

MACQUARIE ASSET MANAGEMENT

Pathways

The post-COVID-19 recovery in global air travel

The Zoom effect versus pent-up demand |
Originally published in April 2022



03

Introduction: The biggest crisis global air travel has ever faced

05

The impact of COVID-19 and the recovery so far: Domestic air travel leads the way and cargo has benefitted

10

The near-term outlook: Pent-up demand to drive growth

16

Zoom and business travel: How large an impact for teleconferencing?

20

The long-term drivers of air travel volumes: Income growth, income growth, income growth

29

Conclusion: Pent-up demand swamps the Zoom effect

Pathways is a proprietary publication for clients of Macquarie Asset Management. For more information, or to speak to the author of this issue, Daniel McCormack, please contact your Macquarie Asset Management Relationship Manager.

Important information and disclaimer

This market commentary has been prepared for general informational purposes by the author, who is a part of Macquarie Asset Management (MAM), the asset management business of Macquarie Group (Macquarie), and is not a product of the Macquarie Research Department. This market commentary reflects the views of the author and statements in it may differ from the views of others in MAM or of other Macquarie divisions or groups, including Macquarie Research. This market commentary has not been prepared to comply with requirements designed to promote the independence of investment research and is accordingly not subject to any prohibition on dealing ahead of the dissemination of investment research.

Nothing in this market commentary shall be construed as a solicitation to buy or sell any security or other product, or to engage in or refrain from engaging in any transaction. Macquarie conducts a global full-service, integrated investment banking, asset management, and brokerage business. Macquarie may do, and seek to do, business with any of the companies covered in this market commentary. Macquarie has investment banking and other business relationships with a significant number of companies, which may include companies that are discussed in this commentary, and may have positions in financial instruments or other financial interests in the subject matter of this market commentary. As a result, investors should be aware that Macquarie may have a conflict of interest that could affect the objectivity of this market commentary. In preparing this market commentary, we did not take into account the investment objectives, financial situation or needs of any particular client. You should not make an investment decision on the basis of this market commentary. Before making an investment decision you need to consider, with or without the assistance of an adviser, whether the investment is appropriate in light of your particular investment needs, objectives and financial circumstances.

Macquarie salespeople, traders and other professionals may provide oral or written market commentary, analysis, trading strategies or research products to Macquarie's clients that reflect opinions which are different from or contrary to the opinions expressed in this market commentary. Macquarie's asset management business (including MAM), principal trading desks and investing businesses may make investment decisions that are inconsistent with the views expressed in this commentary. There are risks involved in investing. The price of securities and other financial products can and does fluctuate, and an individual security or financial product may even become valueless. International investors are reminded of the additional risks inherent in international investments, such as currency fluctuations and international or local financial, market, economic, tax or regulatory conditions, which may adversely affect the value of the investment. This market commentary is based on information obtained from sources believed to be reliable, but we do not make any representation or warranty that it is accurate, complete or up to date. We accept no obligation to correct or update the information or opinions in this market commentary. Opinions, information, and data in this market commentary are as of the date indicated on the cover and subject to change without notice. No member of the Macquarie Group accepts any liability whatsoever for any direct, indirect, consequential or other loss arising from any use of this market commentary and/or further communication in relation to this market commentary. Some of the data in this market commentary may be sourced from information and materials published by government or industry bodies or agencies, however this market commentary is neither endorsed or certified by any such bodies or agencies. This market commentary does not constitute legal, tax accounting or investment advice. Recipients should independently evaluate any specific investment in consultation with their legal, tax, accounting, and investment advisors. Past performance is not indicative of future results.

This market commentary may include forward-looking statements, forecasts, estimates, projections, opinions and investment theses, which may be identified by the use of terminology such as "anticipate", "believe", "estimate", "expect", "intend", "may", "can", "plan", "will", "would", "should", "seek", "project", "continue", "target" and similar expressions. No representation is made or will be made that any forward-looking statements will be achieved or will prove to be correct or that any assumptions on which such statements may be based are reasonable. A number of factors could cause actual future results and operations to vary materially and adversely from the forward-looking statements. Qualitative statements regarding political, regulatory, market and economic environments and opportunities are based on the author's opinion, belief and judgment.

Other than Macquarie Bank Limited ABN 46 008 583 542 ("Macquarie Bank"), any Macquarie Group entity noted in this document is not an authorised deposit-taking institution for the purposes of the Banking Act 1959 (Commonwealth of Australia). The obligations of these other Macquarie Group entities do not represent deposits or other liabilities of Macquarie Bank. Macquarie Bank does not guarantee or otherwise provide assurance in respect of the obligations of these other Macquarie Group entities. In addition, if this document relates to an investment, (a) the investor is subject to investment risk including possible delays in repayment and loss of income and principal invested and (b) none of Macquarie Bank or any other Macquarie Group entity guarantees any particular rate of return on or the performance of the investment, nor do they guarantee repayment of capital in respect of the investment.

Past performance is no guarantee of future results.

Diversification may not protect against market risk.

Investing in real assets securities includes the risk that the value of a fund's shares will be affected by factors particular to real assets securities and related industries or sectors (such as government regulation) and may fluctuate more widely than that of a fund that invests in a broad range of industries.

Natural or environmental disasters, such as earthquakes, fires, floods, hurricanes, tsunamis, and other severe weather-related phenomena generally, and widespread disease, including pandemics and epidemics, have been and can be highly disruptive to economies and markets, adversely impacting individual companies, sectors, industries, markets, currencies, interest and inflation rates, credit ratings, investor sentiment, and other factors affecting the value of the Portfolio's investments. Given the increasing interdependence among global economies and markets, conditions in one country, market, or region are increasingly likely to adversely affect markets, issuers, and/or foreign exchange rates in other countries. These disruptions could prevent the Portfolio from executing advantageous investment decisions in a timely manner and could negatively impact the Portfolio's ability to achieve its investment objective. Any such event(s) could have a significant adverse impact on the value and risk profile of the Portfolio.

Gross domestic product is a measure of all goods and services produced by a nation in a year. It is a measure of economic activity.

Macquarie Group, its employees and officers may act in different, potentially conflicting, roles in providing the financial services referred to in this document. The Macquarie Group entities may from time to time act as trustee, administrator, registrar, custodian, investment manager or investment advisor, representative or otherwise for a product or may be otherwise involved in or with, other products and clients which have similar investment objectives to those of the products described herein. Due to the conflicting nature of these roles, the interests of Macquarie Group may from time to time be inconsistent with the interests of investors. Macquarie Group entities may receive remuneration as a result of acting in these roles. Macquarie Group has conflict of interest policies which aim to manage conflicts of interest.

