The Fairview Terminal expansion is due for completion in 2022. About a third of all container exports from the terminal are grains, oilseeds, and pelletised feed. Another 30 per cent are lumber exports.

A complementary investment is being undertaken by the Prince Rupert Port Authority to install shore power capacity at the terminal, so that docked vessels use hydroelectric power while their cargo is loaded and unloaded, reducing their carbon emissions. This shore power project is part of the Prince Rupert Port Authority's carbon reduction strategy to reduce the port's greenhouse gas intensity by 30 percent from 2018 levels by the year 2030 and reach net-zero carbon emissions by 2050.

Importantly, the World Bank and IHS Markit compared in-port time performance of 351 container ports across the world and found that 4 of the 5 Australian major container ports were in the worst-performing 15 per cent of ports (Table 15). The poorly ranked container ports were Melbourne, Sydney, Adelaide and Fremantle. Only Brisbane had a higher ranking than these four poorly performing container ports, yet for Brisbane, still around 70 per cent of all global ports outperformed it. The internationally poor rankings of Australia's key container ports indicates that many of Australia's key grain export competitors benefit from their more efficient and effective port operations. Given that port logistics costs are a key component of the overall cost of landed containerised grain and fodder, it follows that inefficiencies and inadequate service competition at container ports reduces the market share for Australian containerised grain and fodder.

Table 15. Australian container ports' international rankings (as percentages where 1% = worst; 100% = best)

Port	Administrative comparison (%)	Statistical comparison (%)
Brisbane	33	30
Melbourne	11	14
Fremantle	9	7
Sydney	7	4
Adelaide	5	3

Source: ACCC (2021).

## Urban encroachment

Ports are long-lived spatial assets. Understandably often cities develop adjacent to ports. Initially this proximity delivers lower freight costs and the convenience of ready access to imports and infrastructure for exports. However, as city populations grow in size and wealth, and as population housing density increases then waterfront land becomes increasingly valuable and access to ports often becomes more congested and subject to urban encroachment. Many Australian capital city ports are becoming more boxed in, with urban encroachment and erosion of buffer zones lessening the ease of access to port facilities. Traffic congestion and traffic noise become increasingly important issues for urban communities whose complaining actions often lead to erosion of the ease of access to port facilities. Maintenance of buffer zones becomes the casualty of development forces energised by the increasing worth of coastal and city real estate.

The need to acquire and preserve separate rail corridors for passenger and freight transport is an increasing need as growth in urban populations and density occurs in Australia's major cities. Failing to acquire and protect land for corridors only adds to future costs and problems of congestion and inefficiency. The NSW State Infrastructure Strategy 2022–2042 (NSW Infrastructure, 2022) indicates that investments to create and protect freight buffer zones are an immediate priority.

Yet ports are often geographically rare locations with unique characteristics that need to be preserved if the full value of their temporal stream of economic benefits is to be extracted. As locations, often with natural endowments, they and their access corridors require strategic

oversight and management. Who should own and operate a port asset is an inadequate question. Rather the more important concern is the ownership and operation of port facilities and their accompanying access corridors. Failure to protect and provide the strategically important freight corridors to ports only weakens and jeopardizes the economic performance of container ports.

Rail access to ports is especially important due to the rail mode being a low emission (Deloitte, 2017; IEA, 2019; Figure 55) and low cost service for transporting large volumes of grain and fodder over long distances. The NSW, WA and Vic governments both subsidise rail access to their respective container ports. Most recently, the Vic government announced in its 2022–23 budget a rail subsidy called the Mode Shift Incentive Scheme.

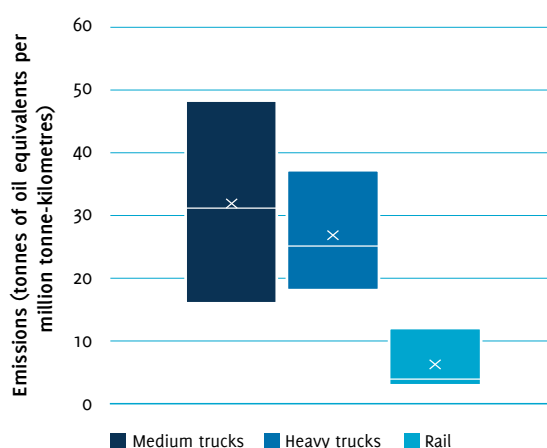


Figure 55. Emissions from various land transport modes

Source: Adapted from IEA (2019).

## Opaqueness in supply chains

In reviewing vulnerable supply chains in Australia, the Productivity Commission (2021) stated that “Supply chains can be long, complex, and opaque, and data can be difficult to obtain.” (p. 7). The Productivity Commissions identified one potentially useful role of government in aiding the management of risks in supply chains. That role was the provision of information and expertise in risk identification. Already the ACCC has a role as a regulator of some port operations and in that role collects critical information, which if appropriately shared, can help identify risks and issues in that key part of grain supply chains. The value to the government and users of grain supply chains of accurate datasets is that they can be indicators of efficiency and can help de-risk investments that draw on or improve those supply chains.

The Productivity Commission also noted that governments could reduce the costs that firms might incur to understand their supply chain risks and quoted the example of governments who promoted the use of global data standards to facilitate the exchange of supply chain data between industry and governments. A key component of the National Freight and Supply Chain Strategy, as outlined by DITCRD (2019) was the need to better measure freight and supply chain performance to aid government and industry to improve freight productivity and help evaluate where infrastructure were required.

In the USA the Federal Maritime Commission has used its powers to force shipping companies that carry containers to provide a range of specific information related to vessel calls they have made to the United States since June 2021, including the number of loaded and empty containers carried on a ship’s return journey to Asia. Ocean carriers are now required to share information about the export services they offer American shippers. The Federal Maritime Commission has instituted a Maritime Transportation Data Initiative that commenced with industry meetings in December 2021 and will culminate in June 2022 with an industry-wide Data Summit.

The data initiative has three key objectives:

- Catalogue the status quo in maritime data elements, metrics, transmission and access;
- Identify key gaps in data definitions/ classification; and
- Develop recommendations for common data standards and access policies/ protocols.

The Commission’s activity is seemingly underpinned by the adage “you can’t manage what you can’t measure”. Collation of data sets and identification of data gaps allow the Commission to have greater oversight and provides clarity and understanding about what is underway in the shipping trade, including the containerised goods trade.

The same issue of opaqueness in containerised grain supply chains applies in Canada, despite its bulk grain supply train being subject, under statute, to regular monitoring. A bulk grain monitoring program is commercially managed by Quorum Corporation and supply chain participants are required to provide data that reveals the nature and efficiency of their services. However, although Canadian railways collegiately reveal their inland containerised grain movements, the rail companies do not always know the grain cargoes, as shippers are only required to divulge that information if it is a hazardous material. Another reporting problem is that around 70 per cent of grain that ends up in containers first arrives at Canadian ports in rail wagons. At port that grain is packed into containers. Those container packers however are not licensed by the Canadian Grains Commission and so are not required to report their grain handling data. Moreover, these entities are not keen to reveal their data to their competitors for fear it may reveal how well or poorly their businesses may be performing.

The NSW government acknowledged opacity in supply chains and inadequacy of access to data, and so created a freight data hub (see <https://opendata.transport.nsw.gov.au/dataset/freight-data>). Its purpose is to collate data from multiple sources to support evidence-driven decisions by key stakeholders. Access to the datasets enables charts to be generated, such as Figure 56 that reveals how over the period 2016 to 2022, both the container turnaround times and the stevedore service level worsened until September 2020 and then have plateaued, showing no improvement.

Opacity in containerised grain supply chains can act as a barrier to entry and can raise risk premia in transactions. Greater transparency can facilitate commercial exchanges and more greatly reward training and educational services needed by newcomers keen to engage in the trade of bulk or containerised grain. An initial review of the processes and many entities that form containerised grain supply chains (McKay, 2022) reveals that exporting grain or fodder in containers is not a simple task. The myriad of tasks, the many risks, the many entities, special terms and acronyms encountered when engaging in the export of containerised grain, fodder or seeds reveal that the venture is complicated. To be successful and avoid the many potential pitfalls associated with containerised exports requires due diligence, competence, adherence to the detail of

processes and for newcomers, reliance on advice and skills of those already engaged in and proficient in the export of containerised grain. Clearly, here is an opportunity for industry and government collaboration to collate information to lessen the opacity of containerised grain supply chains and then also invest in education or training for prospective participants in containerised grain export.

Although various organisations offer basic training and education for potential exporters, the many tasks and difficulties faced by exporting business are rarely addressed in sufficient detail. The view of several stakeholders engaged in containerised grain export was that there is no readily available source of independent, experienced information to assist prospective entrants to the export of containerised grain, GTA (2018) being an exception. The experience of various participants interviewed during the preparation of this report revealed that when exporting via containerisation “There’s many a slip twixt the cup and the lips!”.

A more detailed review of the policies, regulations and industry structures that underpin containerised grain supply chains in Australia would likely reveal many specific opportunities for improvement. One overdue national investigation is to assess the economic and environmental benefits of a consistent national approach to modal pricing of transport services, especially road versus rail.

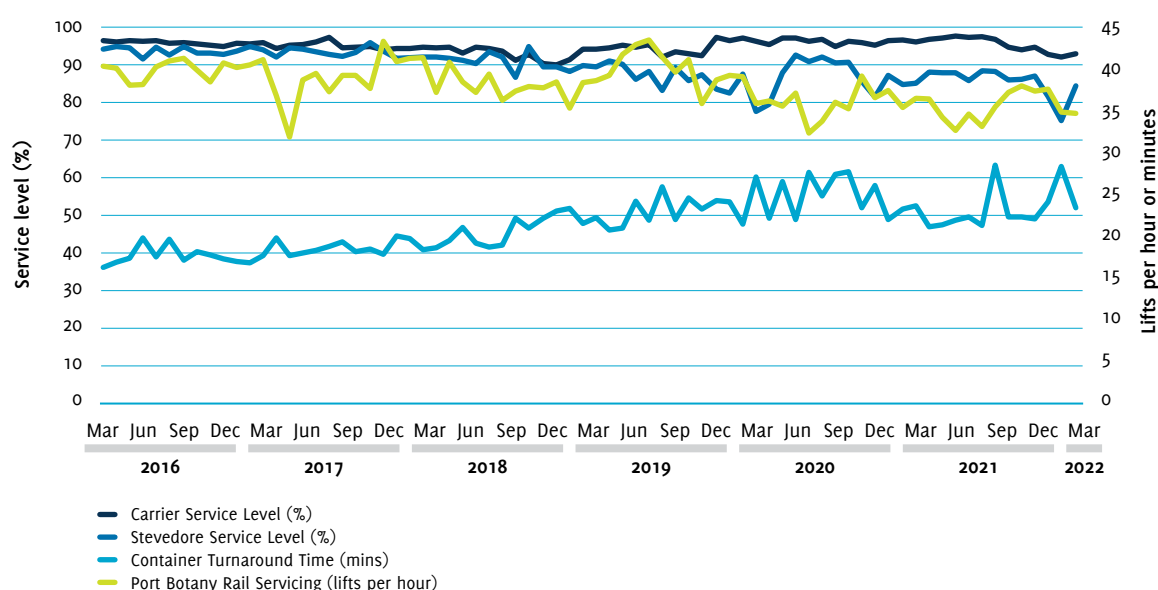


Figure 56. Performance metrics for the Port of Botany: 2016 to 2022

Source: Based on data from the NSW Transport Open Data Hub.

## Market diversification

A role of government identified by the Productivity Commission, regarding supply chains, is to help enlarge Australia's market diversification. Already the Australian Government provides financial support to firms through Export Market Development Grants. The Export Market Development Grants program reimburses eligible Australian exporters for part of their costs of promoting, developing and expanding their presence in overseas markets. In addition, in December 2020, the Australian Government announced a \$42.9 million Agribusiness Expansion Initiative:

*... to scale up support to over 2000 agri food exporters each year through Austrade's existing services. Austrade will also work with industry bodies to deliver targeted advice and trade missions (where possible) to help exporters expand and diversify in existing and new markets. (Austrade, sub. 46, p. 3)*

Containerisation is often the initial pathway for market testing and market expansion.

