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The Air Cargo and Logistics Value Chain: The Case of Australia*

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Abstract: *The COVID-19 pandemic period offered the opportunity to consider the adjustment of elements of the transport system to the shock. This paper reviews the experience of the air freight system. It discusses how initially the pandemic led to rising rates, especially because of restrictions on passenger travel, which in turn induced a supply response that allowed capacity to recover. The consequences for trade costs are also examined using data on product imports by Australia by mode. The rise in trade costs for air freight during the pandemic was significant but less than that for sea freight. The drivers of variation in trade costs at the levels of product and economy of origin are identified, including distance, unit value, and institutional variables. The long run trend is for trade costs to fall in both sea and air freight modes. There is scope for further reduction in costs associated with air freight when supported by innovation in the sector, including the application of digital technology. This shift is facilitated by a number of policy initiatives, including more open policy regimes for air freight services and implementation of commitments in the World Trade Organization's Trade Facilitation Agreement.*

Keywords: air freight, COVID-19, trade costs, services trade restrictiveness

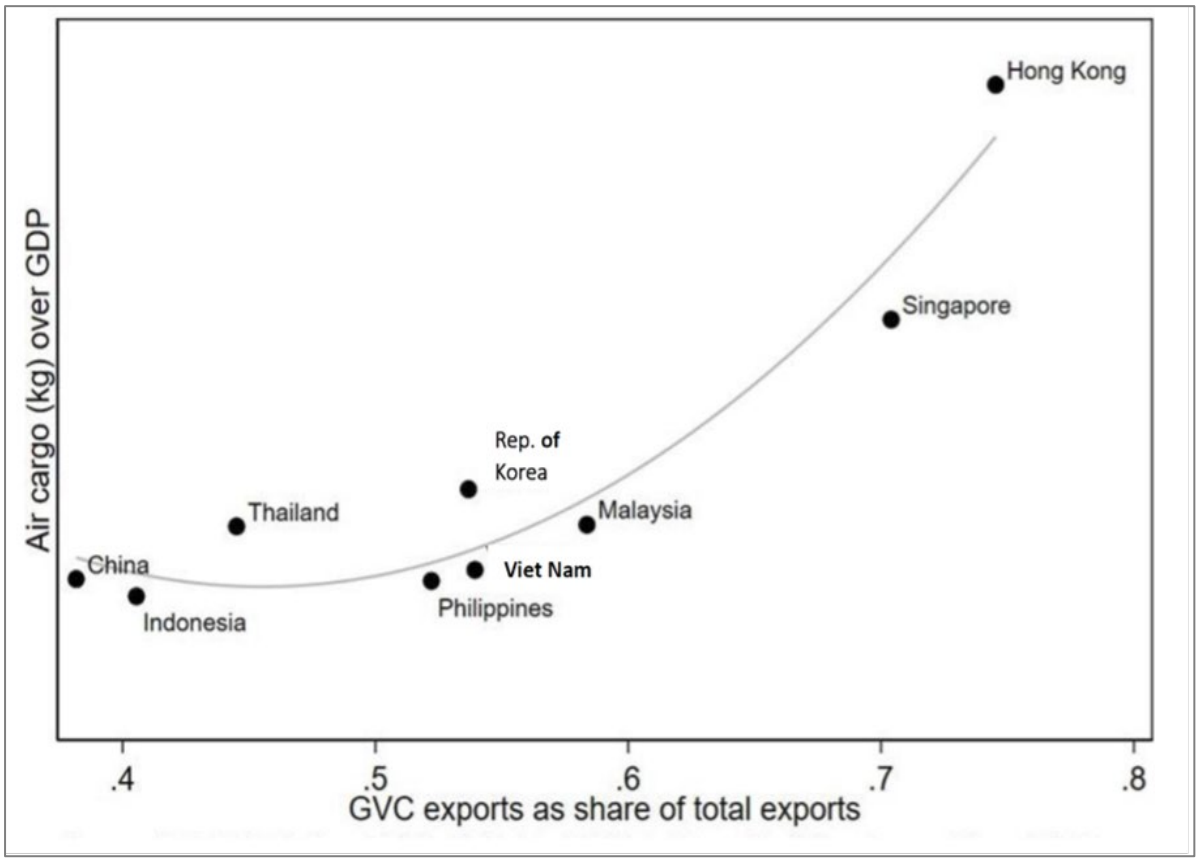
JEL Classification: R41, F14

* The companion paper by Pomfret and Sourdin (2023) to this one provides an econometric analysis of the determinants of trade costs. These papers were prepared as a joint project, and this paper draws on the econometric results. All errors in this paper are the responsibility of this author.

1. Introduction

The cargo system is worth attention for a number of reasons. The first one is its association with participation in global value chains (GVCs). Figure 1 shows GVC exports as a share of total exports plotted against air cargo activity relative to the gross domestic product (GDP). The figure shows an upwards sloping relationship, that is, there is a positive association between GVC participation and the use of air cargo. The implication is that air cargo is a facilitator of GVC activity.[1]

Figure 1: Relationship of Air Cargo Activity Relative to GVC Participation



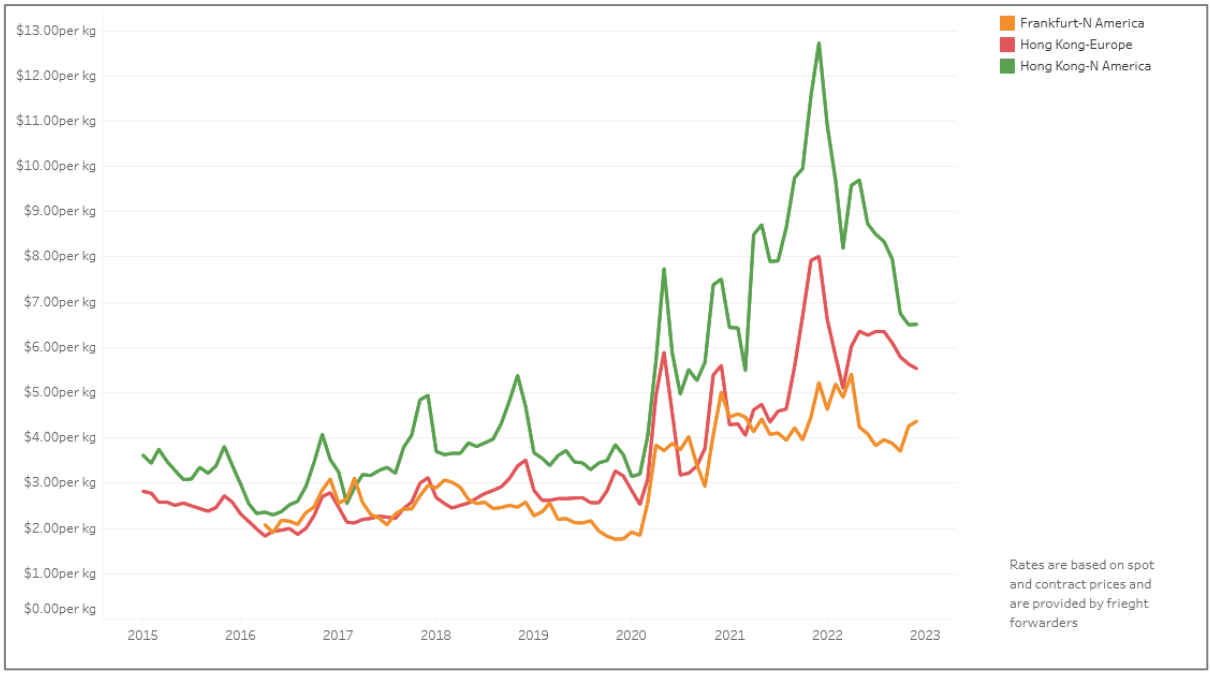
GDP = gross domestic product, GVC = global value chain, kg = kilogramme
Note: On the vertical axis, the standardised position of the country on a scale of 0 to 1 for air cargo over GDP, indicating the importance of air cargo in national production. The horizontal axis provides the sum of backwards and forwards GVC participation as a share of total value added in exports.
Source: Findlay, Roelfsema, and Van de Wouw (2021).