All third-party marks cited are the property of their respective owners.

© 2022 Macquarie Group Limited

Introduction: The biggest crisis global air travel has ever faced





The COVID-19 crisis took an unprecedented toll on global air travel. As the crisis broke in early 2020 and health concerns increased, the formal travel restrictions that were put in place effectively caused air travel to grind to a halt – volumes fell 96% in the US, 85% in China and 94% in Europe.¹

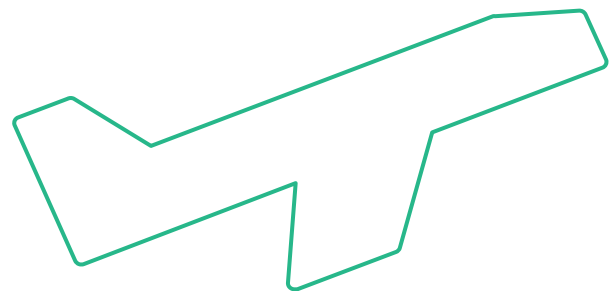
Once countries contained the first wave of the virus air travel resumed and in some countries the recovery has been robust. But it has been stronger for domestic travel than international travel, and there are still uncertainties about the speed of the recovery from here and what the long-run growth rate will be once we get back to pre-crisis activity levels. Chief amongst these is how large the “Zoom effect” will be. This is the idea that COVID-19 has proved that Zoom is more effective for business meetings than we thought pre-crisis, and this could reduce growth in business travel in both the short and long run.

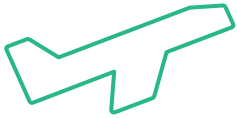
There is also considerable uncertainty about the amount of pent-up demand in the system. Will this recovery be like 2001, when demand was strong enough to drive volumes back to a level consistent with gross domestic product (GDP), but not strong enough to give rise to an overshoot as consumers looked to make up for the travel missed during the downturn? Or are we now going to see a surge in demand as people look to take the holiday they missed during the COVID-19 period, go to the wedding that was postponed, and visit the clients they haven't seen in over two years? Thinking longer term, is GDP still the powerful driver of air travel volumes it was pre-crisis? And will the need to decarbonise lead to price increases that will slow growth?

In this note we address these interesting questions. The first section examines COVID-19's impact on air travel across the world and provides an update on the latest volume numbers by region, as well as an assessment of the robustness of the recovery to date. The second section examines the likely strength and trajectory of the recovery in the near term. It focuses on the potential for pent-up demand to drive growth and illustrates just how powerful an impact it could have on volumes projections. The third section analyses the Zoom effect and tries to quantify it. The fourth section focuses on the long-term outlook for growth in air travel volumes and examines the relationships with, and sensitivities to, income growth and price changes. The final section offers our conclusions.

1. Passenger volumes at Frankfurt Airport from December 2019 to April 2020.

The impact of COVID-19 and the recovery so far: Domestic air travel leads the way and cargo has benefitted





After decades in which global air travel proved resilient to all kinds of shocks, from the oil shocks of the 1970s, to the high interest rates and double-dip recession of the early 1980s, and the global downturns of the early 1990s and early 2000s, COVID-19 wreaked havoc on the

industry in 2020, with global revenue passenger kilometres (RPKs) falling 65.8% (Figure 1). Volumes bounced back solidly in 2021, but with restrictions on international travel still in place for much of the year in many countries, volumes were less than half of 2019 levels.

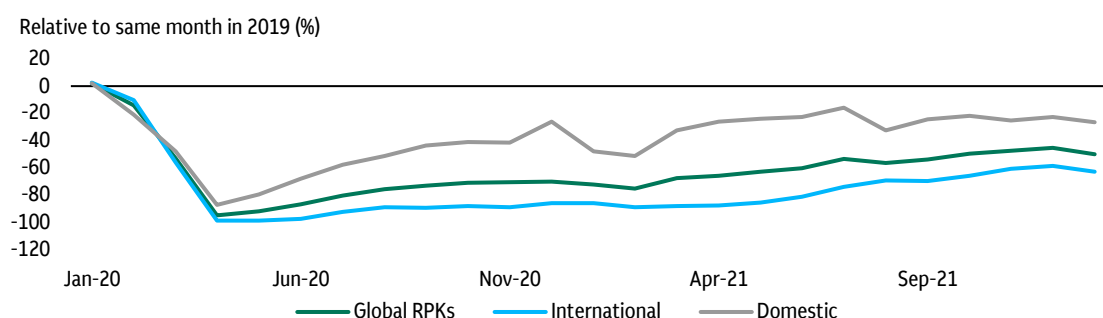
Figure 1:
Global RPKs: COVID-19 was the worst downturn ever for global air travel



Sources: International Air Transport Association (IATA) Air Passenger Monthly Analysis (December 2021), Boeing Commercial Market Outlook (2009, 2014, 2021).

The downturn was also extremely sudden, with year-over-year growth in RPKs falling from a 2.4% expansion to a 94.3% contraction in just three months from January 2020 to April 2020 (Figure 2). The travel restrictions were a major factor behind the collapse in activity, but it is highly likely that a major contraction in volumes would have occurred even if no formal travel restrictions were put in place, due to the health risks and natural human caution prevailing at the time.

Figure 2:
Global RPKs by month: A sudden stop



Source: IATA Air Passenger Monthly Analysis (<https://www.iata.org/en/publications/economics/>).

Domestic air travel has led the recovery, particularly in geographically large countries such as the US and China. With international travel still formally restricted in some countries and quarantine requirements in place in many others, the slower recovery in this component is not a surprise. In the US, domestic air travel is now back to 87.4% of its pre-COVID-19 peak, while international travel has reached only 59.1% (Figure 3). The recovery has been slower in South America – in Brazil, domestic travel is back to 86.7% of its pre-COVID-19 peak, while international travel has recovered only 48.9% (Figure 4).