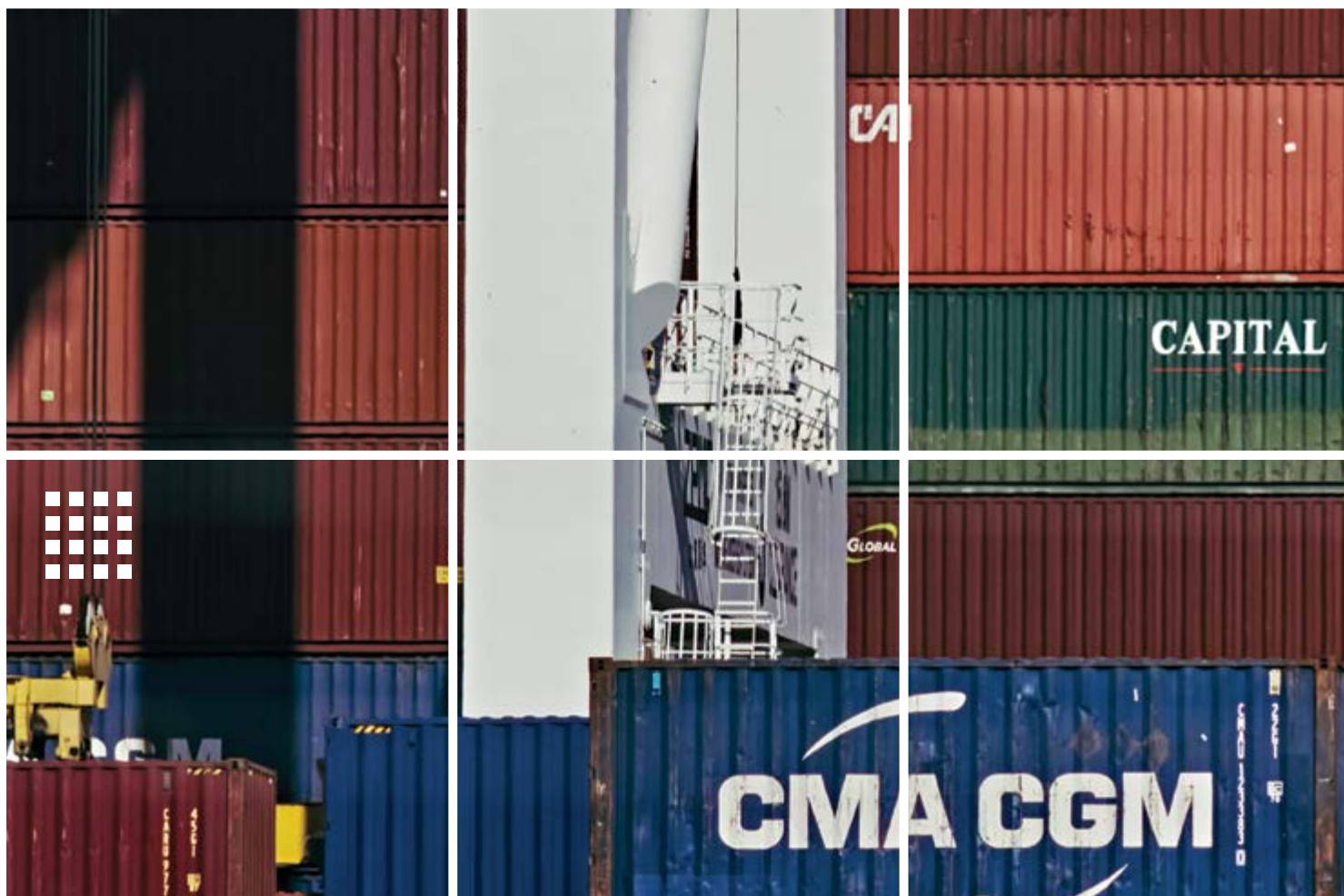
A further role for government is to create a regulatory and policy environment that avoids unnecessary impediments to domestic and international trade. Open trading environments allow businesses to more effectively respond to operating uncertainties or unanticipated risks in their supply chains, and to adapt their production or supply chains in response to a major disruption at a lower cost. Actively supporting and advocating for a rules-based global trading system is a key role for government in a country like Australia that is trade-exposed.

As noted by the Productivity Commission, sometimes government regulation is a useful and required intervention in order to support competition. Regulation should be:

- outcomes focused and not unduly prescriptive.
- integrated and consistent with other laws, agreements, and international obligations.
- enforceable and embody the minimum incentives needed for effective compliance.

A further role for government to enhance market diversification through provision of pre-competitive information and analysis. The public good nature of information (non-rivalrous and non-excludable) can mean it is best supplied through government action, drawing on or sometimes requiring industry collaboration. Such information and analysis can facilitate investment and risk management decisions by industry, leading to market developments and greater market diversification from which the entire economy can benefit.





# Stakeholders' views of container supply chain issues and solutions

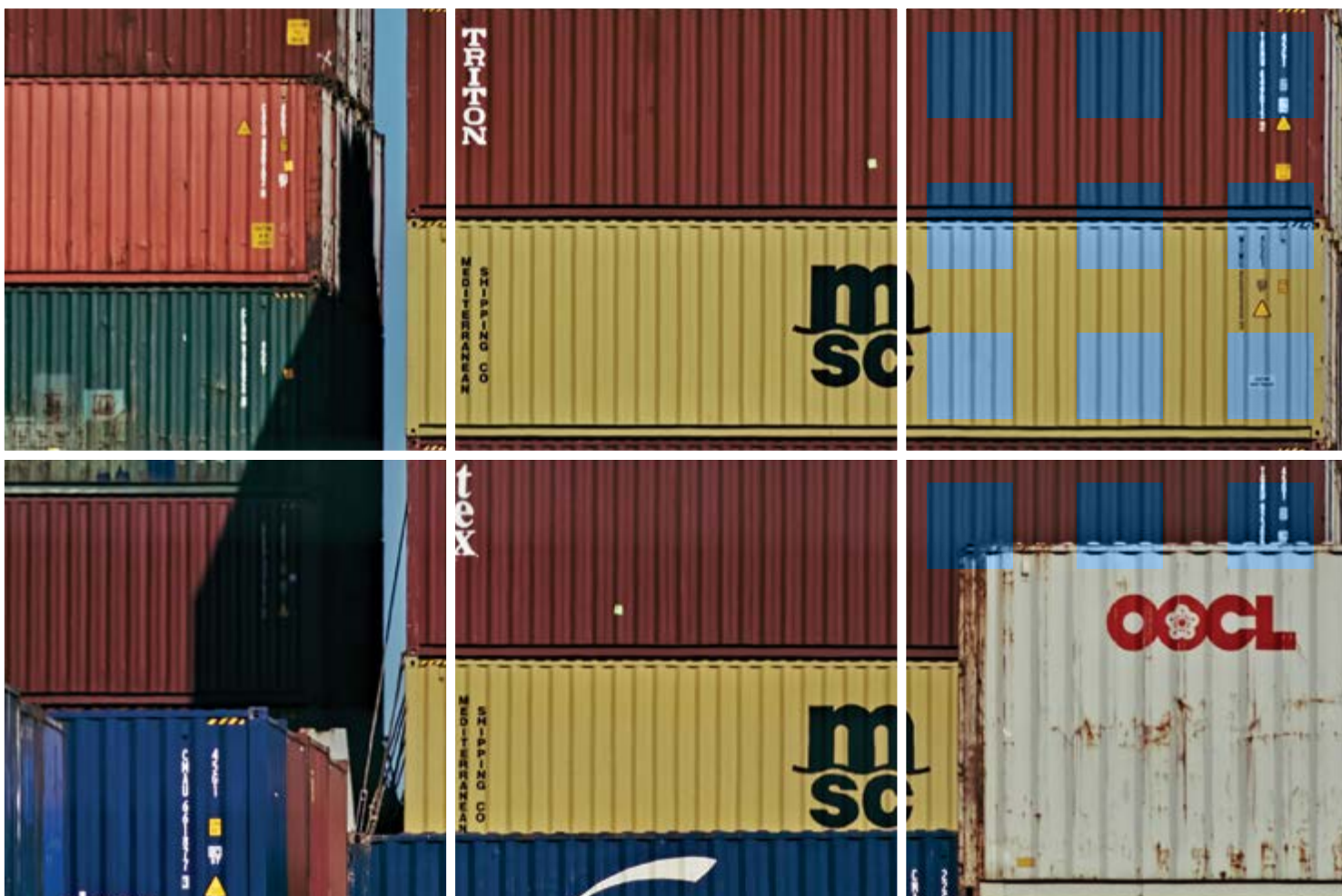
## Background

The previous section listed several issues affecting trade in containerised products, including grain and fodder. However, it is important to ascertain which of these issues most affects that trade yet are amenable to alteration by Australian action. To aid that prioritisation task grain and fodder container packing businesses were surveyed in February and March 2022.

The issues presented in the survey were identified by the project team after consultation with industry stakeholders as a short-list of possible key issues. Survey respondents were asked to rank the relative importance of these issues and to rate the effectiveness of government regulation, research reports and other mechanisms for achieving reform of Australian supply chains. The survey questions are detailed in [Appendix 5](#).

## Respondents

Via internet searches and industry contacts, a list of grain and fodder container packing and export businesses operating in Australia was compiled. We used this list to contact 85 business operators in early February 2022 and requested their participation in the survey. In response to this initial contact, 29 people either partially or wholly completed the survey. To gain more respondents, the survey was also sent to about 20 stakeholders via Darren White from the Australian Fodder Exporters Association in late February. As a result, a further 3 people completed the survey, giving a total of 32 people who partially or wholly completed the survey by the time of the completion deadline in mid-March.



Most people responding to the survey indicated that their business was exporting more than 500 TEU per annum with Cost and Freight (CFR) contracts being used by half of them (Figure 57). Direct to Container Terminal (DCT) contracts were also used as the main selling method by about 25 per cent of the respondents (Figure 58).

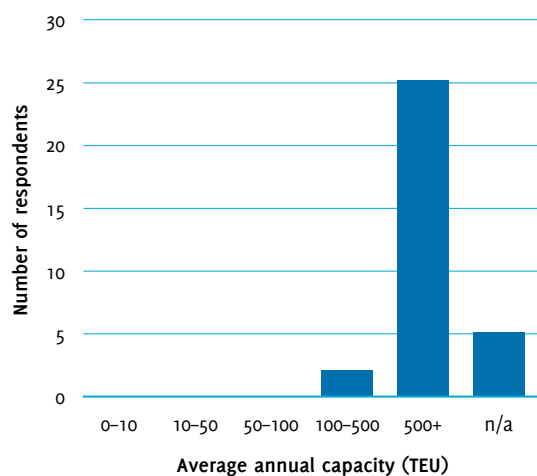


Figure 57. Three-year average container export volume of businesses operated by the survey respondents

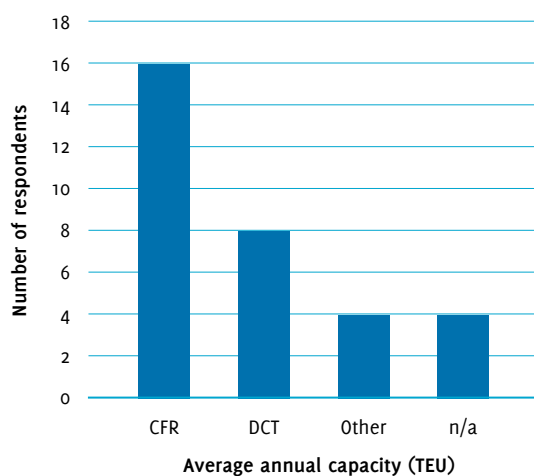


Figure 58. Main selling method used by businesses operated by survey respondents

## Main issues facing businesses exporting containerised grain

During the second half of 2021 our project team convened 14 formal meetings with industry stakeholders to identify the main issues affecting the containerised grain industry. Farmers, owners and operators of container packing businesses, industry representatives, port operators and government departments were consulted during this process. The project team then summarised the main issues into 15 statements – one statement for each issue. Survey respondents were asked whether they wholly agreed, partially agreed or did not agree with each statement. [Appendix 2](#) lists the full statements as they appeared in the survey. We have used an abbreviated form of the statements when presenting graphical results.

Three statements received a high level of agreement ([Figure 59](#)). Issues relating to landside port charges increasing at short notice received the highest number of agreement responses (26 in total). Only two people disagreed with this statement. Issues relating to the poor availability of 20ft containers and the limitations of ACCC powers with respect to shipping lines received a high level of agreement and some partial agreement but no disagreement.

More people disagreed than agreed with only one statement. This was relating to insufficient investment to maintain international markets. For all other statements more people agreed than disagreed with each statement, however as shown in [Figure 60](#), eight of the 15 statements received more people partially agreeing with the statements than wholly agreeing.