[1] Shepherd, Shingal, and Raj (2016) studied this relationship in more detail. They also found that better air cargo performance is positively associated with export unit values, which they interpret to mean that better access to air cargo can help firms move up the value chain to higher value-added activities.

The other reason for taking an interest in the air cargo system is the experience of freight rates during the novel coronavirus disease (COVID-19) period. Figure 2 illustrates the shifting rates from 2020 onwards. There was a big COVID-19 shock with respect to air freight rates, with rates more than doubling, and which are still above 2019 levels.

Some questions of interest then are what drove these changes in freight rates and what is been the consequences especially for trade costs in goods trade. Here we focus on the Australian experience.

Figure 2: Air Freight Rates, Selected Routes, 2015–2023 (US$)



kg = kilogramme.

Source: Air Cargo News. AirFreight Rates – Baltic Exchange Airfreight Index. https://www.aircargonews.net/data-hub/airfreight-rates-tac-index/

To begin, this paper provides some background on what is involved in the airfreight process including physical movements data and information flows and financial flows. Then, a discussion of the drivers of the COVID-19 experience follows. With that background, we turn to a study of the Australian experience of trends and movements in trade costs and discuss some factors in the outlook for trade costs associated with this value chain.

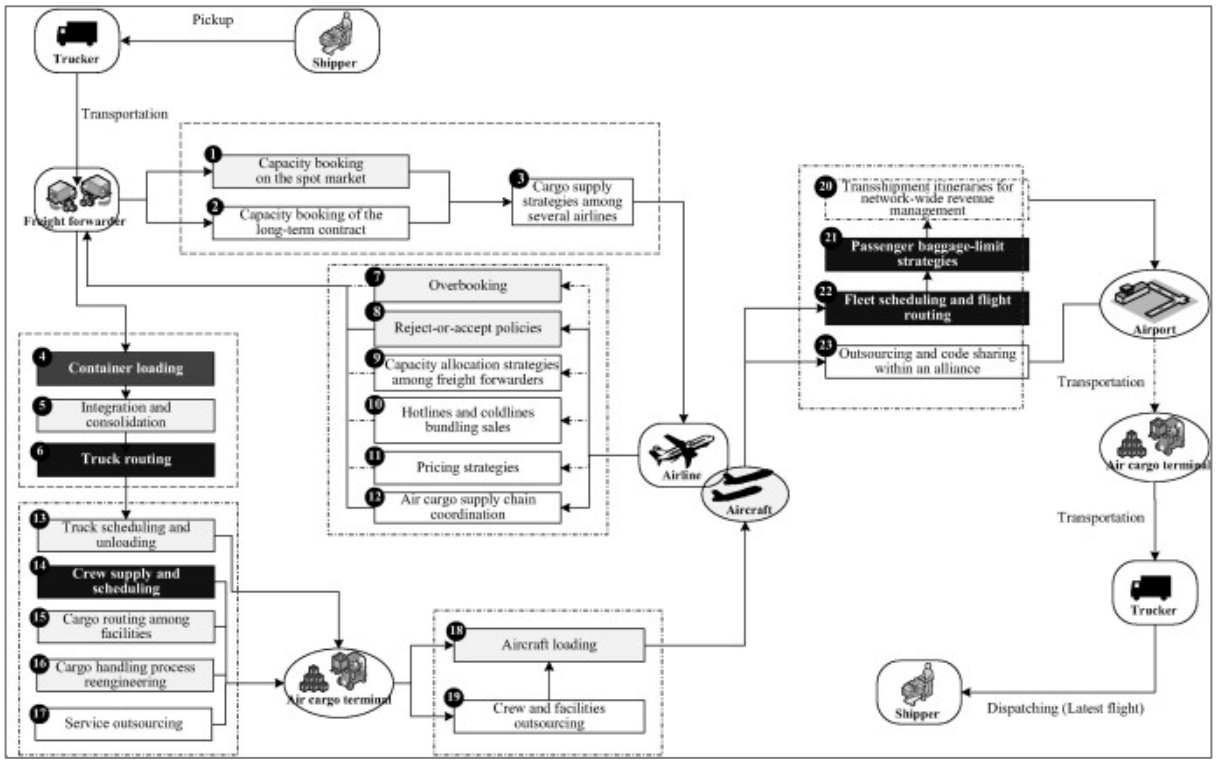
2. Air Freight Value Chain

In the air freight value chain, there are physical, data, and financial flows to consider. The focus here is on chains that operate across international borders, and on the end-to-end delivery of goods – this is the purpose to which air cargo contributes, and considering its role

in the context of the complementary activities in the chain offers more insight into trends in trade costs than consideration of flight activity alone. Also, flight activity has its own value chain, but we do not consider that here in any further detail. See Pearce (2013) for more detail of this value chain.

Figure 3 shows a picture of the air cargo set of physical activities. A feature of this figure is that the air movement itself is only a small part of the total set of activities (on the right-hand side in the airport section), which include a lot of land transport as well as paperwork, booking processes, etc., and other cargo handling. Note also alongside these physical movements and data and financial flows there is also movement of people across borders, such as crew involved in transport services.

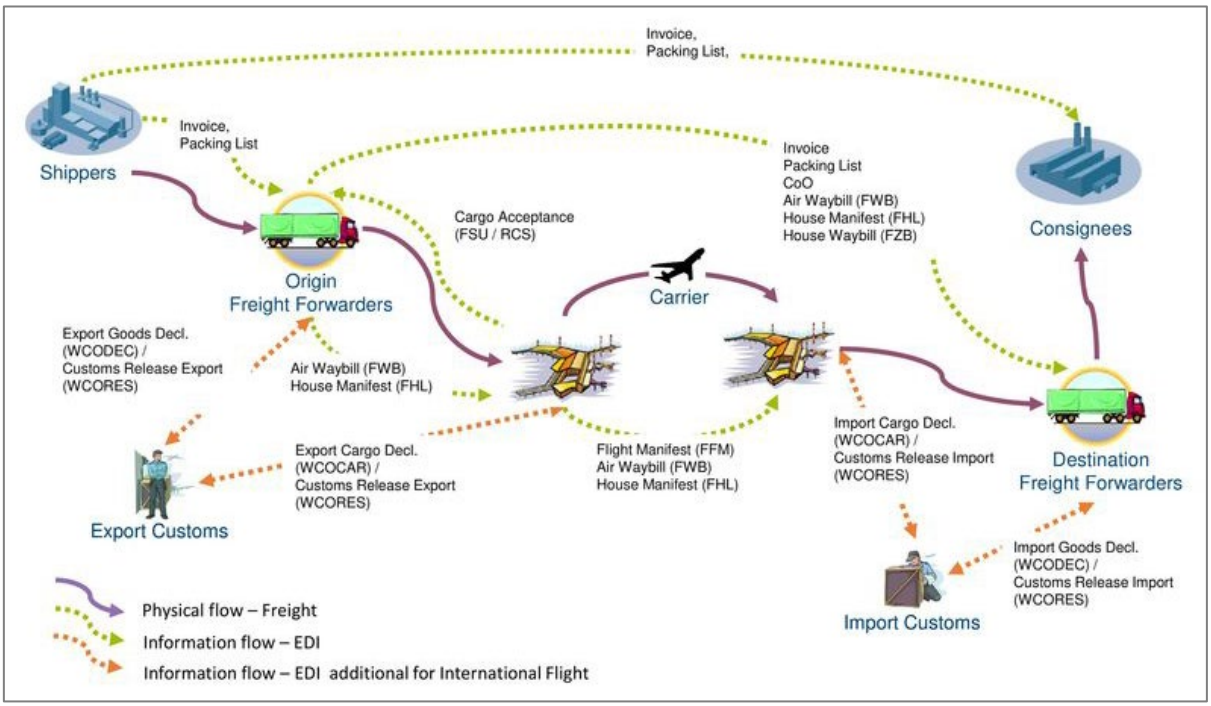
Figure 3: Air Cargo Value Chain, Physical Activities



Source: Feng, Li, and Shen (2015).