Figure 3:
Air travel volumes – US

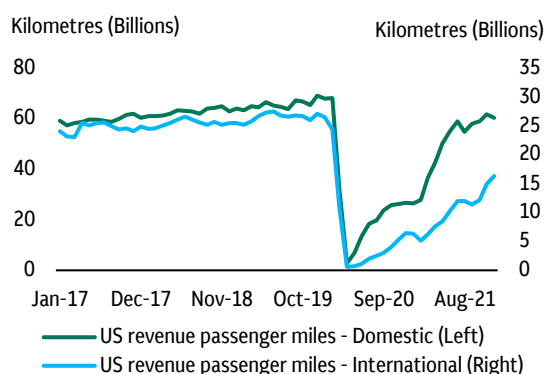
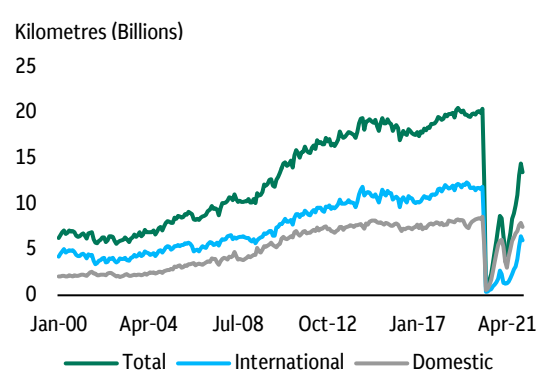


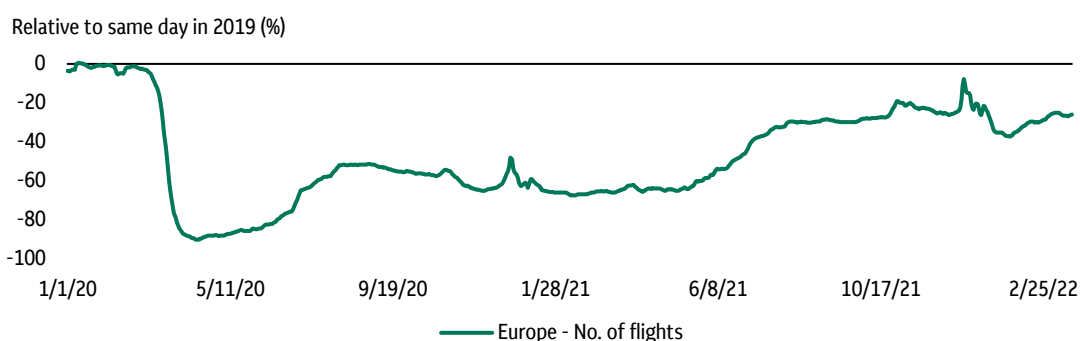
Figure 4:
Air travel volumes – Brazil



Source: Macrobond (March 2022).

The number of intra-Europe flights is currently 25.7% below the equivalent day in 2019 (Figure 5). Flight activity has closely tracked changes in infection rates and movement restrictions in continental Europe. Activity initially picked up as Europe recovered from the first wave of the virus in 3Q20, then paused as infection rates surged and Europe went back into recession, before increasing again over the summer of 2021 as flight and movement restrictions across Europe were eased. It is worth noting that the number of flights may overstate the recovery somewhat, as load factors are likely to be lower than pre-crisis.

Figure 5:
Flight volumes – Europe



Source: Eurocontrol (March 2022).

The lower load factor can be seen in the data for Frankfurt airport (Figure 6), where a gap has opened up between the number of flights and the number of passengers that wasn't there pre-crisis. Specifically, flight volumes are back to 53.9% of their pre-COVID-19 peak, while passenger volumes are only back to 39.4%. For Amsterdam, there has been a stronger recovery in intra-Europe flights than in the longer, intercontinental flights – intra-Europe flights is back to 55% of pre-COVID-19 levels, whereas intercontinental travel back to 51.4% (Figure 7).

Figure 6:
Air travel – Frankfurt Airport

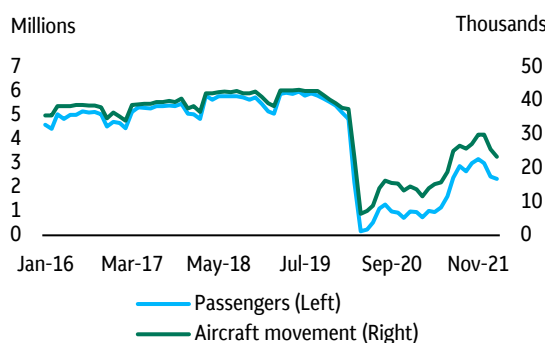
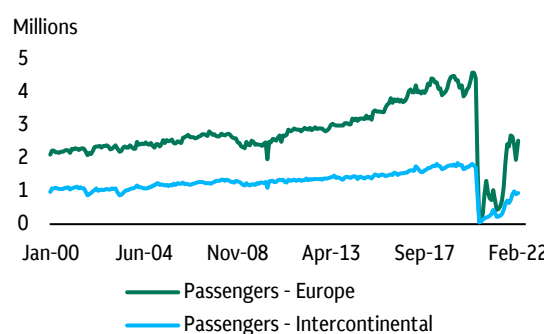


Figure 7:
Air travel – Amsterdam Airport



Source: Macrobond (March 2022).

In Asia flight volumes are still very suppressed. Domestic flights in China have recovered quite strongly, but activity in much of the rest of the region is struggling (Figures 8 and 9). For many countries in Asia, international travel is a relatively high proportion of total travel, which means that a recovery in the region is likely to be dependent on a normalisation in this segment of the market.

Figure 8:
Air travel – South Korea

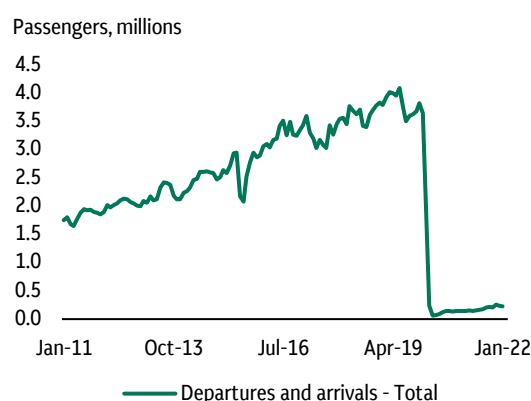
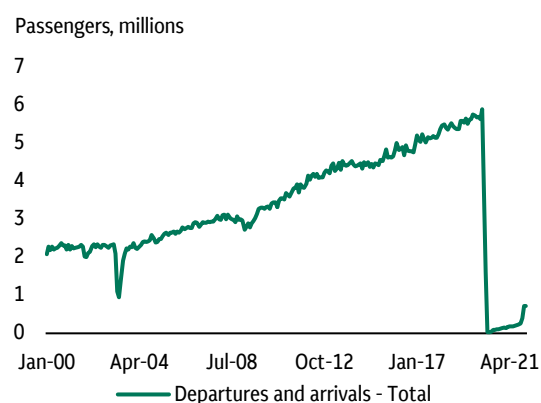