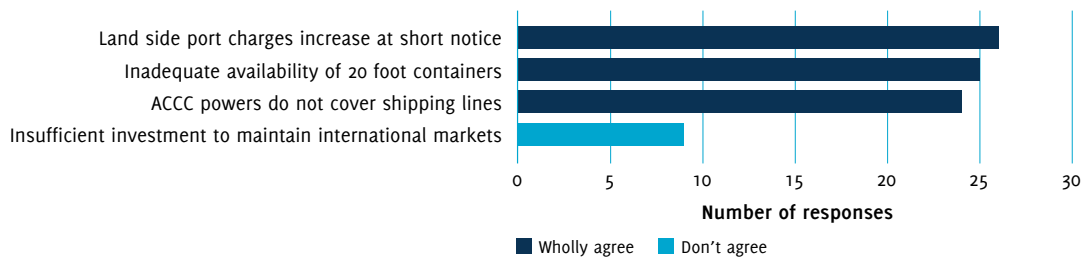


Figure 59. Statements about supply chain issues that received the highest level of agreement or disagreement from survey respondents

Note: See [Appendix 2](#) for the full statements of issues

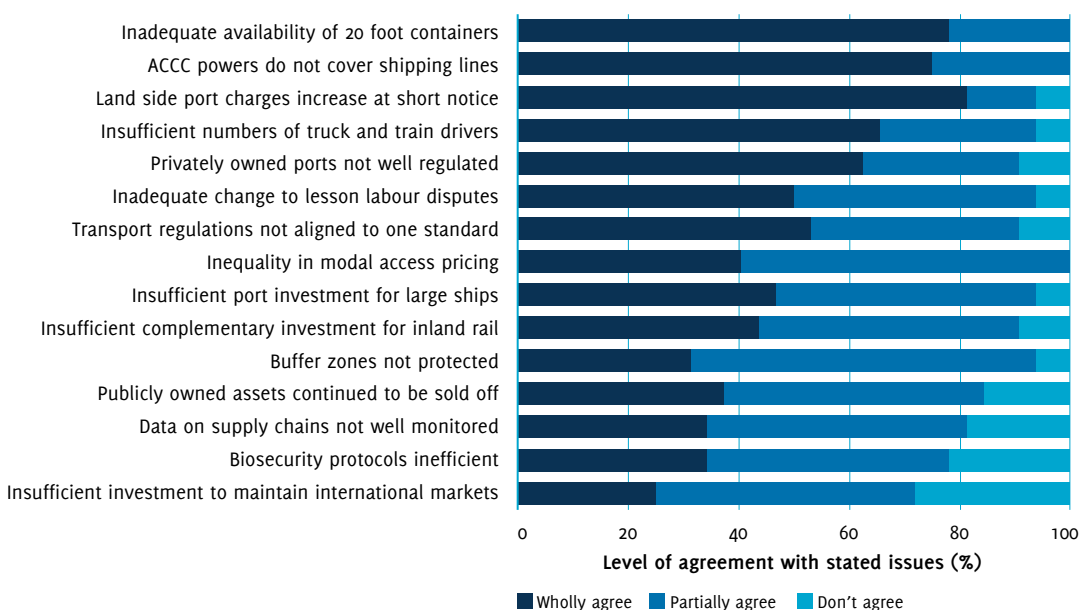


Figure 60. Number of people wholly agreeing, partially agreeing, or disagreeing with statements on issues affecting containerised grain supply chains

Note: See [Appendix 2](#) for the full statements of issues

## Relative importance of supply chain issues

To gain an understanding of the likely impact of each issue to the respondents' businesses we asked them to select the five issues of most importance to their business. The five issues selected were placed by the respondents in order of importance and we calculated an index to determine the relative importance of the issues to all respondents (see [Appendix 4](#) for details).

The five issues that received the most agreement by respondents (see [Figure 60](#)) were also the issues that had the greatest impact on the respondents' businesses ([Figure 61](#)).

However, the order in which the top five issues appeared changed slightly. For example, the issue relating to privately owned ports being poorly regulated received the fifth highest overall agreement score, but its level of importance to businesses was rated as having the third most important impact.

The greatest change in the order of agreement with issues and their impact on businesses came with those falling in the lower half of the agreement range (see [Figure 62](#)). Issues relating to insufficient investment to maintain international markets received the lowest level of agreement but were rated in the top half of the business impact range.

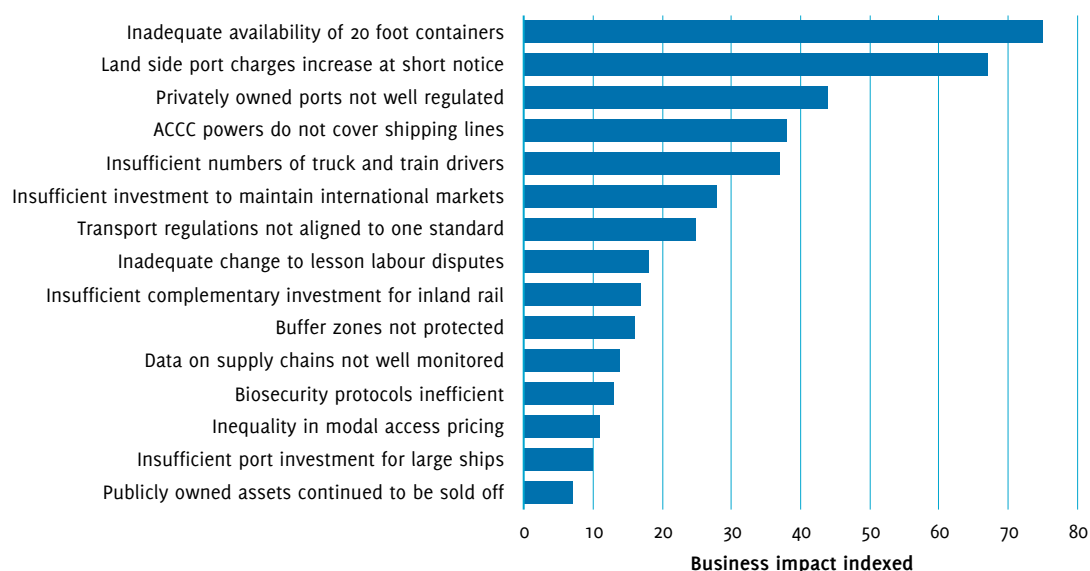


Figure 61. Relative importance of containerised grain to the respondent's business

Note: See [Appendix 2](#) for the full statements of issues

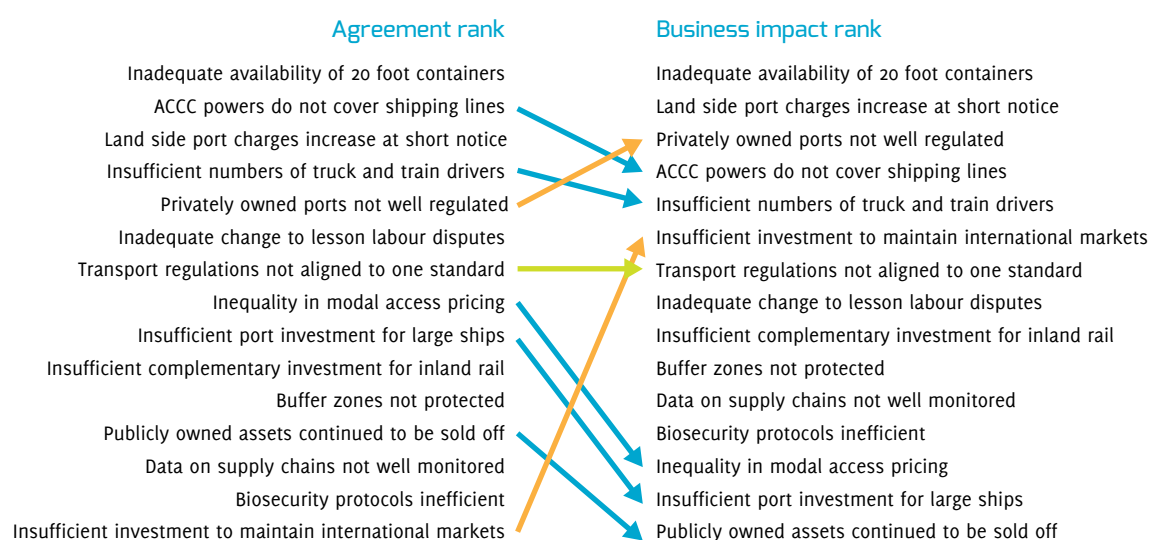


Figure 62. The rankings of respondents' agreements with issue statements compared with their rankings of the business impacts of these issues

Note: See Appendix 2 for the full statements of issues

## Effect of supply chain issues on businesses

Issues affecting containerised supply chains described above are likely to have a range of impacts on businesses. To determine the relative importance of these effects we asked respondents to rank, in order of severity, how their business was impacted for the top five issues they identified. The following categories were provided:

- Increased costs mostly borne by the business.
- Less flexibility to change the volume of container shipments at short notice.
- Increased costs mostly passed on to customers.
- Required switching to a different service provider (e.g. shipping line or transport operator) to manage costs.
- Reduced reliance on container shipments within the business.
- No direct effect on costs.

A business effects index was calculated with results expressed as a proportionate score for each of the six categories (see Appendix 5 for more details).

Unsurprisingly, of all the issues considered, the option of *increased costs mostly borne by the business* was rated consistently higher than other options, while *no direct effect on costs* was rated as a minor effect overall (see Figure 63).

The direct effect on costs however was not dominant for all issues. Most issues had a range of impacts (see Table 16). The issue of publicly owned assets continuing to be sold off was rated as having the least effect on costs. Interestingly also, the two transport related issues were rated as having the highest impact that required switching to a different service provider.

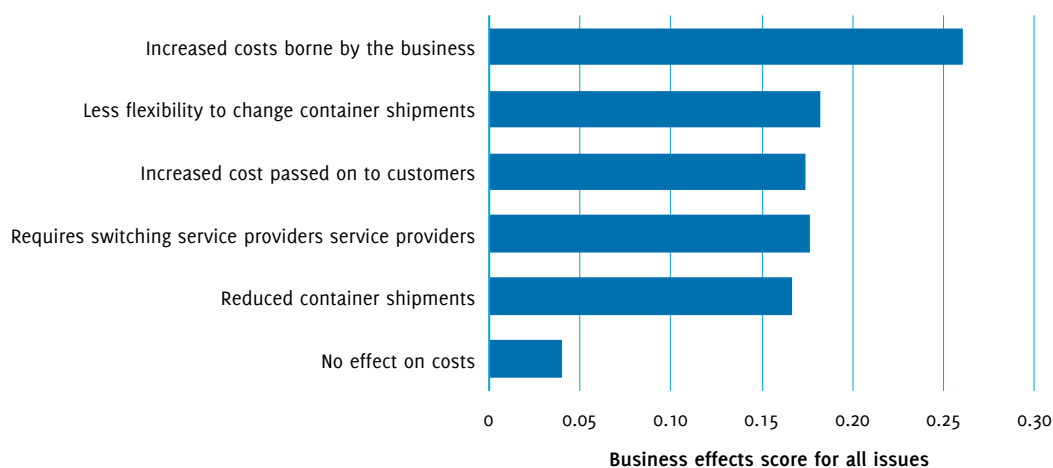


Figure 63. The relative impact of supply chain issues on businesses in six areas. Ratings are averaged across all issues

Note: See Appendix 6 for details

Table 16. The main areas where supply chain issues tend to impact respondents' businesses

Dominant effect on cost	
Issues where <i>"Increased costs borne by the business"</i> received an impact score more than 8 points higher than the next highest impact.	<ul style="list-style-type: none"> <li>• Inequality in modal access pricing.</li> <li>• Biosecurity protocols inefficient.</li> <li>• Inadequate change to lesson labour disputes.</li> <li>• Land side port charges increase at short notice.</li> <li>• ACCC powers do not cover shipping lines.</li> <li>• Insufficient numbers of truck and train drivers.</li> </ul>
Least effect on cost	
Issues where <i>"No direct effect on cost"</i> received a higher impact score than <i>"Increased costs borne by the business"</i> .	<ul style="list-style-type: none"> <li>• Publicly owned assets continued to be sold off.</li> </ul>
Highest effect on switching service providers	
Issues where <i>"Requires switching service providers service providers"</i> received the highest impact score.	<ul style="list-style-type: none"> <li>• Transport regulations not aligned to one standard.</li> <li>• Insufficient complementary investment for inland rail.</li> </ul>
Broad effect on businesses	
Issues where the impact score was reasonably well distributed across all impact areas.	<ul style="list-style-type: none"> <li>• Insufficient port investment for large ships.</li> <li>• Data on supply chains not well monitored.</li> <li>• Buffer zones not protected.</li> <li>• Insufficient investment to maintain international markets.</li> <li>• Privately owned ports not well regulated.</li> <li>• Inadequate availability of 20ft containers.</li> </ul>

Note: See Appendix 2 for the full statements of issues



## Mechanisms to achieve change

Respondents were asked to rate the effectiveness of six potential mechanisms for obtaining meaningful reform in containerised supply chains (Figure 64). The six options (see Appendix 6 for more detail) presented to respondents were:

- **Reports** — Research reports describing issues and recommending actions
- **Lobbying** — Representative organisations prioritising issues and lobbying for change
- **Self-regulation** — Industry developing self-regulation and standards
- **Government Regulation** — Government imposing new laws and regulation
- **Monitoring** — Regular monitoring of prices and logistics to inform government and industry (e.g. by the ACCC)
- **Ad-hoc government enquiry** (e.g. Productivity Commission enquiry)

Twenty-five people responded to this question about six potential mechanisms for obtaining meaningful reform in containerised supply chains and were asked if the mechanism:

- was not at all effective;
- had some effect;
- had a reasonable effect;
- was most effective.

Government regulation was rated by most people (9 out of 25, or 36 per cent) as the most effective mechanism to achieve reform. Monitoring was the next most frequently rated option (5 respondents or 35 per cent). Self-regulation and ad-hoc enquiry were the most frequently rated options (20 per cent each) perceived as being not at all effective. Slightly more than half of all respondents considered reports, lobbying and ad-hoc enquiries as only having some effect in achieving reform. When converted to an effectiveness index, government regulation was the most effective mechanism to achieve reform while reports were considered the least effective.