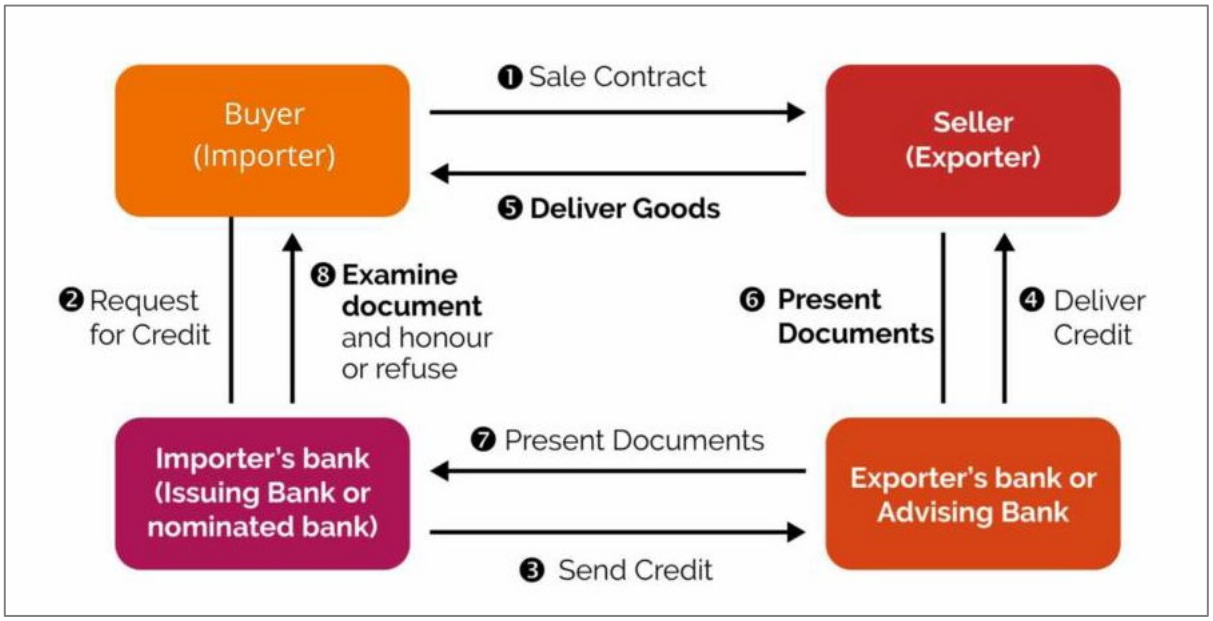
Figure 4 shows the data on paper flows that occur alongside the physical flow. Again, another feature of this figure is the number of steps involved. Then in Figure 5 we show the financial flows that occur on top of the data and physical flows, which is the familiar letter of credit process.

Figure 4: Data and Information Flows Compared to Physical Flows



EDI = electronic data interchange.
Source: International Airport Transport Association (IATA) e freight-fundamentals (2013) 1. e freight-fundamentals | PPT (slideshare.net) (accessed 12 February 2024).

Figure 5: Financial Flows and the Letter of Credit



Source: Trade Finance Global. Letters of Credit. https://www.tradefinanceglobal.com/letters-of-credit/

Complexity is a theme of all these figures, and there is further comment below on how technological change might reduce this complexity, which is also expected to lead to lower trade costs.

With this background we now examine more carefully some of the drivers of the changes in freight rates over the COVID-19 period.

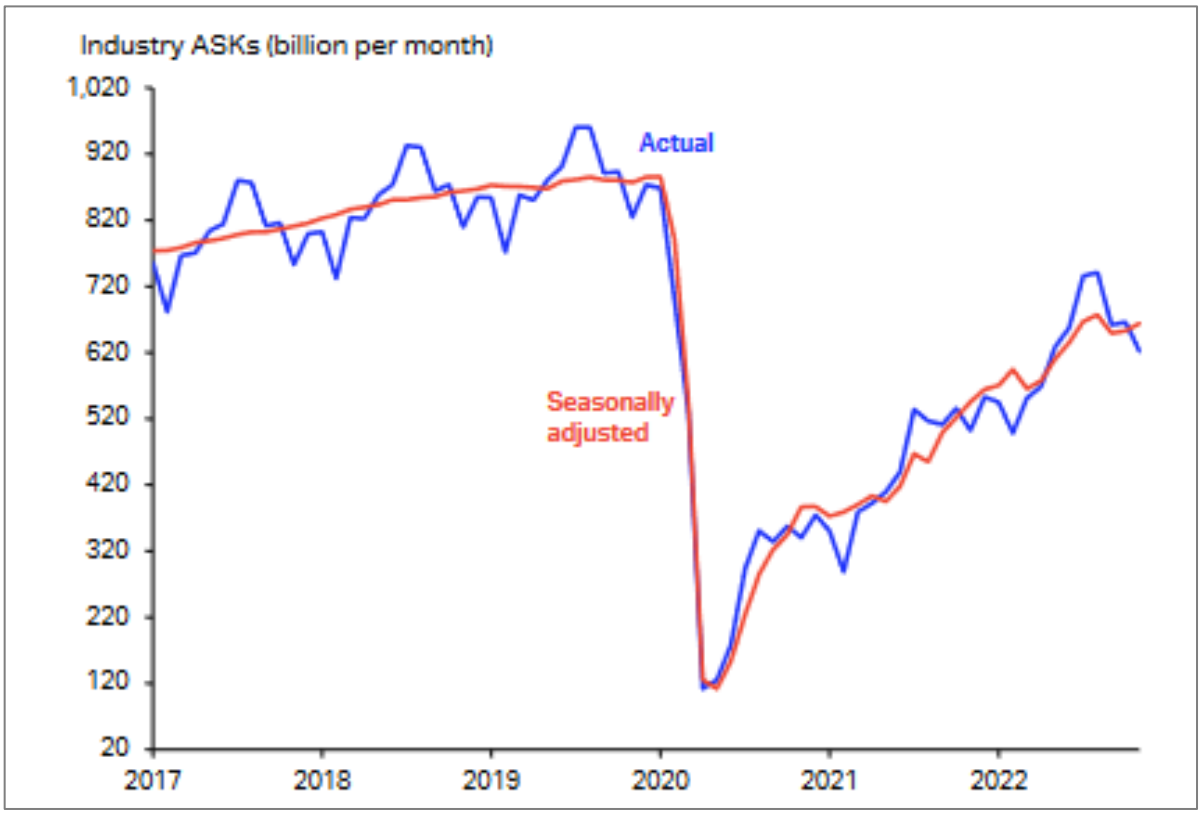
3. Origins of Changes in Freight Rates

Given the complexity of this process, how did COVID-19 affect the supply and demand for the bundle of activities associated with the air cargo system. The rise in rates was observed earlier and generally there are three contributors identified.

One is the reduction in capacity in passenger aircraft related to the restrictions applied to people movement.