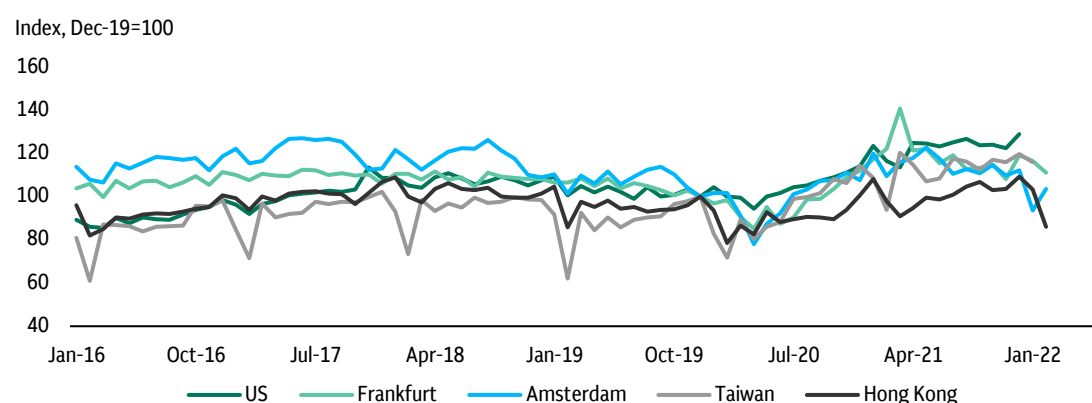
Figure 9:
Air travel – Singapore



Source: Macrobond (March 2022).

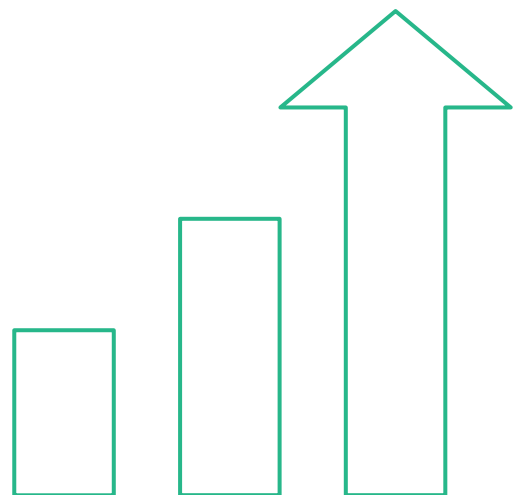
Lastly, cargo volumes have been relatively unaffected by the crisis, with some airports actually benefitting as many people shifted to online shopping. Figure 10 shows cargo volumes from the start of 2016 to February 2022 for a range of countries for which we have data. All show a pickup in activity during the COVID-19 period.

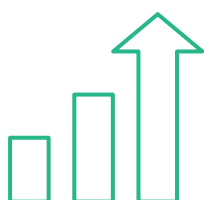
Figure 10:
Cargo volumes



Source: Macrobond (March 2022).

The near-term outlook: Pent-up demand to drive growth

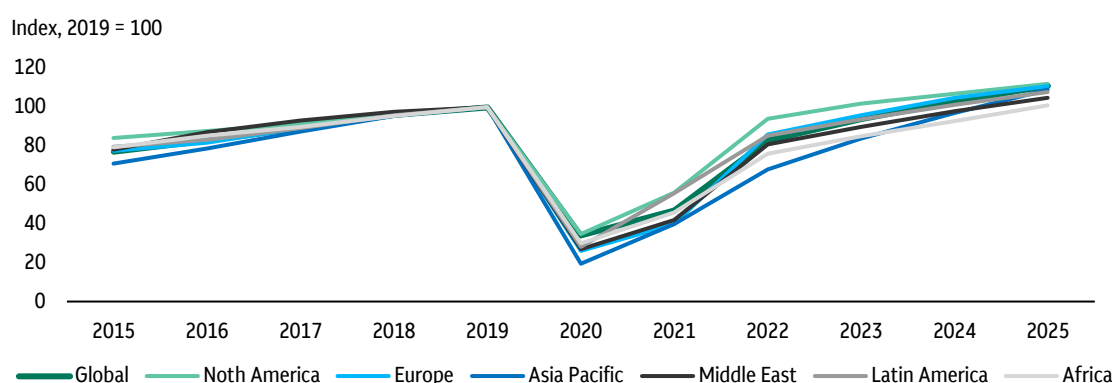




In this section we examine the near-term outlook for air travel volumes, focusing on when volumes are likely to return to pre-COVID-19 levels and how strong pent-up demand could be. We use the IATA's forecasts for RPKs for 2022-2025,² shown in Figure 11, as a comparison point. These projections have global RPKs returning to their

2019 level in 2024. However, there is substantial variation by region, with North America seeing the strongest recovery (back to 2019 levels in 2023), Europe and Latin America³ needing an extra year to get back to pre-COVID-19 levels (2024), while Asia, the Middle East and Africa take longer still (2025).

Figure 11:
Global forecasts for RPKs



Source: IATA (<https://www.iata.org/en/pressroom/2022-releases/2022-03-01-01/#:~:text=In%202021%2C%20overall%20traveler%20numbers,2024%20and%20101%25%20in%202025>).

How reasonable are these projections? Could air travel return to pre-COVID-19 levels sooner? To address these questions we examine four recovery scenarios to see how volumes evolve under different assumptions. The aim is to give a sense of the sensitivities involved to better equip us to make a judgement about the likely speed of the recovery.