When asked to rate the effectiveness of the different mechanisms for achieving reform for issues of most importance to their business, respondents continued to consider government regulation as the most effective mechanism. For only three issues was government regulation not rated the most effective. These issues were:

- **Data on supply chains being not well monitored.** Respondents considered reports and monitoring to be equally effective as government regulation.
- **Inadequate change to lesson labour disputes.** Respondents regarded self-regulation, monitoring and ad-hoc enquiry as being equally effective as government regulation.
- **Inequality in modal access pricing.** Respondents regarded reports and lobbying as being equally effective as government regulation.

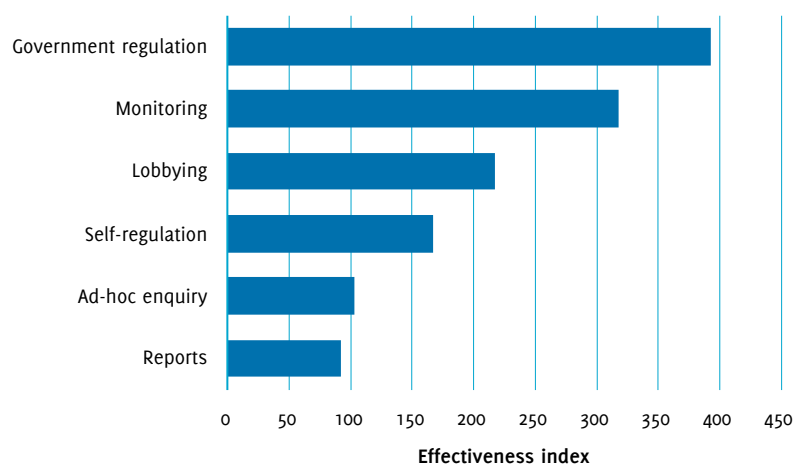


Figure 64. Relative effectiveness of a range of mechanisms aimed at achieving reform in containerised supply chains

## Correlation between project and industry assessment

Prior to conducting the survey, the project team independently assessed the 15 issues in terms of their impact on the industry and the feasibility of implementing reforms. From this assessment the team formed a group of prioritised recommendations consisting of issues that, in their assessment, had both a high impact and high feasibility of achieving reform (see Figure 65)

Agreement between the project team's recommendations and that obtained in the survey was relatively poor. Most of the project team's prioritised issues (issues falling above the line in Figure 65) were in the mid-range of issues as assessed by survey respondents (Table 17). Four out of the top five issues as assessed by the survey respondents fell below the frontier of prioritised recommendations as determined by the project team.

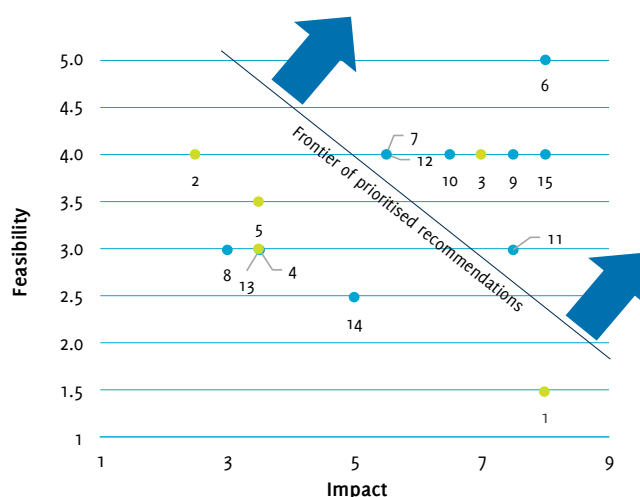


Figure 65. Issues rated by the project team as having an impact on containerised supply chains and the feasibility of achieving reform of the issues

Note: Issues they rated to have a high impact and high feasibility are displayed above the line. The numbers relate to the impact ranking determined by survey respondents with the top five issues coloured in green

Table 17. Issues subject to prioritised recommendations by the project team. Issues are listed in order of business impact (highest impact at the top) as rated by survey respondents

Ranking	Issue	Included within project teams prioritised issue
1	Inadequate availability of 20ft containers	
2	Land side port charges increase at short notice	
3	Privately owned ports not well regulated	yes
4	ACCC powers do not cover shipping lines	
5	Insufficient numbers of truck and train drivers	
6	Insufficient investment to maintain international markets	yes
7	Transport regulations not aligned to one standard	yes
8	Inadequate change to lesson labour disputes	
9	Insufficient complementary investment for Inland Rail	yes
10	Buffer zones not protected	yes
11	Data on supply chains not well monitored	yes
12	Biosecurity protocols inefficient	yes
13	Inequality in modal access pricing	
14	Insufficient port investment for large ships	
15	Publicly owned assets continued to be sold off	

Part of the explanation for the observed differences in ratings is that the survey only targeted people involved in container packing who most likely focused on the impacts to their individual business when responding to questions, rather than the industry as a whole. The project team jointly focused on whole-of-industry impacts and the feasibility of achieving reform through the project's recommendations.

Two issues were rated very differently by respondents versus the project team. Firstly, the lack of 20ft containers was the top issue according to survey respondents and this was also assessed as having a high impact by the project team (issue number 1 in [Figure 65](#)). However, this issue did not make the project team's list of priorities because the feasibility of the project's activities having an impact on this issue was considered to be very low. In effect, availability of 20ft containers was assessed by the project team to be a global structural issue unlikely to be cost-effectively solved by any of the project team's recommendations.

In contrast, the issue of publicly owned assets continuing to be sold off (issue number 15 in [Figure 65](#) and [Table 17](#)) was rated as the least impactful issue by survey respondents, but, was included within the project team's list of prioritised issues. Survey respondents may or may not have considered this issue as important for the industry, yet interestingly considered it to have a low impact on their business.

These differences in perception of issues, while, understandable and explainable, are important considerations when framing overall recommendations. Additionally important are respondents' views regarding the perceived effectiveness of achieving reform through industry reports. Survey respondents considered that such reports, which are one of the main outputs from this project, are the least effective mechanism for achieving reform of issues of most importance to their business.

The survey results reveal that owners and operators of containerised grain and fodder businesses rate government regulation as the most effective mechanism to achieve beneficial reform. Of next importance is monitoring of the container supply chains. By contrast, self-regulation and ad-hoc enquires are rated to be the least effective mechanisms for beneficial reform of container supply chains.

Relatedly, in 2022 key grain grower organisations (e.g. Grain Producers Australia) have voiced concerns that there needs to be independent, expert analysis of grain supply chains and competition in the grain market (Heard, 2022). The call has been for an ACCC inquiry into the structure of the grains industry. In response, the deputy chair of the ACCC, Mick Keogh, has indicated that such an industry inquiry would be useful, allowing a close analysis of margins through the supply chain. However, he has also added that without statutory powers to gather the required information from industry players, such a review would not be particularly useful.

So here is a potential example of government failure where in the grains industry in general, but also in the particular case of the export of containerised grain and fodder, the owners and operators of containerised grain and fodder businesses consider government regulation as the most effective mechanism to achieve beneficial reform; yet a body like the ACCC that could best inform and evince that regulatory and monitoring power lacks the legislative teeth to gather the required information.

As stated by at the start of this report by Joseph Stiglitz (2021), a Nobel laureate in economics – “We must work to correct market failures and government failures. It is a never-ending struggle to create good institutions.” In short, governments need to do more than just commission reports that outline issues and opportunities affecting container supply chains. Governments need to ensure that grain supply chain businesses and service providers are subject to monitoring, scrutiny and regulation (where required) to ensure that the wider Australian economy and not just a handful of entities within those supply chains are beneficiaries of the operations of those supply chains.

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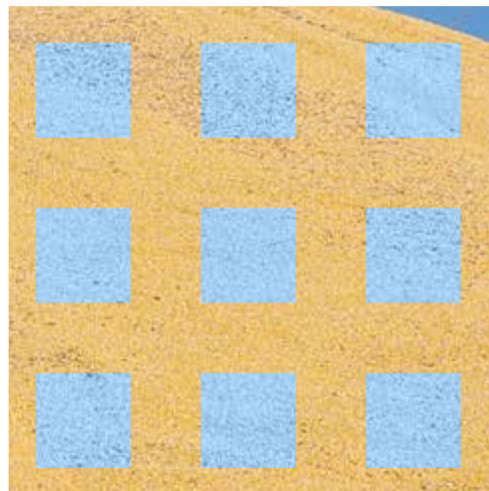
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**“Supply chains can  
be long, complex,  
and opaque, and  
data can be difficult  
to obtain.”**

Productivity Commission, 2021



# Appendices

## Appendix 1. How much grain or hay can be packed in a container?

How much grain or hay that can be packed in a container is an important economic consideration as it affects the per tonne costs of handling and transport of that containerised product. The amount of grain or hay loaded into a container depends on a few factors such as the type of container (20ft or 40ft), the bulk density of the product and road transport load weight limitations.

The typical bulk densities of various grains and hay are listed in [Table A1](#).

Table A1. Bulk densities of different grains

Grain type	Bulk density (kg/hl)
Lupins	78
Lucerne seed	76
Wheat	75
Mung beans	75
Chickpeas	74
Canola	67
Barley	65
Oats	50
Sunflower	40
Oaten hay	15

A typical 20ft container with a rating of 30 tonne, tare of 2.4 tonne and volume of 33m<sup>3</sup> (330 hectolitres) will be able to be fully loaded with any of the grains listed in [Table A1](#). However, a 40ft container is often only packed up to road transport load limits. For example, to load a 40ft container to a gross weight of 30 tonnes with a grain of bulk density 75 kg/hl (600kg/m<sup>3</sup>), given that the tare of the container is 4 tonnes and the internal floor area is 27.8 m<sup>2</sup>, the height to fill inside the container is 1.25 metres. Note, the internal height of a 40ft container is 2.39 metres so in this example the container would be around half full.

The exact formula for determining the packing of the 40ft container is:

$$\text{Height of grain inside the container} = \frac{[\text{Grain weight (gross allowable weight of the container-its tare weight) (tonnes)}]}{[\text{Floor area of container (m}^2\text{)} \times \text{Grain bulk density (kg/m}^3\text{)}]}$$

Applying this formula reveals that the lighter (i.e., the less dense) is a grain, the greater the volume of the 40ft container that can be packed. Oaten hay and grains like oats or sunflower can be more easily be fully packed into a 40ft container than dense grains like lupins or wheat.

## Appendix 2. Bulk Handlers' delivery routes

Table A2. Routes used to compare Viterra's freight charges across available years

Origin	Destination	Origin	Destination
Arno Bay	Port Lincoln	Lock	Port Lincoln
Booleroo Centre	Walleroo	Loxton	Outer Harbor
Bordertown	Outer Harbor	Pinnaroo	Outer Harbor
Buckleboo	Port Lincoln	Poochera	Thevenard
Darke Peak	Port Lincoln	Rudall	Port Lincoln
Elliston	Port Lincoln	Streaky Bay	Thevenard
Gladstone	Outer Harbor	Tailem Bend	Outer Harbor
Kapinnie	Port Lincoln	Warramboo	Port Lincoln
Keith	Outer Harbor	Wirrulla	Thevenard
Kimba	Port Lincoln	Witera	Thevenard
Lameroo	Outer Harbor	Wudinna	Port Lincoln