Figure 6 shows the dramatic decline in seat capacity in 2020. Air cargo (around 50% of the total volume, as discussed below) is carried in the belly holds of passenger aircraft to this reduction also led to a fall in cargo capacity, as shown in Figure 7.[2]

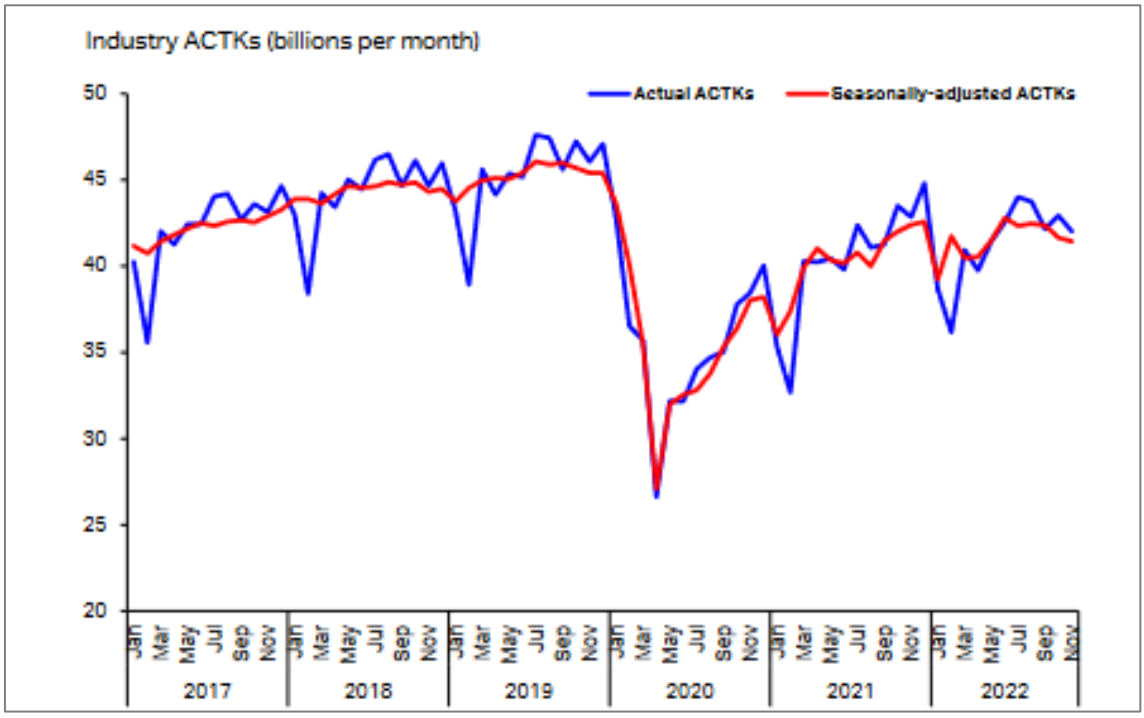
Figure 6: Change in Available Seat Kilometres, Global



ASKs = available seat kilometres.
Source: IATA (2022a).

[2] In 2022, global passenger revenue was still under 70% of that in 2019 (IATA, 2022).

Figure 7. Change in Air Cargo Capacity, Global



ACTKs = available cargo tonne kilometres.
Source: IATA (2022b).

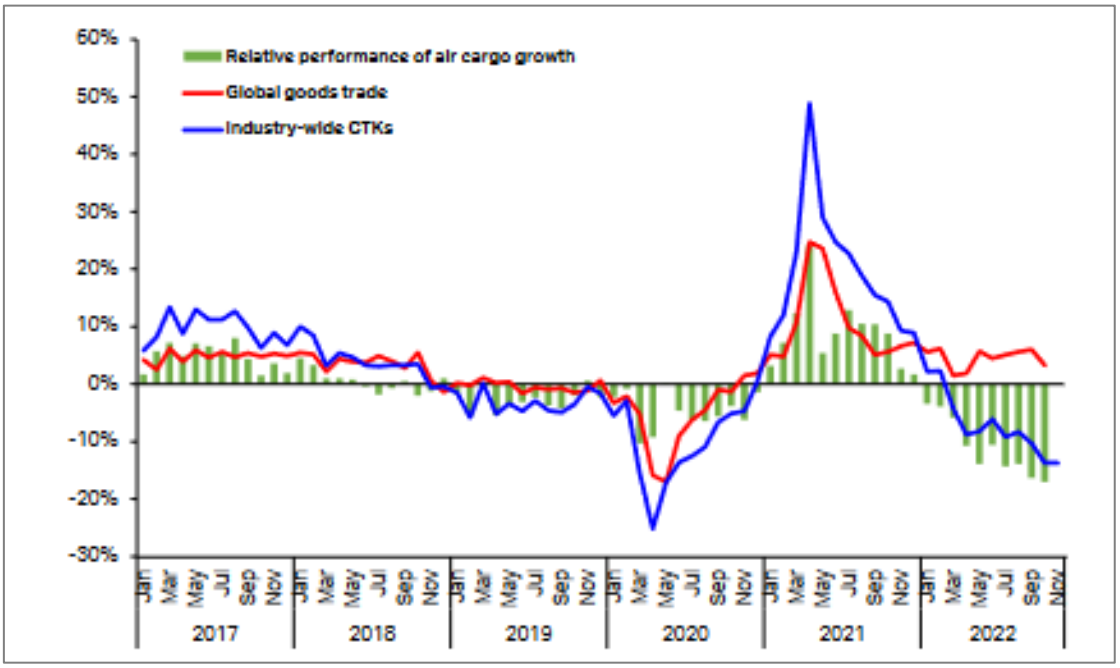
Air cargo followed the same trend as passenger capacity, but in 2022 the increase slowed. The driver of that change is the next talking point.

Figure 7 refers to the supply side of the market for air cargo. Freight rates are the outcome of both supply and demand side factors and there was a special event on the demand side of these markets in the COVID-19 period. This was the growth in demand for goods relative to services. A rapid increase in goods consumption, associated with the effects of the lockdowns due to COVID-19, led to a rapid growth in global goods trade this shift is illustrated in Figure 8. It increased the demand for air cargo. Given the constraints on capacity, freight rates increased, but at the same time also drew out new capacity so the cargo tonne kilometres (CTK) number also increased.[3]

[3] In other words, as COVID-19 developed, air cargo supply decreased but demand increased, so rates rose with in principle uncertain effects on the volume of the service provided (quantity supplied did increase over time, including through innovative redesign of space in passenger aircraft, but not to the pre-existing level). As demand for goods decreased again, the rates fell and quantity supplied stopped growing (and in the short run load factors fell).

Figure 8: Growth in Global Goods Trade and Cargo Tonne Kilometres

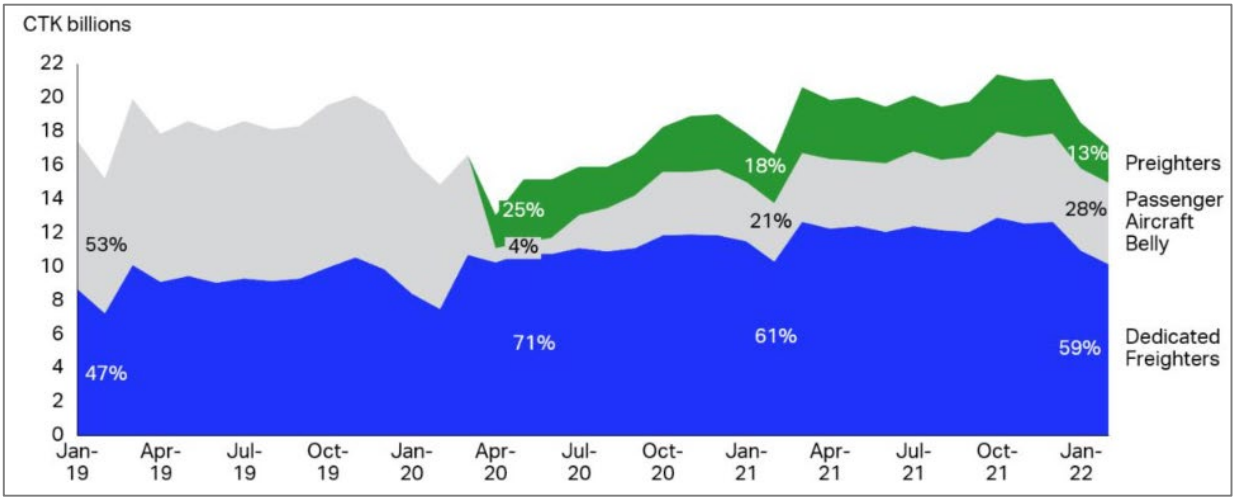
(% year on year)



CTKs = cargo tonne kilometres.
Source: IATA (2022b).