2. <https://www.iata.org/en/pressroom/2022-releases/2022-03-01-01/>

3. The Latin American forecasts are based on an arithmetic average of South America, Central America and the Caribbean.

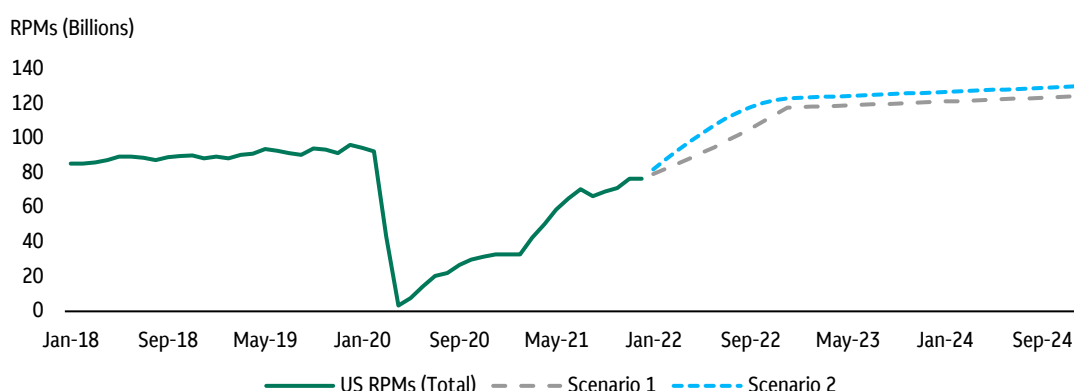
The best data we have are for the US and it is the most advanced of the major developed world economies in terms of opening up, so it could be considered the canary in the coal mine.⁴ The recovery in the US has been robust so far, particularly in domestic travel. After the initial dead-cat bounce following the first COVID-19 wave, growth in air travel started to flatten out in the second half of 2020 and particularly in 4Q20 as COVID-19 infection rates surged again. Through 2021 the recovery accelerated once more, with domestic and international revenue passenger miles (RPMs) growing at 7.1% and 8.1% per month respectively.

Scenarios 1 and 2

Figure 12 shows total RPMs for the US and two hypothetical projections. These projections use recent growth rates as the starting point and adjust or modify them in different ways going forward to return to a more normal rate of growth over time.

- **Scenario 1.** This assumes that RPMs grow to end 2022 at half the rate they averaged in 2021, and then revert to their long-run growth rate from the start of 2023.
- **Scenario 2.** This scenario assumes that the monthly growth rate slows in a linear fashion over the course of 2022 from the average growth rate of 2021 to its long-run growth rate. From 2023 onwards, volumes increase at their long-run growth rate.

Figure 12:
US RPMs: The recovery so far and two scenarios



Source: Macrobond (March 2022).

What we find interesting about each of these scenarios is that even though the assumptions are quite modest relative to the trajectory of the recovery to date, they are both far stronger than the IATA forecasts. In Scenario 1, volumes are 2.4% below the IATA case in 2022, but in 2023 and 2024 they are 10.3% and 8.1% higher, respectively. In Scenario 2, volumes are above the IATA forecasts in all three years – 7.1% higher in 2022, 15.4% in 2023 and 13.1% in 2024.

4. Other regions will take longer – Europe is opening up more slowly and Asia and the Middle East are more dependent on international travel – but the same principles apply, so the US is a good proxy for what will, in time, happen elsewhere.

Scenario 3: 9/11 recovery

In this scenario, air travel returns to its “normal” level over the same number of quarters as it did after the 2001 crisis. Here we define normal as the level of air travel consistent with its historical relationship to GDP.⁵ That is, it assumes that air travel grew/contracted through the downturn and subsequent upswing at the same multiplier of GDP it did over the long run. This approach has the advantage of adjusting for the different GDP paths during the 2001 and 2020 downturns.

After 9/11 it took 14 quarters – from the peak in volumes in 2Q01 until 4Q04 – for air travel to regain its “normal” level (Figure 13). In the current crisis the peak occurred in 4Q19, which means that a 2001-style recovery would see US air travel volumes regain their equilibrium level in 2Q23 (Figure 14). There are several interesting points that flow from this:

- First, this trajectory implies a much slower rate of growth going forward than has occurred during the recovery to date. Air travel volumes reaching their equilibrium level in 2Q23 implies 5.3% growth per quarter for the next seven quarters. By comparison, during 2021 volumes grew by 24.2% on average per quarter, and since the trough in volumes in 2Q20 they have grown an average of 44.1% per quarter.
- Second, this would imply that US travel volumes will be 13.9% higher in 2023 than they were in 2019, whereas the IATA is forecasting them to be only 2% higher. In other words, even this relatively modest growth profile is noticeably stronger than what the IATA is forecasting.

Figure 13:
The 2001 downturn was fairly shallow, with limited buildup of latent demand

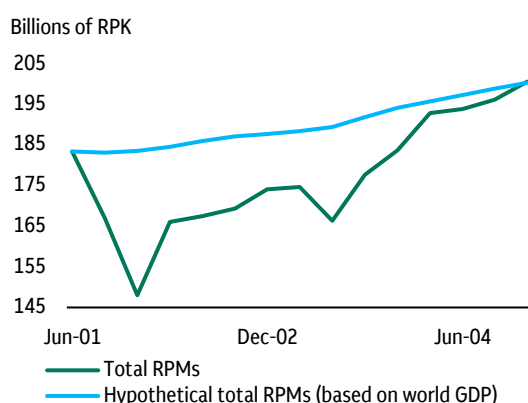
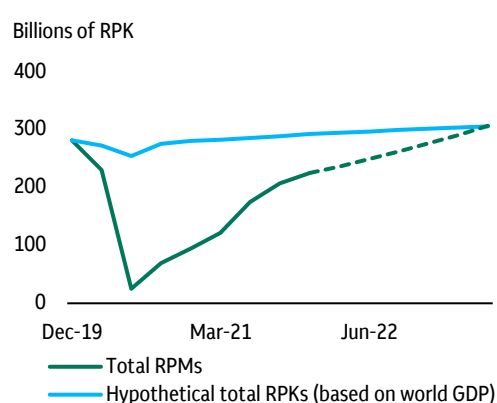


Figure 14:
The 2020 downturn has been much deeper, with a potentially huge buildup of latent demand



Source: Macrobond (March 2022).

5. We use world GDP for our analysis because the correlation between US travel volumes and world GDP is slightly higher than with US GDP.

One challenge to this approach is that it leaves no scope for pent-up demand to drive volumes. In the 2001-2004 period, the cumulative shortfall in air travel relative to its equilibrium level was 190 billion Revenue Passenger Miles (RPMs), or 25.9% of pre-downturn levels. If volumes pan out the same way again this time, the cumulative shortfall will be 1.3 trillion RPMs, or 112.4% of pre-downturn levels. In short, the amount of “missed travel” in this crisis is a multiple of what it was in 2001-2004, meaning there is much greater scope for pent-up demand to drive the recovery this time around.