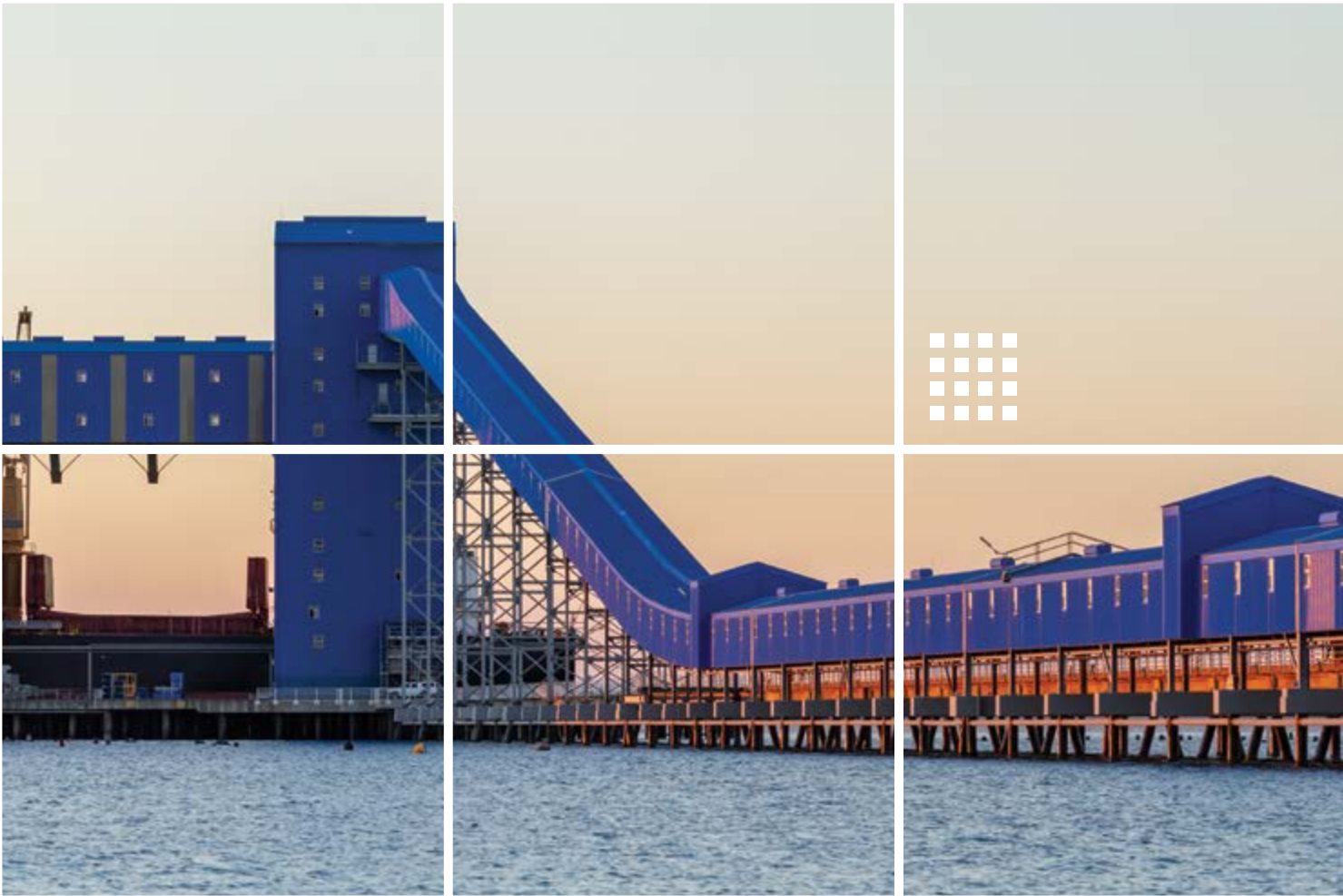




Table A3. Routes used to compare CBH freight charges across available years

Origin	Destination	Origin	Destination	Origin	Destination
Ainsworth	Kwinana	Gnowangerup	Albany	Mullewa	Geraldton
Aldersyde	Kwinana	Goodlands	Kwinana	Munglinup	Esperance
Ardath	Kwinana	Goomalling	Kwinana	Narembeen	Kwinana
Arrino	Geraldton	Hyden	Albany	Narrogen	Kwinana
Avon	Kwinana	Jacup	Albany	Nembudding	Kwinana
Ballidu	Kwinana	Jennacubbine	Kwinana	Newdegate	Albany
Beacon	Kwinana	Jerramungup	Albany	Nomans Lake	Kwinana
Beaumont	Esperance	Jubuk	Kwinana	Nungarin	Kwinana
Bencubbin	Kwinana	Kalannie	Kwinana	Nyabing	Albany
Bokal	Albany	Karlgarin	Albany	Ongerup	Albany
Bolgart	Kwinana	Katanning	Albany	Perenjori	Geraldton
Borden	Albany	Kellerberrin	Kwinana	Piawaning	Kwinana
Boyup Brook	Albany	Kirwan	Kwinana	Pingrup	Albany
Brookton	Kwinana	Kodj Kodjin	Kwinana	Pithara	Kwinana
Broomehill	Albany	Kojonup	Albany	Quairading	Kwinana
Bruce Rock	Kwinana	Kondinin	Kwinana	Ravensthorpe	Esperance
Bullaring	Kwinana	Konnongorring	Kwinana	Regans Ford	Kwinana
Bulyee	Kwinana	Koorda	Kwinana	Salmon Gums	Esperance
Bunjil	Geraldton	Korbelka	Kwinana	Shackleton	Kwinana
Cadoux	Kwinana	Kukerin	Albany	Three Springs	Geraldton
Calingiri	Kwinana	Kulin	Kwinana	Trayning	Kwinana
Canna	Geraldton	Lake Grace	Albany	Wagin	Albany
Carnamah	Geraldton	Lake King	Esperance	Watercarrin	Kwinana
Cascades	Esperance	Lake Varley	Esperance	Watheroo	Kwinana
Cleary	Kwinana	Latham	Geraldton	Wellstead	Albany
Coorow	Geraldton	Manmanning	Kwinana	West River	Esperance
Corrigin	Kwinana	Marchagee	Geraldton	Wickepin	Kwinana
Cunderdin	Kwinana	Mawson	Kwinana	Wilgoyne	Kwinana
Dale	Kwinana	Mclevie	Kwinana	Woodanilling	Albany
Darkan	Albany	Meckering	Kwinana	Wubin	Kwinana
Doodlakine	Kwinana	Merredin	Kwinana	Wyalkatchem	Kwinana
Dowerin	Kwinana	Miling	Kwinana	Yarding	Kwinana
Dudinin	Kwinana	Mindarabin	Albany	Yealering	Kwinana
Dumbleyung	Albany	Mingenew	Geraldton	Yerecoin	Kwinana
Ejanding	Kwinana	Mogumber	Kwinana	York	Kwinana
Gabbin	Kwinana	Moora	Kwinana	Yorkrakine	Kwinana
Gairdner	Albany	Morawa	Geraldton		

## Appendix 3. Information sources for the bulk supply chain analysis

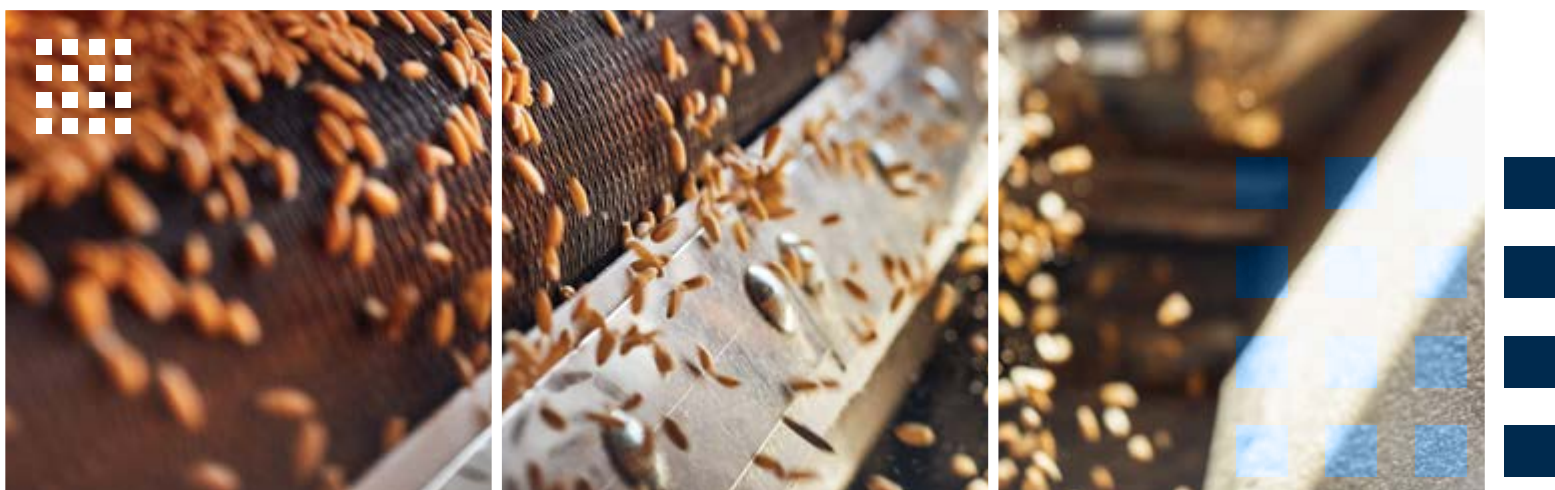
Table A4. References to data sets and documents considered in the supply chain analysis

Supply chain segment	Historical Data	Data for 2021	Data for 2022
Freight	Stretch <i>et al.</i> 2014 White <i>et al.</i> , 2018	<ul style="list-style-type: none"> <li>• CBH 2020c</li> <li>• Viterra 2020b</li> <li>• Viterra 2020c</li> <li>• Viterra 2020d</li> <li>• Viterra 2020e</li> <li>• GTA 2020a</li> <li>• GTA 2020b</li> <li>• GTA 2020c</li> </ul>	<ul style="list-style-type: none"> <li>• CBH 2021c</li> <li>• Viterra 2021b</li> <li>• GTA 2021a</li> <li>• GTA 2021b</li> <li>• GTA 2021c</li> </ul>
Receival sites	White <i>et al.</i> , 2018	<ul style="list-style-type: none"> <li>• GTA 2020a</li> <li>• GTA 2020b</li> <li>• GTA 2020c</li> <li>• GTA 2020d</li> <li>• GTA 2020e</li> </ul>	<ul style="list-style-type: none"> <li>• GTA 2021a</li> <li>• GTA 2021b</li> <li>• GTA 2021c</li> <li>• GTA 2021d</li> <li>• GTA 2021e</li> </ul>
Warehouse storage	Stretch <i>et al.</i> 2014 White <i>et al.</i> , 2018	<ul style="list-style-type: none"> <li>• CBH 2020a</li> <li>• Viterra 2020a</li> <li>• GrainFlow 2020a</li> <li>• GrainFlow 2020b</li> <li>• GrainCorp 2020a</li> <li>• Emerald 2020</li> </ul>	<ul style="list-style-type: none"> <li>• CBH 2021a</li> <li>• Viterra 2021a</li> <li>• GrainFlow 2021</li> <li>• GrainCorp 2021a</li> </ul>
Port loading	Stretch <i>et al.</i> 2014 White <i>et al.</i> , 2018	<ul style="list-style-type: none"> <li>• CBH 2020b</li> <li>• Viterra 2020a</li> <li>• Flinders Ports 2020</li> <li>• Emerald 2020</li> <li>• Port of Melbourne 2020</li> <li>• GrainCorp 2020b</li> <li>• Australian Amalgamated Terminals 2020</li> <li>• Quattro 2020</li> <li>• NAT 2020</li> <li>• NSW Ports 2020</li> </ul>	<ul style="list-style-type: none"> <li>• CBH 2021b</li> <li>• Viterra 2021a</li> <li>• Flinders Ports 2021</li> <li>• GrainCorp 2021b</li> <li>• Australian Amalgamated Terminals 2021</li> </ul>
Shipping	White <i>et al.</i> , 2018	<ul style="list-style-type: none"> <li>• Baltic Exchange 2021</li> <li>• Ship and Bunker 2021</li> </ul>	

## Appendix 4. Assumptions for estimating international sea freight rates on various routes

The shipping freights consider a speed of 14 knots consuming 32t of fuel oil per day. The routes considered were:

- P3A\_82 (Panamax Japan-S Korea Transpacific round voyage)
- P4\_82 (Panamax Japan-S Korea trip to Skaw Passero)
- P5\_82 (Panamax South China, Indonesian round voyage (BEP Asia))
- P6\_82 (Panamax Singapore round voyage via Atlantic)





## Appendix 5. Screen shots of questions used in the survey

What is your average (3 yr average) container export volume in TEU?

☐ 0-10      ☐ 10-50      ☐ 50-100      ☐ 100-500      ☐ 500+      ☐ n/a

Do you sell mainly CFR or DCT?

☐ CFR  
☐ DCT  
☐ Other (Specify)   
☐ n/a

### Q1: Issues reducing the effectiveness of containerised supply chains.

Stakeholder consultation has identified 15 issues affecting containerised grain supply chains. Please indicate your level of agreement with these issues:

	Don't agree	Partially agree	Wholly agree
Publicly-owned container port assets and supply chain infrastructure continue to be sold-off.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Investments and technology change that lessen disruption to container supply chains from labour disputes are inadequate.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Land-side port charges are increased with short notice and are not regulated.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Many biosecurity protocols and processes are inefficient and are not cost-effective.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is insufficient number of heavy vehicle truck drivers and train drivers.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Container and bulk supply chain services are not well monitored so data is not available to support policy-making and investment decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is insufficient investment in port capability to accommodate larger container ships.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q2: Relative importance of containerised supply chain issues.

Please drag 5 issues from the left column into the right column, and place in order of importance to your business. These TOP 5 issues will be used within the questions later in the survey.

Items to Rank

- Ports are now mostly privately-owned acting in their own interest with little regulatory control (e.g., opening days, hours and pricing).
- Publicly-owned container port assets and supply chain infrastructure continue to be sold-off.
- Container and bulk supply chain services are not well monitored so data is not available to support policy-making and investment decisions.

Most important
Least important

#### Appendix 5. Screen shots of questions used in the survey (continued)

### Q3: Effect on your business.

In general, how has the following supply chain issue affected your business costs?

**Land-side port charges are increased with short notice and are not regulated.**

Items to Rank	Highest Impact
Increased costs mostly passed on to customers.	
Less flexibility to change the volume of container shipments at short notice.	
Required switching to a different service provider (e.g. shipping line or transport operator) to manage costs.	
No direct effect on costs.	
Increased costs mostly borne by the business.	
Reduced reliance on container shipments within the business.	
	Lowest Impact

Q4: Mechanisms to achieve change

In general, how effective are the following mechanisms in generating meaningful reforms in the supply chain?