The higher freight rates and the constraints on passenger operations led to some interesting responses in the industry. This was the substitution of passenger aircraft to freighter aircraft, sometimes called 'preighters'. Figure 9 shows the rise in that share from mid-2020 but that also that share has since been falling (PortCalls, 2022). The figure also shows the dramatic fall in the share of passenger aircraft barely capacity for handling cargo, then its recovery to about half the previous share. The substitution into dedicated freighters, and the alternative use of passenger aircraft, helped sustain the growth in capacity in Figure 7. The available cargo tonne kilometres (ACTKs) by 2022 were closer to pre-COVID levels than passenger available seat kilometres (ASKs) shown in Figure 6 (despite passenger capacity recovering more quickly). Overall, during the COVID-19 experience the share of dedicated freighters rose from less than 50% to around 60%.

Figure 9: Sources of Air Cargo Capacity



CTKs = cargo tonne kilometres.
Source: IATA (2022c).

Meanwhile, the slowdown in the growth of global goods trade is the driver of lesser growth of capacity in Figure 7 in 2022.

Another feature of the COVID-19 experience was policy applied to air crew (such as vaccination, testing, quarantine, and other restrictions). These conditions varied across economies, which led to complexity in decision making and in crew rostering, and changes in flight patterns, adding to costs. For example, an airline would serve a more restrictive location indirectly with the final leg of a journey being a short haul and avoid stopovers in more restrictive locations (APEC, 2021). Application of the policies on crew movement, and uncertainties associated with them, also added to delays. Various proposals for the facilitation of the movement of people in times of crisis have been developed, reflecting the principles of Good Regulatory Practice (ASEAN, 2019).[4] These suggestions were developed in the context of the pandemic, and the question is now whether these ideas can be applied always, rather than just in times of crisis.

[4] APEC (2021) for example makes recommendations to undertake better stakeholder engagement, better coordination amongst agencies (e.g. health, border control and airports), more research to support the application of risk-based policies, and to apply controls which are the least invasive, cooperation across countries with respect to testing standards and conformance and align with international standards and approaches. The latter includes participation in the Collaborative Arrangement for the Prevention and Management of Public Health Events in Civil Aviation, hosted by the International Civil Aviation Organization.

4. Trade Costs

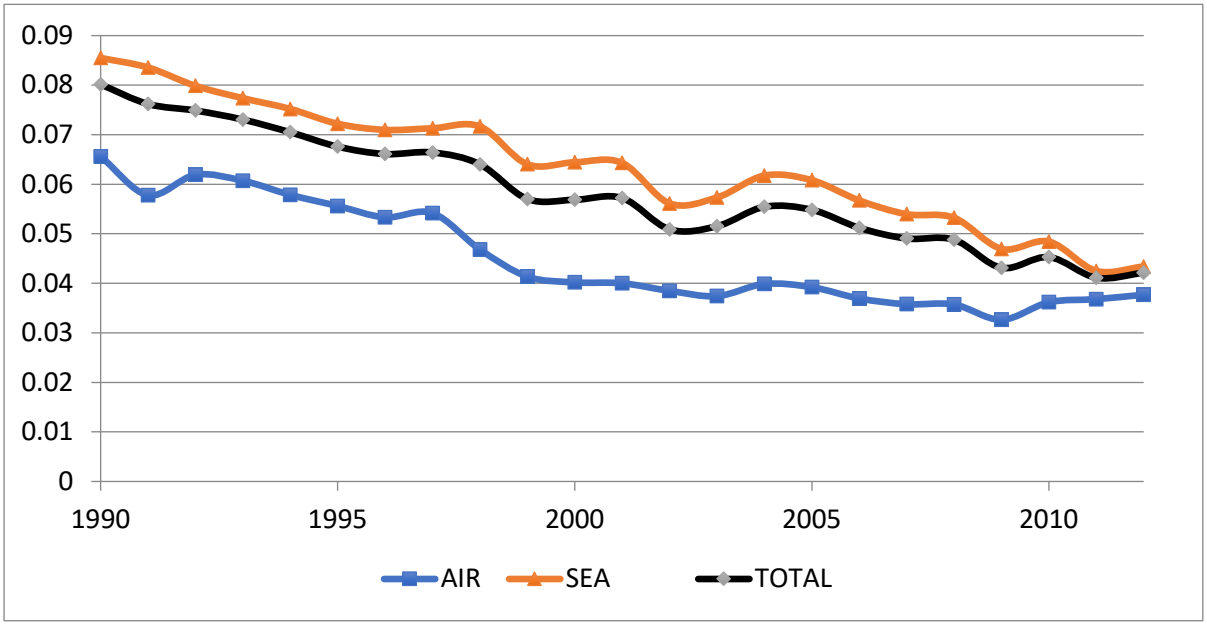
How did these events translate into trade costs in the post-COVID-19 period? We can respond to this question using data on Australian trade. The same data have been used in previous work by Pomfret and Sourdin (2010) when they explained why trade costs vary. They explained that as tariffs fall, trade costs are becoming more significant obstacles to trade. They argued that the gap between the cost, insurance, and freight (CIF) and the free on board (FOB) value of a trade flow, which is available in the Australian data, is a useful measure of trade costs. They then used the Australian data to identify the contribution of factors like distance, weight, and size of trade bilateral trade flow to the variation of trade costs by trade partner and by mode. Pomfret and Sourdin (2023) have updated their earlier work for the post-COVID-19 period.

Figure 10 shows the movement in trade costs associated with imports into Australia for the period 1990 to 2012, based on the 2010 paper. The average CIF/FOB gap was 8% of the FOB value of imports in 1992 and by 2007 gap was less than 5%, and by 2012 it had fallen to 4%. These average trade costs of 4% to 5% were larger than Australia's average tariff at the time.

Using more recent data it has been possible to update the 2010 study. Figure 11 shows the average *ad valorem* trade costs for Australian imports for the period of 2013 to 2021. Trade costs were on average under 4% by 2019. However, in 2020 and 2021 the trend was reversed as trade costs increased sharply to 5% to 6%. This level is significantly different to earlier years (according to the associated econometric work): the initial increase was higher for air but overall greater for sea freight. The COVID-19 events, we can infer, did have a significant effect on trade costs. The drivers of that result were identified above.