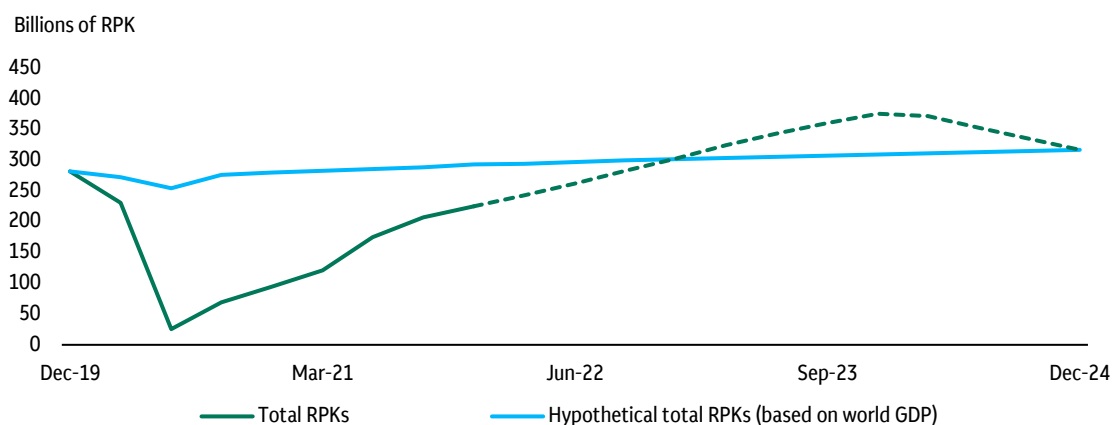
Scenario 4: Pent-up demand

In this final scenario we assume that the crisis has created some pent-up demand. That is, as economies reopen and countries remove domestic and international travel restrictions, people will be keen to make up for some of the travel they missed during the COVID-19 period. This could occur for both leisure and business travel.

Specifically, we assume that RPMs regain their equilibrium level by the end of this year and then, over the course of 2023 and 2024, recover one-quarter of the RPMs⁶ that were lost during the downturn, before returning to a level consistent with GDP (Figure 15). Under this scenario 2022 is slightly (4.7%) higher than the IATA case, while 2023 (25.0%) and 2024 (17.5%) are much higher (Figure 16).

The key point is that this is a powerful effect. Even if only a modest amount of lost demand is recovered, current industry forecasts are too low. If a decent amount – say 50% – of lost demand is recovered, current forecasts are too low by a large margin.

Figure 15:
Volumes profile under a 25% pent-up demand catch-up scenario

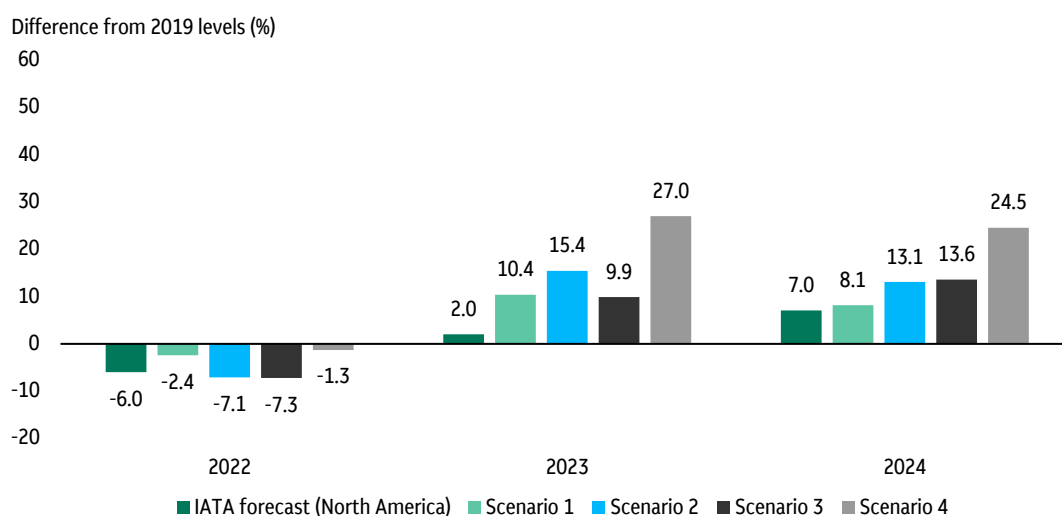


Source: Macrobond (March 2022).

6. It is worth noting that because this recovery is stronger than Scenario 4, there is less lost demand, meaning the pent-up demand recovery is smaller than would be implied by Scenario 4.

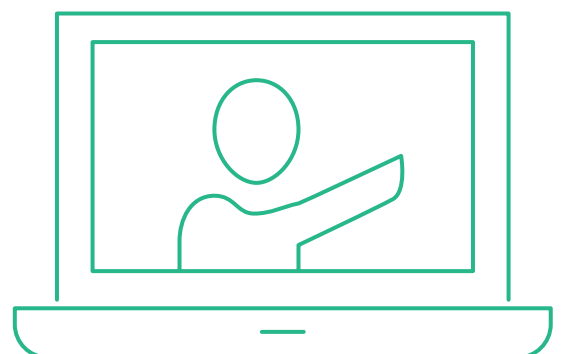
Of the four scenarios considered in this section, all are stronger than the IATA forecasts (Figure 16). The IATA forecasts not only assume no recovery of lost demand but also assume something weaker than what occurred in 2001, when it took more than three years for air travel to simply return to a level consistent with the level of overall economic activity (GDP). The speed of the recovery to date, combined with the huge amount of potential pent-up demand that has built up over the last two years, suggest to us that the balance of risks to the IATA projections, both for the US and globally, is firmly to the upside.

Figure 16:
The four scenarios versus the IATA forecasts



Sources: Macrobond (March 2022), IATA.

Zoom and business travel: How large an impact for teleconferencing?