Please rate the following

	Not at all	Some effect	Reasonable effect	Most effective
<b>Reports</b> — Research reports describing issues and recommending actions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Lobbying</b> — Representative organisations prioritising issues and lobbying for change	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Self-regulation</b> — Industry developing self-regulation and standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Govt. Regulation</b> — Government imposing new laws and regulation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Monitoring</b> — Regular monitoring of prices and logistics to inform government and industry (e.g. by the ACCC)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<b>Ad-hoc Enquiry</b> — Ad-hoc government enquiry (e.g. Productivity Commission enquiry)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q5: Best mechanisms to resolve issues

If there are any other issues or solutions that we haven't considered, please outline briefly in the text box below.

4

4 of Australia's top  
5 container ports  
are in the worst-  
performing 15 per cent  
of global ports





## Appendix 6. Statements of issues affecting containerised supply chains

Respondents were asked to consider 15 statements on issues affecting containerised grain supply chains. The full statements presented to respondents are listed in [Table A5](#).

Table A5. Issues as stated to survey participants and the abbreviated form used to present data in this report

Issue as presented in the survey	Restated issue for ease of presentation in this report
Ports are now mostly privately-owned acting in their own interest with little regulatory control (e.g., opening days, hours and pricing).	Privately owned ports not well regulated
Publicly-owned container port assets and supply chain infrastructure continue to be sold-off.	Publicly owned assets continued to be sold off
Container and bulk supply chain services are not well monitored so data is not available to support policy-making and investment decisions.	Data on supply chains not well monitored
Many biosecurity protocols and processes are inefficient and are not cost-effective.	Biosecurity protocols inefficient
There is insufficient complementary investment to inland rail to support cost-effective movement of containerised grain and fodder	Insufficient complementary investment for inland rail
There are insufficient resources committed to maintaining and enlarging international market access for Australian grains and fodder.	Insufficient investment to maintain international markets
Buffer zones for least-cost grain pathways are not actively protected.	Buffer zones not protected
Heavy road transport regulations are not well aligned to enable one national standard.	Transport regulations not aligned to one standard
Land-side port charges are increased with short notice and are not regulated.	Land side port charges increase at short notice
Investments and technology change that lessen disruption to container supply chains from labour disputes are inadequate.	Inadequate change to lesson labour disputes
There is inadequate availability of 20 foot food-grade containers.	Inadequate availability of 20 foot containers
There is an insufficient number of heavy vehicle truck drivers and train drivers.	Insufficient numbers of truck and train drivers
There is insufficient investment in port capability to accommodate larger container ships.	Insufficient port investment for large ships
The powers of the ACCC to enhance competition, do not cover shipping lines.	ACCC powers do not cover shipping lines
Equality in modal access pricing (i.e., rail v road) is not being maintained (e.g. inclusion of congestion impacts, emissions and accident risk)	Inequality in modal access pricing

## Appendix 7. Agreement Score

An agreement score to estimate the overall level of agreement with the statements listed in [Table A5](#) was calculated by weighting the number of times participants either disagreed, partially agreed or wholly agreed with a statement, then multiplying that count by either 1, 2 or 3 respectively. For example the agreement score of 63 for the issues “Insufficient investment to maintain international markets” (first issue listed in [Table A6](#)) was calculated as  $(9 \times 1) + (15 \times 2) + (8 \times 3) = 63$

Table A6. Number of times respondents either did not agree, partially agreed or wholly agreed with the issues stated as affecting containerised grain supply chains and the calculated agreement score

Issue	Don't agree count	Partially agree count	Wholly agree count	Agreement score
Insufficient investment to maintain international markets	9	15	8	63
Biosecurity protocols inefficient	7	14	11	68
Data on supply chains not well monitored	6	15	11	69
Publicly owned assets continued to be sold off	5	15	12	71
Buffer zones not protected	2	20	10	72
Insufficient complementary investment for inland rail	3	15	14	75
Insufficient port investment for large ships	2	15	15	77
Inequality in modal access pricing	0	19	13	77
Transport regulations not aligned to one standard	3	12	17	78
Inadequate change to lesson labour disputes	2	14	16	78
Privately owned ports not well regulated	3	9	20	81
Insufficient numbers of truck and train drivers	2	9	21	83
Land side port charges increase at short notice	2	4	26	88
ACCC powers do not cover shipping lines	0	8	24	88
Inadequate availability of 20ft containers	0	7	25	89

## Appendix 8. Business Impact Index

A business impact index was calculated by weighting the number of responses received in each category by the inverse to which it was ranked. For example the impact index of 7 for the issue “Publicly owned assets continued to be sold off” (first issue listed in [Table A7](#)) was calculated as

$$(0 \times 5) + (1 \times 4) + (0 \times 3) + (1 \times 2) + (1 \times 1) = 7$$

Table A7. Number of times (count) issues were placed in order of importance from 1 – most important to 5 – least important (e.g. the issue of inadequate availability of 20 foot containers was rated as most important on seven occasions.) and its impact index (calculated as described above)

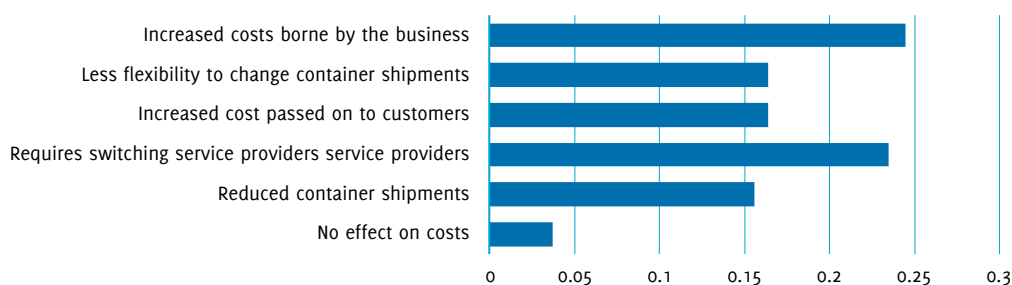
Issue	Rated as 1 count	Rated as 2 count	Rated as 3 count	Rated as 4 count	Rated as 5 count	Impact index
Publicly owned assets continued to be sold off	0	1	0	1	1	7
Insufficient port investment for large ships	0	0	1	2	3	10
Inequality in modal access pricing	0	1	0	3	1	11
Biosecurity protocols inefficient	0	2	1	0	2	13
Data on supply chains not well monitored	0	1	1	2	3	14
Buffer zones not protected	1	1	2	0	1	16
Insufficient complementary investment for inland rail	1	0	1	3	3	17
Inadequate change to lesson labour disputes	1	2	1	0	2	18
Transport regulations not aligned to one standard	0	2	3	4	0	25
Insufficient investment to maintain international markets	4	0	2	1	0	28
Insufficient numbers of truck and train drivers	1	3	5	1	3	37
ACCC powers do not cover shipping lines	3	2	4	1	1	38
Privately owned ports not well regulated	4	3	0	4	4	44
Land side port charges increase at short notice	6	6	3	1	2	67
Inadequate availability of 20ft containers	7	4	4	5	2	75

## Appendix 9. Business Effects Index

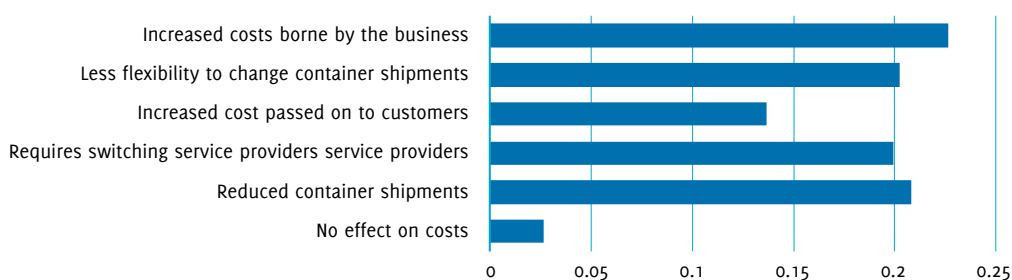
A business effects index was calculated by weighting, for each issue, the number of responses received in each category by the inverse to which it was ranked. In order to emphasise the differences between categories, weightings were increased or decreased for the upper and lower ratings respectively (i.e. 8 – ranked 1st, 7 – ranked 2nd, 4 – ranked 3rd, 3 – ranked 4th, 1.5 – ranked 5th, 0.5 – ranked 6th).

Issues received different numbers of responses because respondents only rated their top five issues. This meant that issues that received a high agreement score fell into respondents' top five issues more frequently than issues that received a low agreement score, and consequently received a higher number of rating responses. In order to compare across issues with different numbers of responses, results were expressed as a proportion of the total index score.

### a) Privately owned ports not well regulated



### b) Data on supply chains not well monitored

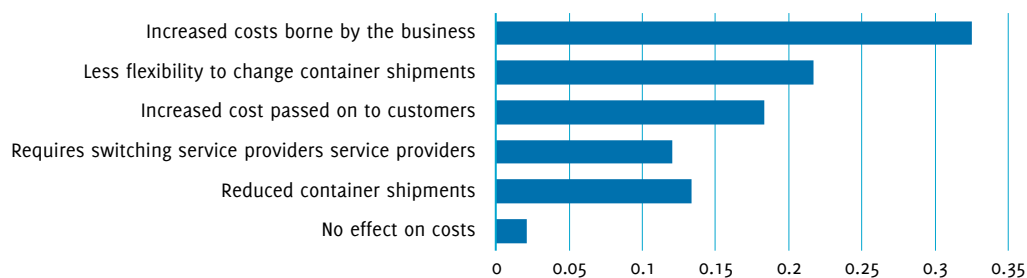


### c) Publicly owned assets continued to be sold off

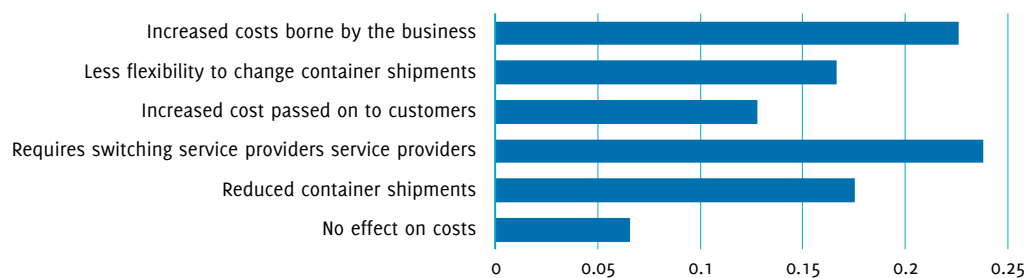


**Figure A1.** The business effect index for each of 15 issues rated by responses. Note respondents only rated their top five issues so different issues received different numbers of ratings

#### d) Biosecurity protocols inefficient



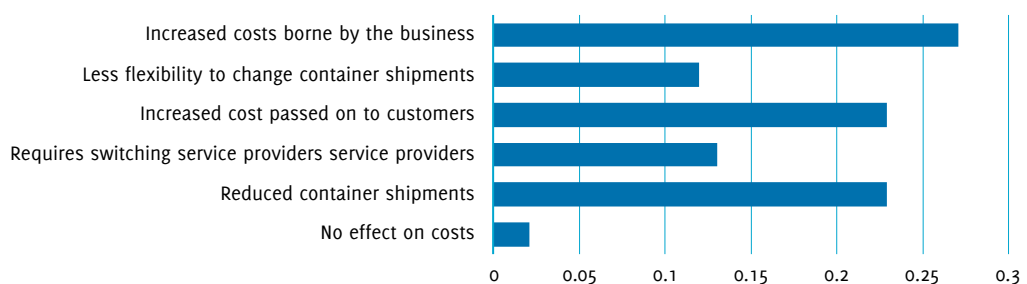
#### e) Insufficient complementary investment for inland rail



#### f) Insufficient investment to maintain international markets



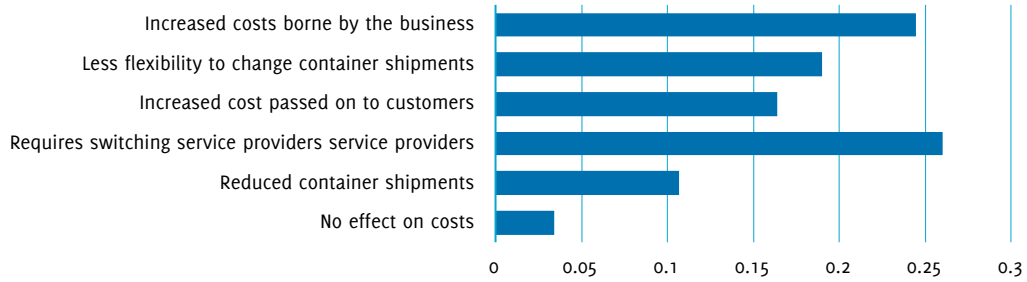
#### g) Buffer zones not protected



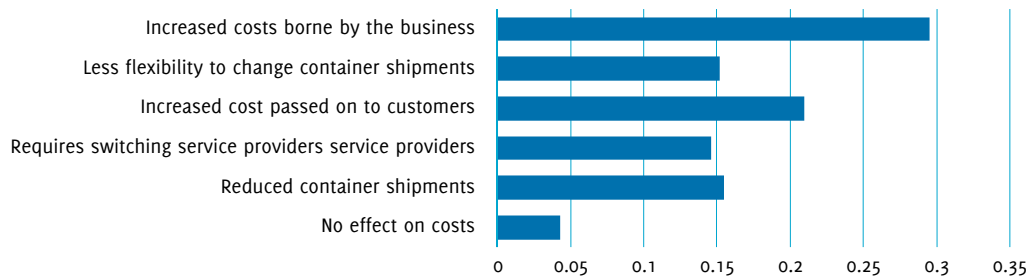
**Figure A1** The business effect index for each of 15 issues rated by responses. Note respondents only rated their top five issues so different issues received different numbers of ratings (*cont.*)