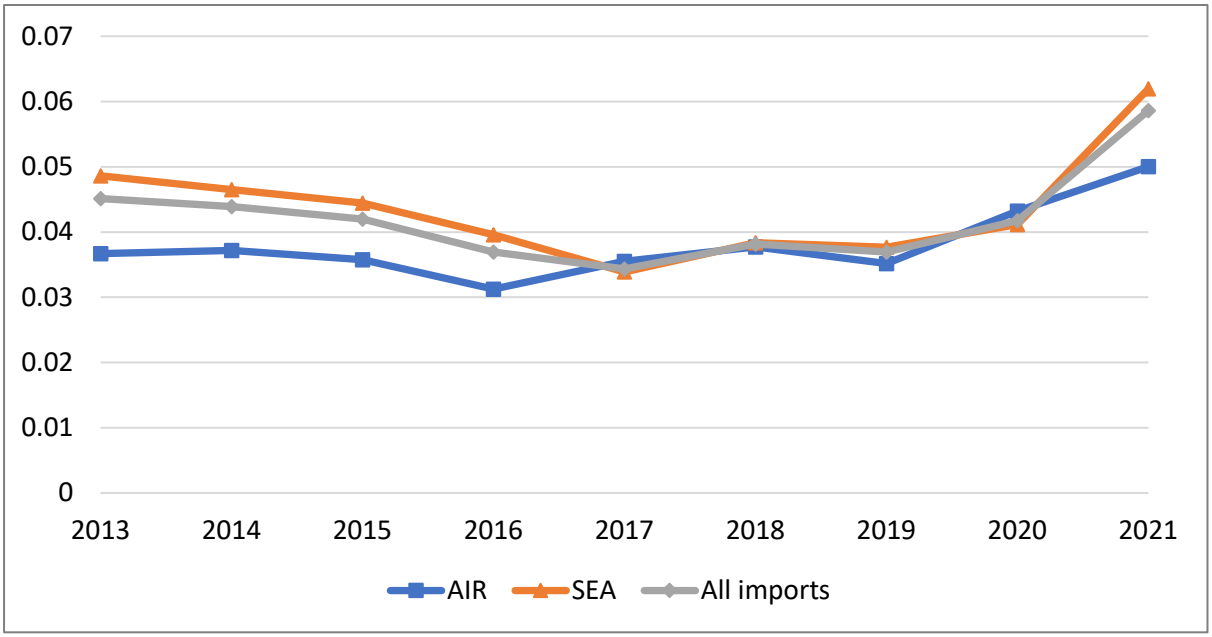
As noted, the change in trade costs was significantly different to that of earlier years. But the increase (of the order of 25% to 50%) was not as significant as the rise in freight rates, according to the changes evident in Figure 2. A contribution to these results is that, as noted in the discussion of the air cargo value chain, air freight is not the only component of trade costs.

Figure 10: Trade Costs (ad valorem relative to FOB value), Australian Imports, 1990 to 2012



FOB = free on board.
Sources: Pomfret and Sourdin (2010, 2023).

Figure 11: Trade Costs (ad valorem relative to FOB value), Australian Imports, 2013 to 2021



FOB = free on board.
Source: Pomfret and Sourdin (2023).

With respect to determinants of variations in trade costs by sea and air Pomfret and Sourdin found the following significant variables.

Table 1. Significant Explanatory Variables[5]

	2019		2021	
	Sea	**Air**	**Sea**	**Air**
Distance	+	+	+	+
Unit value (value/weight)	-	-	-	-
Total imports by mode	-	-	-	+
Institutional quality	-	-	-	-

Note: All coefficients were significant at the 1% level except the coefficient on total imports by mode for air transport in 2019 which was significant at the 5% level. All models were estimated with product level fixed effects. Log imports for air and sea are total imports by mode of transport. Year dummies were included.
Source: Pomfret and Sourdin (2023).

Table 1 shows the significant explanatory variables of changes in trade costs (these results are aligned with those of the 2010 study). These include distance, the ratio value to weight, and the size of trade, with a positive coefficient on distance and negative coefficient on the other two items. The same pattern applies for sea and air generally, except that the coefficient on the size of trade for air is positive in 2021 (and insignificant when the model is estimated using panel data).[6]

[5] The equations were estimated separately but there is an interaction amongst them. The shift in relative trade costs by mode leads to a substitution between modes. For example, as trade costs by sea rises relative to those for air (as in Figure 11), then some goods switch from sea to air. These will be the goods with the highest unit value travelling by sea, which will lower the available unit value of sea freight and raise the average trade cost. But these goods will be amongst the lowest unit values of goods travelling by air so the substitution will lower the average unit value of goods travelling by air, which will also raise average trade costs by air. Average trade costs increase in both modes. The extent of modal substitution that occurred in the COVID-19 period is a topic for further work.

[6] One explanation is that this result for the air mode is due to modal substitution on busier routes (although this outcome is not evident in the coefficient for sea transport). Another is that the growth in demand for goods led to an increase in e-commerce transactions, which mainly were handled by air, and which given the shipment size involved higher trade costs.

5. Forces for Reductions in Air Freight Trade Costs

The aftermath of COVID-19 and the readjustment of patterns of demand is likely to return trade costs to their pre-COVID levels. It will be interesting to monitor the pace at which that occurs.[7] One constraint that airlines report is that of replacing staff previously laid off in the COVID-19 period.[8]

But there is continuing interest in the scope to reduce trade costs to even lower levels compared to those pre-COVID. In this section we consider some opportunities in that respect. Table 1 shows the results that institutional quality is also significant and negative, that is higher institutional quality in the trading partner lowers trade costs. Shepherd et al (2016) report a similar result. They formed an index of the quality of forms of trade facilitation most relevant to air freight (mainly referring to the quality of the customs administration system) and found that there was considerable variation in this indicator across economies by income level. An increase in the index also led to significant increase in GVC participation. They formed another index that concentrated on the use of information technology, which showed a similar result. Improvements in institutional quality, via these channels, are expected to lower trade costs for freight moving by air.[9][10]

Considering the application of digital technologies, a number of reports have noted the slow pace of application of that technology in the air freight sector. For example,

> A large number of air freight forwarders and even the carriers still rely on manual processes which stands in the way of end-to-end visibility and transparency from the customers' standpoint (that is, creating) a transformation of the way in which the stakeholders operate and interact with each other to create a seamless journey for the digital customers (using digital booking, digital invoicing, and constant status updates). Additionally, air freight companies need to stop their reliance on manual data entry and

[7] There are other common factors driving fuel costs which lead to forces in other directions, for example fuel prices. For a discussion of recent events in jet fuel markets, and adaptations by airlines, see McKinsey and Company (2022).
[8] See e.g. Olson (2023).
[9] A further contribution might be expected from the implementation of the Trade Facilitation Agreement (TFA). Pomfret and Sourdin (2023) formed a variable based on the percentage of the implementation of the TFA but it was not significant in their model, in part because of its correlation with the institutional quality variable.
[10] Support for trade facilitation (but not commitments to air transport reform – see below) comes from trade agreements, which now include a number of relevant chapters. Pomfret and Sourdin (2023) considered a treatment of participation in trade agreements in their model but concluded it was difficult to capture their contribution because of their different depths of treatment and the overlaps between them.

make way for instant connectivity with the carriers, suppliers, and end customers (GLobalia Logistics Network, 2022).

The Boston Consulting Group (BCG) noted the scope for airlines to benefit from digitalisation:

Sales-system capabilities in air freight businesses have lagged those of their passenger counterpart whether in supporting consistent quotation practices for the same or a similar request or in offering dynamic pricing. Digital booking was nearly non-existent prior to 201(and) instant-confirmation booking is still quite new for most carriers and forwarders. As a result, carriers often have trouble adjusting prices in response to short-term changes in supply or demand. Many emails can be required to create a single booking, pricing for individual customers is difficult to execute, and response times are notoriously slow (BCG, 2021).