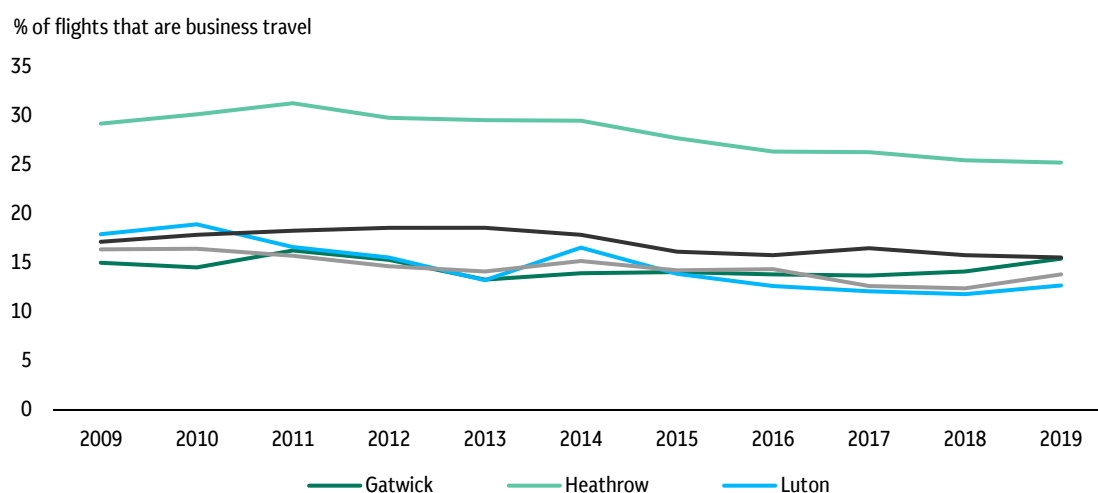


One of the key learnings of the COVID-19 period is that teleconferencing works quite well as an alternative to in-person business meetings. Some analysts are concerned about the impact this will have on both the near-term recovery in air travel and the long-term trend growth rate once volumes return to normal levels. The magnitude of this effect depends on two factors:

- the proportion of flights that are business-related
- the percentage of those business flights that can now be replaced by teleconferencing.

Data on the proportion of air travel that is business related is, as far as we know, thin on the ground. UK airports survey waiting passengers on the purpose of their travel, and those surveys suggest business travel is around 15-20% of total travel, although there is quite a bit of variation from airport to airport (Figure 17). Interestingly, the proportion that is business travel has been trending down over time at all airports, suggesting leisure is the faster-growing segment.

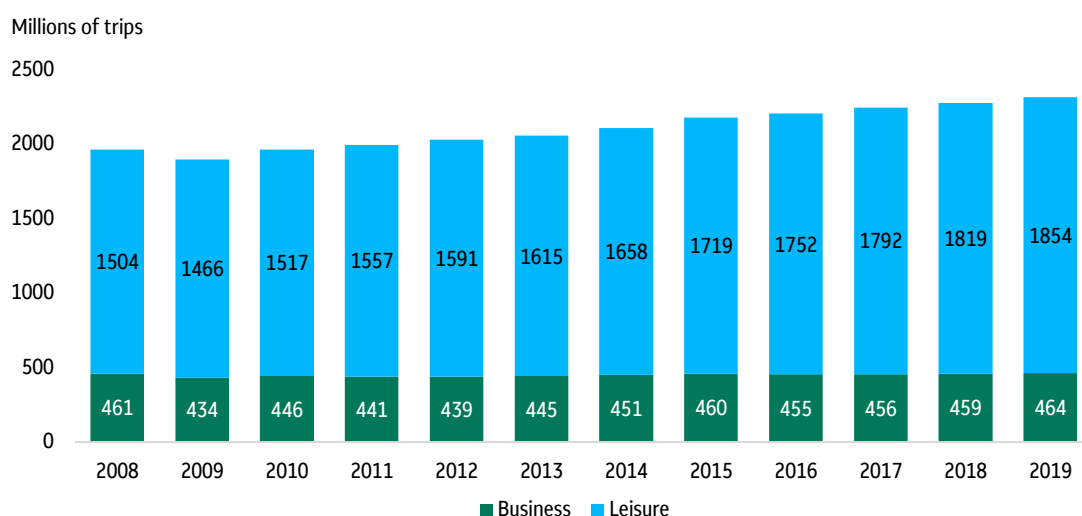
Figure 17:
Business travel as a share of total travel at UK airports



Source: <https://www.gov.uk/government/statistical-data-sets/aviation-statistics-data-tables-avi> (March 2022).

Data for the US, shown in Figure 18, paint a similar picture: business trips⁷ as a percentage of all trips have fallen steadily, from 23.5% in 2008 to 20% in 2019. This is survey data, however, and it may be the case that survey-based data biases the number lower. Usually these data are collected through voluntary interviews at the airport, and leisure travellers are more likely to have the time and the inclination to participate in the survey. The extent of that bias may be difficult to measure, but in our view a decent working assumption is that business travel accounts for roughly one-quarter of all air travel.

Figure 18:
US business and leisure travel



Source: https://www.ustravel.org/system/files/media_root/document/Research_Travel-Forecast_Summary-Table.pdf

While business's share of travel volumes is relatively small, it does account for a much larger share of revenue and profit for the airlines. A higher proportion of business travellers fly business class or first class, and they tend to book closer to the travel date, when ticket prices are often higher. This doesn't have direct implications for travel volumes, but it could have indirect implications if reduced business travel means lower revenues, requiring price increases for other classes of travel.

7. Trips of 50 miles or more, one way, away from home or including one or more nights away from home.

The second question, of what proportion of this travel can be replaced by teleconferencing, is even more uncertain. Employees and employers alike may demand spending less time on planes in the post-COVID-19 period, but the question is how many trips are actually superfluous to requirements. One survey by Oliver Wyman (Figure 19) suggests that 43% of business travellers plan to travel less post-COVID-19.

Figure 19:
Business travel plans post-COVID-19

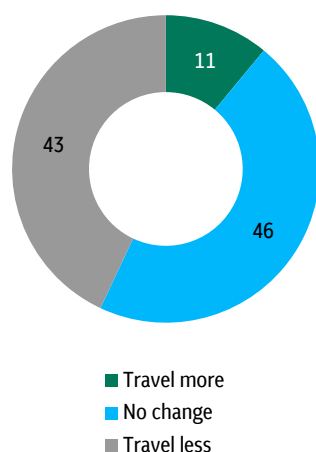
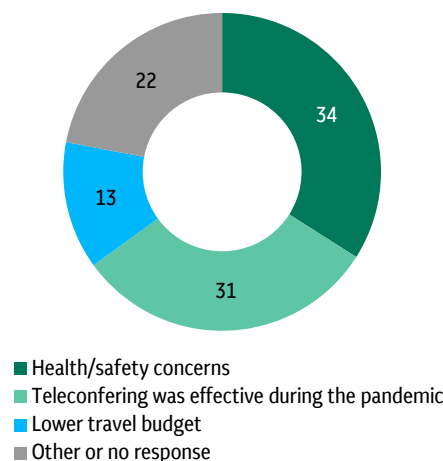


Figure 20:
Reasons for traveling less



Source: <https://www.oliverwyman.com/our-expertise/insights/2020/oct/anticipating-the-travel-recovery.html> (March 2022).