## Appendix 9. Business Effects Index (continued)

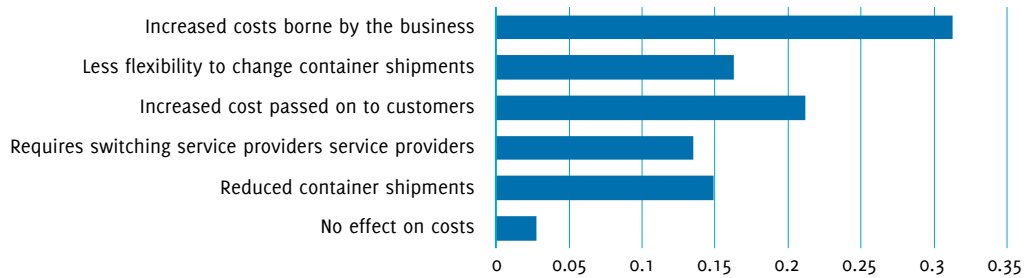
### h) Transport regulations not aligned to one standard



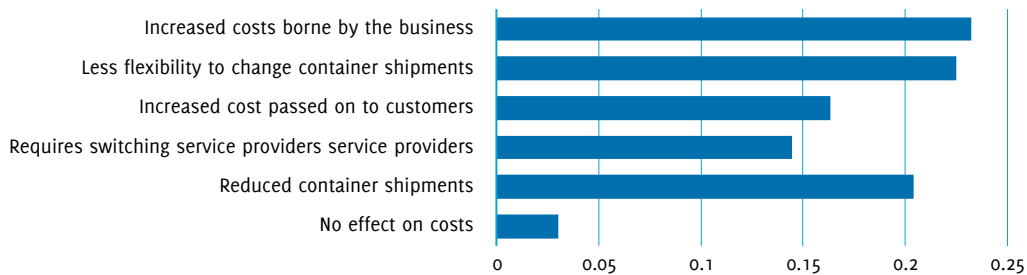
### i) Land side port charges increase at short notice



### j) Inadequate change to lesson labour disputes



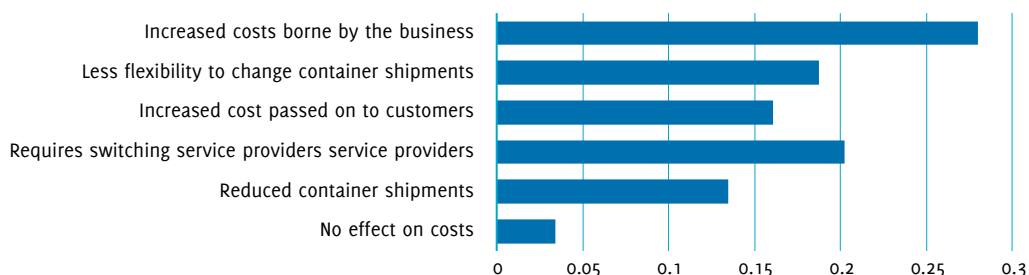
### k) Inadequate availability of 20' containers



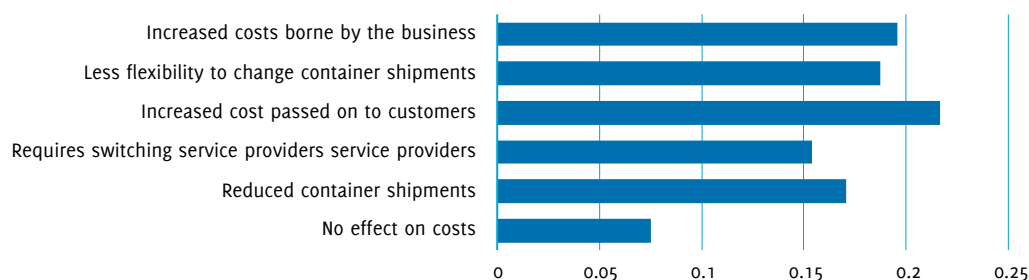
**Figure A1** The business effect index for each of 15 issues rated by responses. Note respondents only rated their top five issues so different issues received different numbers of ratings (*cont.*)



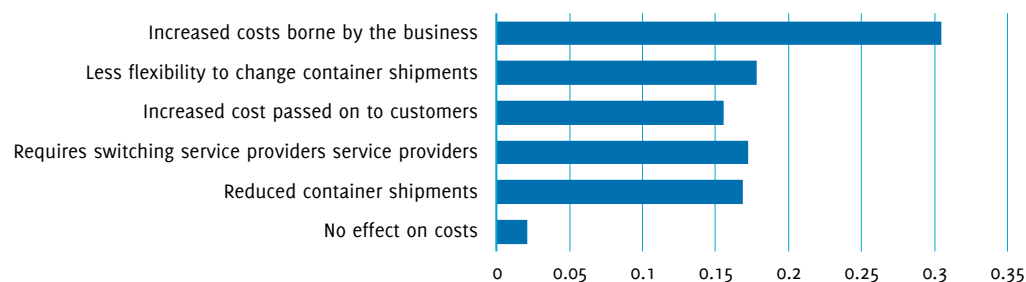
#### l) Insufficient numbers of truck and train drivers



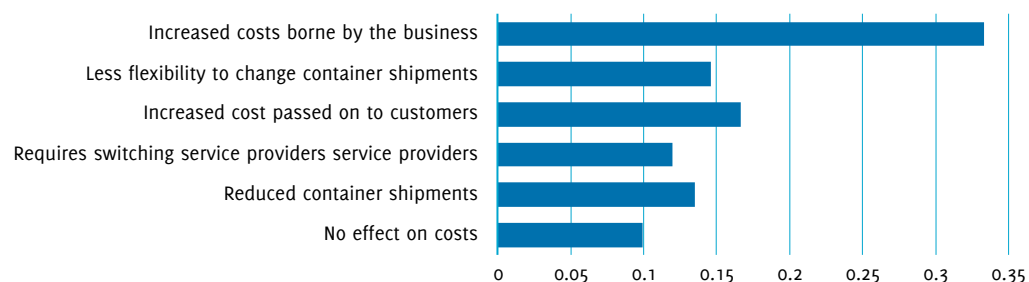
#### m) Insufficient port investment for large ships



#### n) ACCC powers do not cover shipping lines



#### o) Inequality in modal access pricing



**Figure A1** The business effect index for each of 15 issues rated by responses. Note respondents only rated their top five issues so different issues received different numbers of ratings (*cont.*)

## Appendix 10. Reform effectiveness index

A reform effectiveness index was calculated by weighting, for each issue, the number of responses received in each category using a linear scale (i.e. 1 – no effect, 2 – some effect, 3 – reasonable effect, 4 – most effective). In addition, as with the business effects index, in order to compare across issues with different numbers of responses, results were expressed as a proportion of the total index score (Table A8).

Table A8. Number of times respondents indicated different mechanisms were effective at achieving reform of issues affecting containerised grain supply chains

Mechanism for reform	Privately owned ports not well regulated	Publicly owned assets continued to be sold off	Data on supply chains not well monitored	Biosecurity protocols inefficient	Insufficient complementary investment for inland rail	Insufficient investment to maintain international markets	Buffer zones not protected	Transport regulations not aligned to one standard	Land side port charges increase at short notice	Inadequate change to lesson labour disputes	Inadequate availability of 20 foot containers	Insufficient numbers of truck and train drivers	Insufficient port investment for large ships	ACCC powers do not cover shipping lines	Inequality in modal access pricing
Reports	1	0	3	0	0	0	1	0	1	0	1	0	0	1	2
Lobbying	4	0	1	1	1	2	1	4	2	0	4	4	1	3	2
Self-regulation	1	0	0	0	2	2	0	2	1	2	5	4	0	0	1
Govt. regulation	13	2	3	4	6	4	2	7	15	2	10	6	5	8	2
Monitoring	4	0	3	1	1	0	1	0	5	2	6	3	0	4	0
Ad-hoc enquiry	3	0	2	1	1	0	0	1	2	2	3	1	1	3	0

## Appendix 11. Explaining the surge in container rates

The initial outbreak of COVID forced China and its neighbours into national lockdowns at the end of 2019. The region is the world's main source of manufactured goods yet COVID caused a shutdown initially in the region's manufacturing sectors. Cargo ships already en route out of Asia dropped off hundreds of thousands of containers full of goods in ports across the Americas — but because of pandemic restrictions, they could not load those containers back up with new products to send back to Asia. Instead, the containers piled up in ports and inland rail depots.

By the end of 2020, Asian manufacturing was fully recovered. Simultaneously, under COVID, most international households had increased their savings (Figure A2) and increased their

expenditure on home improvements (Figure A3), face masks and sanitisers, rather than personal services like dining-out or attending live shows. Despite people having a pent-up demand for tourism (Figure A3), the reality of prolonged restrictions on travel, lock-downs and a greater acceptance of working from home arrangements by employers meant most households upgraded various features of their home or accommodation to make living and working at home more enjoyable and productive. The upshot of the enhanced and sustained demand for homewares and face masks, when combined with China being the principal source of those products, was an increased Chinese demand for empty containers.

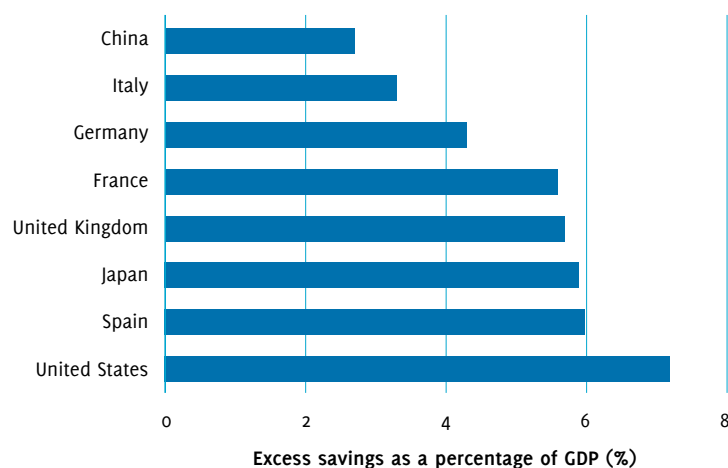
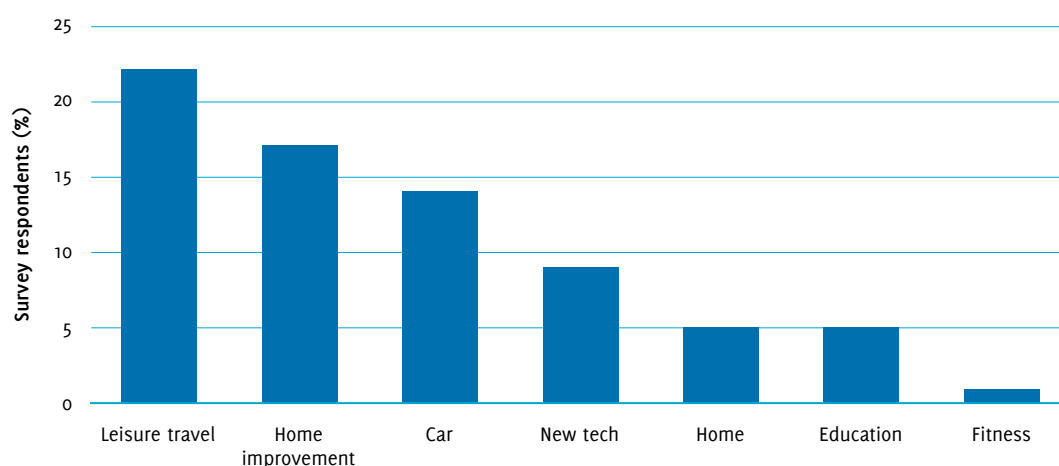


Figure A2. Excess savings as a percentage of country GDP

Source: American Express and BCG.

## Appendix 11. Explaining the surge in container rates (continued)



**Figure A3.** Top purchases that consumers are saving for in 2021

Source: American Express and BCG.

However, previously congested ports struggled to load and unload containers fast enough to keep up with the flow of ships. Many ships, already running behind schedule because of congestion at ports, left their empty containers behind rather than wait days to load them back onboard. Consequently, empty containers continued to pile up at major receiving ports, whilst their supply lessened at major export hubs.