The BCG also noted the response that:

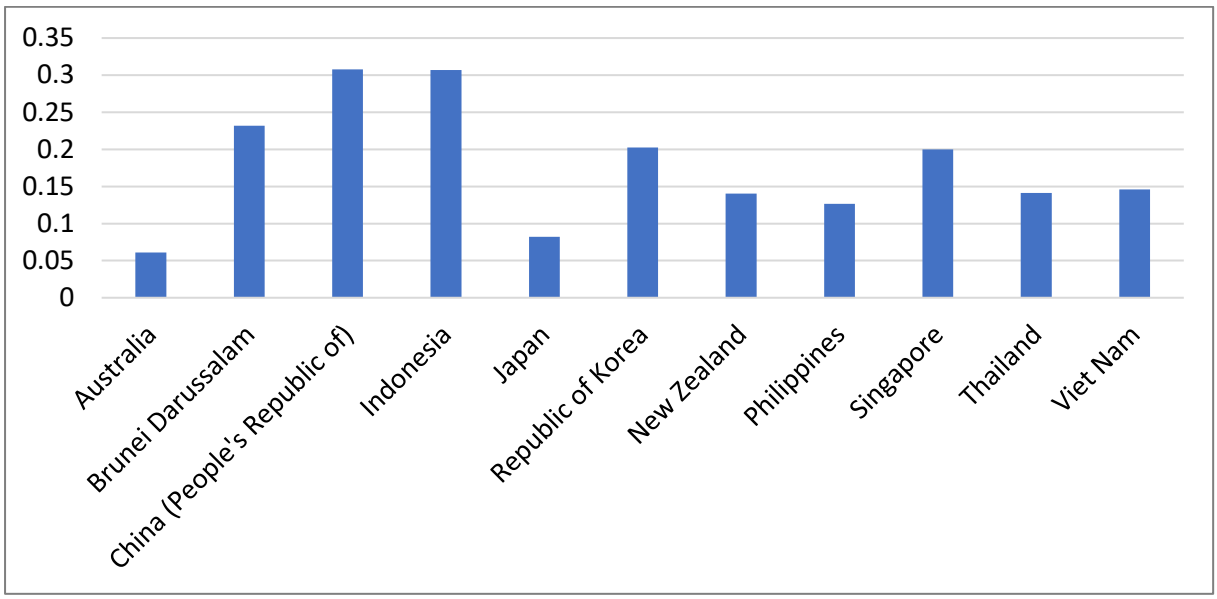
Many carriers have responded by beginning or accelerating migration to online sales, realizing that they cannot run their cargo operations effectively without digitizing them. This involves connecting their internal cargo management systems (CMS) to an e-sales channel, whether their own website or a digital distribution marketplace, such as (www.cargo.one). A well-run marketplace will significantly increase revenue opportunities, by giving carriers access to a wider group of potential customers, including small and midsize forwarders. Such a marketplace will also capture data not typically available through other channels, allowing airlines to evolve their marketing and pricing strategies and measure performance. This will allow them to fill otherwise empty capacity when demand is low and achieve optimal returns when demand is high.

In summary the more extensive application of digital technology is likely to lower trade costs, and according to the assessment of the state of the sector the consequences may be significant. Passing on the benefits of this innovation is facilitated by the support of services firms in the industry ecosystem, e.g. those able to construct and operate the platforms mentioned.[11] There is already evidence of a significant contribution of start-ups in this area of investment (The Economist, 2022).[12]

[11] Findlay, Roelfsema, and Van de Wouw (2021) also argue that these developments can be associated with new business models in air cargo markets, including greater use of point to point rather than hub and spoke services and the integration of digital platforms firms, e.g. Amazon, into air freight services.
[12]The application of blockchain technology to the traditional letter of credit system is expected to lower trade costs in both air and sea freight (see for example Deloitte, n.d. and Alsalim and Ucan, 2023).

Innovation and the development of the air freight services ecosystem is supported by open markets for services transactions, especially those which are digitally delivered. For example, OECD et al. (2022) show the negative relationship of the degree of restrictiveness on computer and other digital services, and the use of digital services as well as the share of digitally enabled services in total services trade (Figures 9 and 10 in that paper). Figure 12 shows the value of an index of the degree of restrictiveness applying to digital services transactions (scale of zero to 1). Generally, the scores are relatively low (0.2 or less) but there are important outliers. The significance of various impediments varies between countries, but generally conditions of infrastructure and connectivity are the most important. These items include conditions on cross-border data flows.[13]

Figure 12. Digital STRI Values, RCEP Members, 2022



RCEP = Regional Comprehensive Economic Partnership, STRI = Services Trade Restrictiveness Index.
Source: OECD Digital Services Trade Restrictiveness Index (oecd.org) (accessed 12 February 2024).

Also of interest is the degree of restrictiveness applying to trade in air cargo services themselves. More open markets are likely to be more competitive, innovation and show higher productivity growth leading to lower trade costs. Air transport markets generally are amongst the most restrictive. The OECD finds that:

- The average 2022 Services Trade Restrictiveness Index (STRI) in the air transport sector is 0.41 out of a maximum of 1 (most trade restricted) indicating a relatively low/high overall

[13] These details are available in the source data. What also matters is not just the levels of restrictiveness but the extent of divergence in policy across economies. This question is a topic for further work.

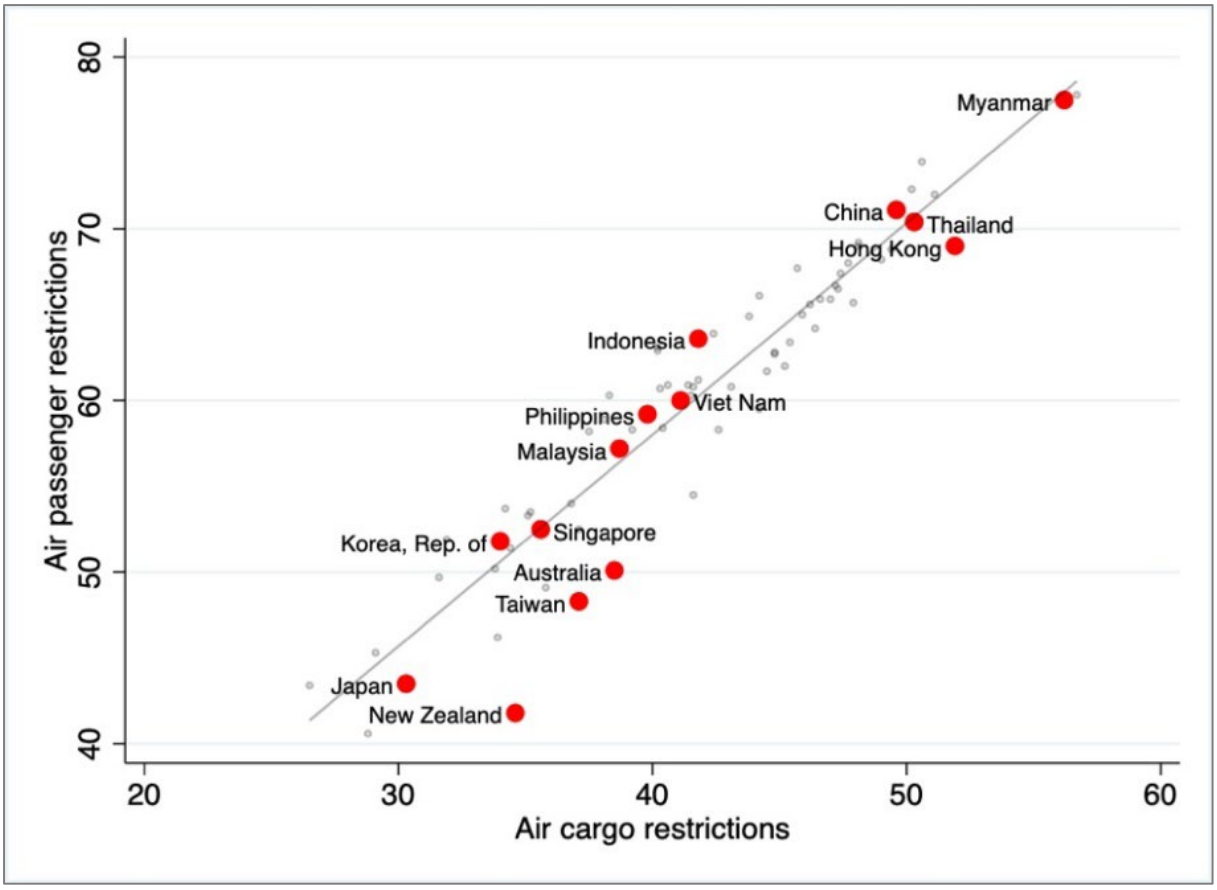
level of restrictiveness. However, individual country scores diverge considerably, ranging between 0.16 and 0.59.