The early months of the global spread of COVID in 2020 caused a curtailment in global shipping, as borders closed, factories shut down and households faced lock-downs and reduced incomes. Labour management issues in many supply chains arose and logistics management quickly became problematic. Timely access to ports and port facilities worsened. Container port congestion became a widespread problem. Trade flows from China were hugely curtailed (Figure A4) for a few months. Then as demand for homewares emerged across the globe, but principally in the wealthier regions of Europe and North America, traders looked to China as the principal source of those products.

China initially controlled the spread of COVID and re-opened its factories, boosting its supply of those products. Trade flows re-emerged in 2020–21, surpassing the value of pre-COVID levels, as shown by the example of China’s trade with the USA (Figure A4).

The impact of the shifts in demand for goods packed in containers; and the inability of shippers and container suppliers to easily or quickly increase the flow of containers to and from China caused a prolonged price spike in container rates. The pricing and revenue impacts are illustrated in Figure A5 and Figure A6. The shaded rectangles in Figure A5 and Figure A6 show the revenue being earned by the shipping container industry; with most of the revenue being generated by the lift in the unit price of accessing containers.

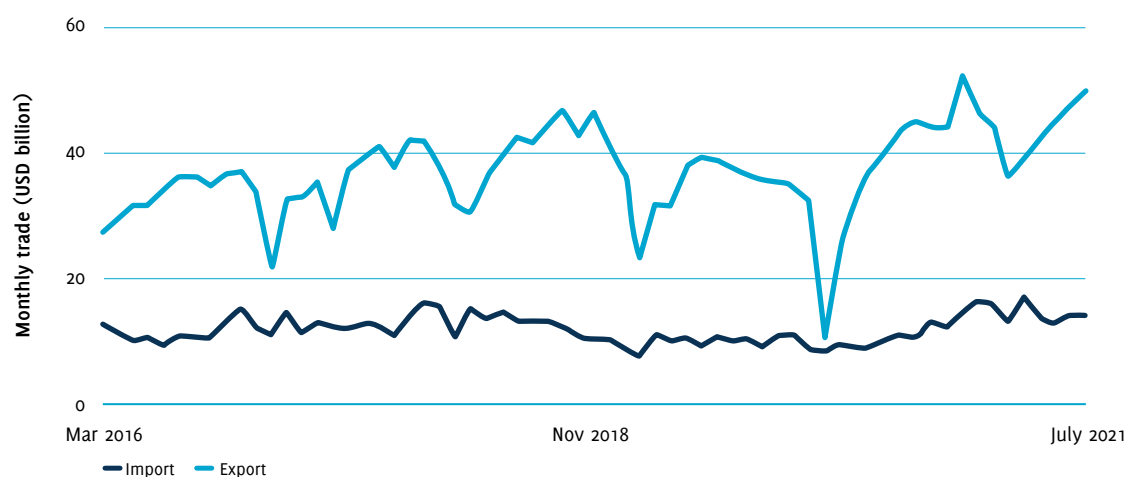


Figure A4. Monthly trade flows between China and the USA: March 2016 to July 2021

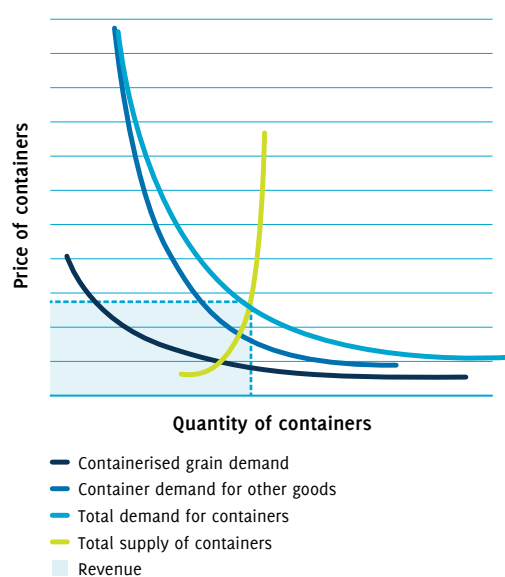


Figure A5. Illustration of demand and supply conditions for containers in 2018

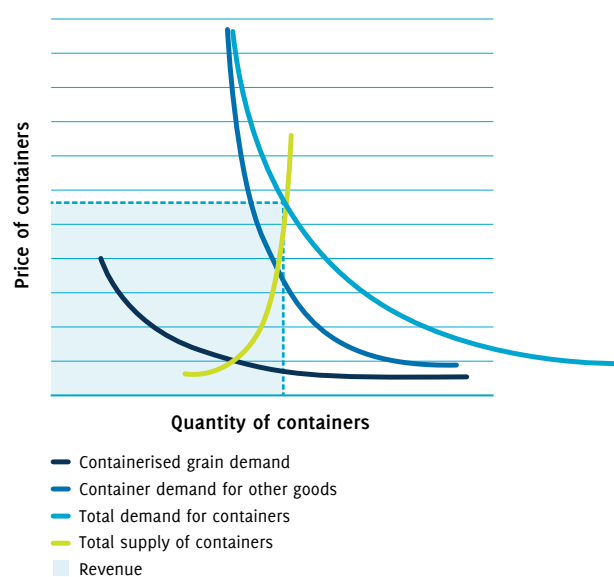


Figure A6. Illustration of demand and supply conditions for containers in 2021

## Appendix 11. Explaining the surge in container rates (continued)

The supply of containers and ships that carried containers during 2020 and 2021 is characterised by what economists call a price inelasticity of supply. Explaining more; COVID disrupted most industry supply chains and manufacturing activity. Quickly and cheaply building more ships to increase the global flow of containers in 2020 and 2021 was not possible. Similarly, a rapid increase in the construction of new containers was not feasible. Moreover, congestion and demurrage issues at many main ports, especially during the early phases of COVID meant that the existing fleet of ships and containers could not efficiently and speedily move goods between various markets and regions. With the size of the container shipping fleet being largely inflexible and constraints also applying to the construction and flow of containers, the supply of containers was what economists call inelastic. In effect the supply of containers was restricted so rationing of containers to end users then occurred through price increases. Fuelling those price increases was firstly the enhanced demand for homewares, and related products, principally transported in containers from China. Secondly, Australia experienced a wave of industrial action at its ports as maritime workers sought to capitalise on the enhanced demand for containerised goods. For example, in 2020 union action reduced Patrick Terminals' operations in Sydney to around 50–60 per cent of usual levels, generating a backlog of 90,000 containers.

Simultaneously higher infrastructure charges were introduced by stevedore companies. For example, in July 2020, Hutchison Ports increased its charges on containers delivered to and from its facility in Brisbane by 9 per cent. VICT in Melbourne also imposed a 7 per cent increase in their charges. Despite container volumes dropping, total operating profit margins for stevedores increased for the first time in a decade, from 5.8 per cent in 2018–19 to 9.9 per cent in 2019–20. Yet the costs of those stevedore charges were being paid by the importers and exporters of containerised goods.

To worsen the commercial reward for importing or exporting containerised goods, shipping companies imposed port congestion charges of up to US\$350 per TEU in September 2020. The shipping line MSC announced a US\$300 per TEU Sydney port congestion surcharge, whilst CMA CGM's ANL announced an equivalent surcharge. As a result, grain exporters, for example, needed to absorb an extra AU\$17 per tonne of direct costs. These congestion charges continued until March 2021.

A casualty of the increased costliness of exporting goods in containers has been the trade of containerised grain. In the fiercely competitive world of grain trading often the margins on grain trades are relatively small. Hence, unanticipated cost increases, or failures in supply chain services rapidly and often completely eroded profit margins. Compared to other goods with attractive profit margins on each container load, grain containers attract small profit margins. Hence, the capacity of containerised grain traders to readily absorb the price increases in container rates, along with disruptions to schedules and congestion costs was limited.

Despite an increased demand for containerised grain due to increases in regional populations and aggregate incomes; cost-effectively satisfying that demand became problematic and throughout 2020 and 2021 was often unprofitable or barely profitable, forcing a diminution of the container trade in grain.



## Appendix 12. The US Ocean Shipping Reform Act of 2021

### Section-by-Section Summary

#### Section 1: Short Bill Title

#### Section 2: Purposes

- Updates and improves the purposes of the Shipping Act to better reflect current federal policy governing international ocean shipping.
- Directs the FMC to promote fleet of US-flagged vessels to meet commercial needs, not just national security.
- Establishes reciprocal trade as part of FMC's mission in enforcing the Shipping Act.

#### Section 3: Service Contracts

- Authorizes the FMC to stipulate additional minimum requirements for service contracts by ocean common carriers, at the agency's discretion.
- Expands the FMC's unreasonable practice jurisdiction to service contracts when an ocean common carrier is engaging in unfair contracting practices on a widespread basis.

#### Section 4: Shipping Exchange Registry

- Establishes new authority for the FMC to register shipping exchanges and issue licenses for registered exchanges to operate.
- Licensing will ensure industry-wide compliance with federal law and FMC regulations for ocean shipping industry and promote widespread adoption of best practices.
- Allows FMC to exempt licensing only for shipping exchanges with equivalent regulatory supervision in their home country.

#### Section 5: Prohibition on Retaliation

- Applies anti-retaliation safeguards to all regulated entities and protects those filing complaints about potentially unlawful conduct or anticompetitive business practices to the FMC.

#### Section 6: Public Disclosure

- Requires the FMC to publish online all findings of false certifications for demurrage and detention charges and any resulting penalties imposed.
- Enhances public transparency for FMC actions and bad actors in ocean shipping industry.

#### Section 7: Common Carriers

- Updates requirements on ocean common carriers to incorporate best practices in the shipping industry.
- Prohibits ocean common carriers from unreasonably declining export cargo bookings if the cargo can be loaded in a safe and timely manner.
- Requires ocean common carriers or marine terminal operators to certify that any demurrage or detention charge complies with FMC regulations, or face penalties.
- Limited exemption for marine terminal operators for any terminal detention or demurrage charges if such charges are based on public port tariffs set under State law.
- Effectively codifies the FMC's "Interpretive Rule on Demurrage and Detention Under the Shipping Act" (Docket No. 19-05).
- Obligates ocean carriers to adhere to minimum service standards that meet the public interest, determined by the FMC in new required rulemaking.

- Requires ocean carriers or marine terminal operators to maintain all records regarding invoiced demurrage or detention charges for at least 5 years and provide such records to the FMC or invoiced party on request.
- Shifts burden of proof in any proceeding with the FMC regarding the reasonableness of demurrage or detention charges from the invoiced party to the ocean carrier or marine terminal operator.
- Prohibits ocean carriers from declining opportunities for U.S. exports unreasonably, as determined by the FMC in new required rulemaking.

#### *Section 8: Assessment of Penalties*

- Authorizes the FMC to order refund relief in addition to civil penalties in enforcement proceedings.

#### *Section 9: Data Collection*

- Requires ocean common carriers to report to the FMC each calendar quarter on total import/export tonnage and twenty-foot equivalent units (loaded/empty) per vessel that makes port in the United States.

#### *Section 10: Complaints*

- Permits third-party challenges to anticompetitive agreements for complaints filed with the FMC
- Establishes new, separate process for addressing demurrage and detention complaints, allowing the FMC to take a more active role in investigating such complaints. Currently, many shippers are reluctant to file complaints due to the complexity, expense, and time involved with the adjudication of such complaints.
- Allows FMC to order automatic and full refund of any detention and demurrage charges paid if accompanied by a certification of compliance with federal law/regulations found to be false due to negligence.

#### *Section 11: Investigations*

- Authorizes the FMC to self-initiate investigations of additional carrier practices and apply enforcement measures, as appropriate.

#### *Section 12: Award of Additional Amounts*

- Authorizes the FMC to order double reparations for violations of existing prohibition (under 46 U.S.C. § 41102(c)) on unjust or unreasonable practices in handling property by ocean common carriers, marine terminal operators, or ocean transportation intermediaries.
- Also authorizes the FMC to order double reparations for knowingly false certification of compliance with federal law/regulations required to accompany any detention and demurrage charge.

#### *Section 13: Injunctive Relief*

- Permits third-party intervenors in court proceedings initiated by the FMC seeking injunctive relief against agreements that reduce competition in the ocean shipping industry.

#### *Section 14: Enforcement of Reparation Orders*

- Authorizes parties owed refund ordered by the FMC to seek enforcement of that payment in federal district court.

#### *Section 15: National Shipper Advisory Committee*

- Specifies that newly established and Congressionally authorized [Advisory Committee](#) may include customs brokers and freight forwarders who participate in ocean shipping commerce.

#### *Section 16: Annual Report to Congress*

- Adds reporting on anticompetitive business practices, nonreciprocal trade practices, or other factors exacerbating the United States' trade imbalance with foreign exporting countries in the FMC's annual report to Congress required under current law.
- Directs FMC to examine foreign state control or undue influence over ocean carriers' business practices and ramifications for the global shipping industry.

#### *Section 17: Technical Amendments*

- Corrects typos, errors, and outdated citations in current law pertaining to the Federal Maritime Commission or the Shipping Act.





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Regional Development



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