- The best performing countries in the sector are Chile, the United Kingdom, and Brazil. Most reforms in 2022 were recorded in India, Japan, and Viet Nam.
- Restrictions on foreign entry are the main drivers of trade restrictiveness in the sector, with contributions to the total index values of 59% in OECD economies and 55% in non-OECD economies.
- The OECD estimates suggest that halving the distance to best practice in this sector is associated with a reduction in the costs of cross-border trade in air transport services between 9% and 25% for the average country included in the STRI database (OECD, n.d.).

The extent of restrictions applying in air cargo markets is consistently less than that applying in passenger markets. Figure 13 shows the differences, noting the different scales of each axis. However, whilst lower there are still relatively high degrees of restrictiveness (out of a total score of 100 in this case) across the region. There is value in continuing efforts to continue to increase the openness in cargo markets, the experience of which may have spillovers for the passenger sector. As noted by the OECD, a starting point is the regime for foreign investment. [14]

[14] The significance of the impact of STRI scores of economies exporting to Australia was tested by Pomfret and Sourdin, but the results were not significant, and the authors argued the contributions of the STRI to outcome were difficult to identify in their data set, in part because of the country coverage of the OECD data that were used in the analysis.

Figure 13: STRI Values for Passenger and Air Cargo Services



STRI = Services Trade Restrictiveness Index.
Source: Findlay, Roelfsema, and Van de Wouw (2021).

6. Conclusion

The air freight value chain did a good job responding to the COVID-19 shock, through a couple of substitutions brought on by higher air freight rates and leading to another round of adjustment in rates. Initial responses are already unwinding as the drivers shift, e.g. the change in goods demand. But the COVID-19 period has illustrated the jointness in supply and therefore the interaction between goods and passenger transport markets.

Air freight rates remain higher than pre-COVID (US$4 to US$6 per kilogramme compared to US$3 to US$4 depending on the route). There was an increase in trade costs of 25%–50% (higher for sea), according to the Australian experience. This level is significantly different to that in the pre-COVID period.

The increase in trade costs was less than the rise in air freight rates, given the presence of other items (insurance, handling etc – see the value chain model) in trade costs.

Trade costs are expected to return to their trend levels once the special factors associated with COVID-19 unwind (subject to other external forces, such as fuel prices).

There is opportunity for further adjustments to trade costs in the longer term, especially through the application of digital technology, in which the sector was a laggard, which will facilitate trade and movements across borders.

That process and the passing on of its benefits to users will be facilitated by a shift to more open markets, in both the services supporting the air freight ecosystem and in the services themselves. There is considerable scope for reform in both areas, with references to shifts in the relevant indices of services trade restrictiveness offering indicators of changes in performance. Inspection of the STRI values also indicates what is possible by benchmarking an economy's current policy regime with that of others.

Support for reform can be provided by implementation of commitments in the Trade Facilitation Agreements and by participation in trade agreements, and active implementation of relevant chapters related to trade facilitation.

Other constraints on productivity in this sector concern those on the movement of flight crew. Their significance was highlighted in the COVID-19 period, which has led to proposals for various reforms to conditions on people movement in times of crisis. It is interesting to consider how those crisis period proposals might be generalised to always apply.

References

Alsalim, M.S.H. and O.N. Ucan (2023), 'Secure Banking and International Trade Digitization using Blockchain', *Optik*, 272, 170269.

APEC (2021), 'Understanding the Impact of COVID-19 Requirements on Air Crew'. APEC Transport Working Group, December. bit.ly/3kM58vd (accessed 6 March 2023).

ASEAN (2019), *ASEAN Guidelines on Good Regulatory Practices*, Jakarta: ASEAN Secretariat.

Boston Consulting Group (2022), 'Digital Innovation Will Take Air Freight to New Heights', 11 August. https://www.bcg.com/publications/2021/digitization-in-air-freight-value

Deloitte (n.d.), 'How Blockchain Can Reshape Finance'. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/grid/trade-finance-placemat.pdf

*Economist, The (*2022), 'A Flotilla of Startups Want to Streamline Global Supply Chains, 7 May. https://www.economist.com/business/2022/05/07/a-flotilla-of-startups-wants-to-streamline-global-supply-chains

Feng, B., Y. Li, and Z.-J. M. Shen (2015), 'Air Cargo Operations: Literature Review and Comparison with Practices', *Transportation Research Part C: Emerging Technologies*, 56, pp.263–80.

Findlay, C., H. Roelfsema, and N. van de Wouw (2021) 'Feeling the Pulse of Global Value Chains: Air Cargo and COVID-19'. *ERIA Discussion Paper Series*, no. 390.

Globalia Logistics Network (2002), 'How Digitization can Revitalize the Air Freight Industry', 14 July. https://www.globalialogisticsnetwork.com/blog/2022/07/14/how-digitization-can-help-to-revitalize-the-air-freight-industry/

International Air Transport Association (IATA) (2022a), 'Air Passenger Market Analysis', December. https://www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-market-analysis---december-2022/ (accessed 5 March 2023).

IATA (2022b), 'Air Cargo Market Analysis', December. https://www.iata.org/en/iata-repository/publications/economic-reports/air-cargo-market-analysis---december-2022/#:~:text=For%20the%20full%202022%20calendar,and%201.6%25%20below%202019%20levels (accessed 5 March 2023).

IATA (2022c), 'IATA Economics Chart of the Week: The Importance of 'Preighters' Seems to Start to Diminish', April. https://www.iata.org/en/iata-repository/publications/economic-reports/the-importance-of-preighters-seems-to-start-to-diminish/ (accessed 5 March 2023).

McKinsey and Company (2022), 'Why Rising Fuel Prices Might not be as Bad for the Airline Sector as it Seems', 15 July. https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/why-rising-fuel-prices-might-not-be-as-bad-for-the-airline-sector-as-it-seems

Olson, G. (2023), 'Why Are Flights so Expensive Right Now', *Thrifty Traveler*, 19 April. https://thriftytraveler.com/guides/travel/why-are-flights-so-expensive-right-now/

Organisation for Economic Co-operation and Development (OECD) (n.d.), 'Air Transport Services 2022'. https://www.oecd.org/trade/topics/services-trade/documents/oecd-stri-sector-note-trair.pdf

OECD, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Economic Commission for Africa (ECA), and United Nations Commission for Latin America and the Caribbean (ECLAC) (2022), 'Shedding New Light on the Evolving Regulatory Framework for Digital Services Trade', *Trade Policy Brief*. https://issuu.com/oecd.publishing/docs/shedding-new-light-on-the-evolving-regulatory-fram (accessed 5 March 2023).

Pearce, B. (2013), 'Profitability and the Air Transport Value Chain', *IATA Economics Briefing* No. 10. June.

Pomfret, R. and P. Sourdin (2010), 'Why Do Trade Costs Vary?' *Review of World Economics*, 146, pp.709–30.

Pomfret, R. and P. Sourdin (2023), 'Trade Costs Before and After COVID-19'. Working Paper.

PortCalls (2022), 'Belly Space Preighter Use Gain and Wane with the Pandemic', 15 November. https://www.portcalls.com/belly-space-preighter-use-gain-and-wane-with-pandemic/ (accessed 6 March 2023).

Shepherd, B., A. Shingal, and A. Raj (2016), 'Value of Air Cargo: Air Transport and Global Value Chains'. Montreal: IATA.

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