Examining the reasons for that reduction in travel, 31% of those surveyed said it is because teleconferencing has proven to be effective during the pandemic (Figure 20). Health and safety concerns (34%) and a lower travel budget (11%) were the other factors cited for reduced travel. Assuming these last two factors normalise, multiplying those numbers out makes for a fairly small impact – 25% (of total travel that is business) × 43% (of business travellers that plan to travel less post-COVID-19) × 31% (due to teleconferencing proving effective) means that teleconferencing may reduce global travel volumes by 3.3% post-COVID-19, which is roughly half a year's annual growth in travel based on the growth in GPKs from 2010 to 2019 inclusive.

The long-term drivers
of air travel volumes:
Income growth,
income growth,
income growth



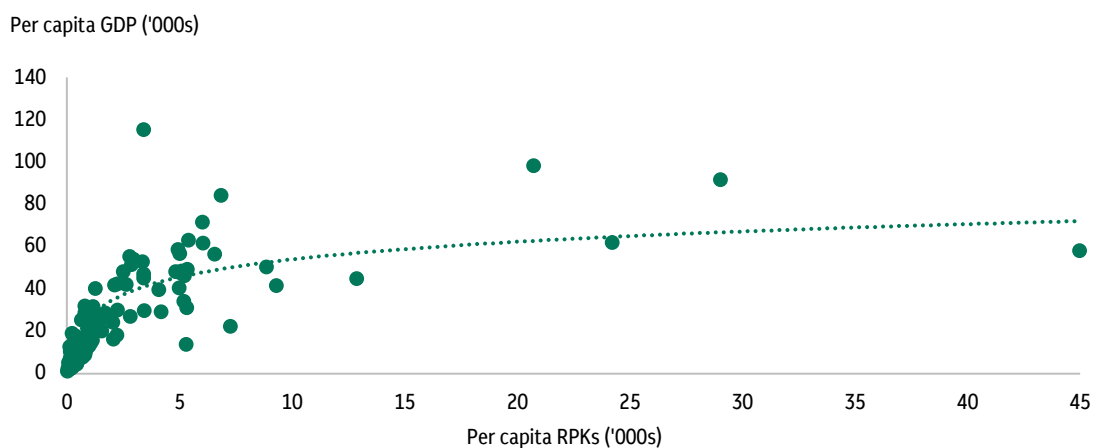


Beyond the near-term outlook there is also uncertainty about how rapidly air travel volumes will grow once the immediate recovery is over and the sector normalises. The literature (and basic economic theory) suggests there are two main variables to consider: income growth and prices. We examine both below.

Income growth: A powerful relationship

There is an abundance of evidence pointing to a strong relationship between income level and air travel intensity. Cross-country data show this clearly. Figure 21 takes data from Our World in Data (OWID) on travel intensity and lines that up with International Monetary Fund (IMF) data on GDP per capita. It shows a strong positive relationship across the data set, indicating that citizens of countries with high incomes (proxied here by GDP per capita) tend to travel more (and in some cases a lot more) than citizens of countries with low incomes.

Figure 21:
Travel intensity rises sharply with income

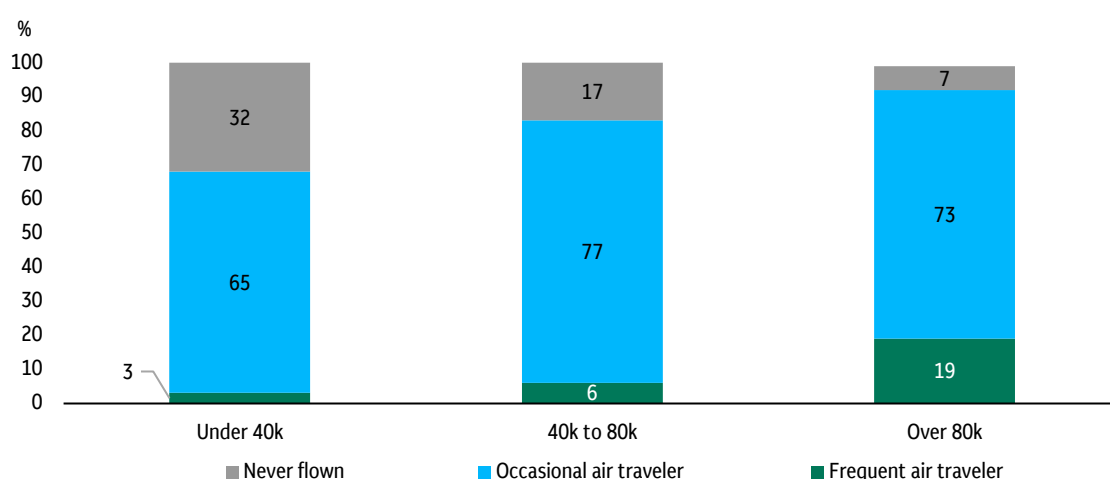


Sources: OWID (November 2021), IMF (November 2021).

It is worth noting that the chart here shows all countries for which data are available. The sensitivity of RPKs to income may, in a statistical sense, be heightened by outliers such as Iceland and the United Arab Emirates that are heavily affected by their geography. But even if these are excluded, the sensitivity remains high. Indeed there appears to be a pinch point at around \$US30,000 where travel intensity picks up sharply. If some very populous countries were approaching this income level this could then have the potential to turbocharge growth in global air travel volumes. But this may still be some way off, as China and India, the world's two most populous countries, are well short of this income level. Russia and Turkey, countries of 144 million and 84 million respectively, are bordering on it, however.

There is also intra-country evidence that travel intensity rises with income. Figure 22 shows the results from a survey undertaken in the US on travel frequency by income level. While this survey, along with similar ones for other countries,⁸ strongly supports the notion that there is a positive relationship between income and air travel volumes, the lack of specificity in the categories and the potential for subjectivity on the part of the survey respondent in defining the terms makes it difficult to quantify the relationship based on these data alone.

Figure 22:
Travel intensity and income – US



Source: <https://www.statista.com/statistics/316376/air-travel-frequency-us-by-income/> (March 2022).

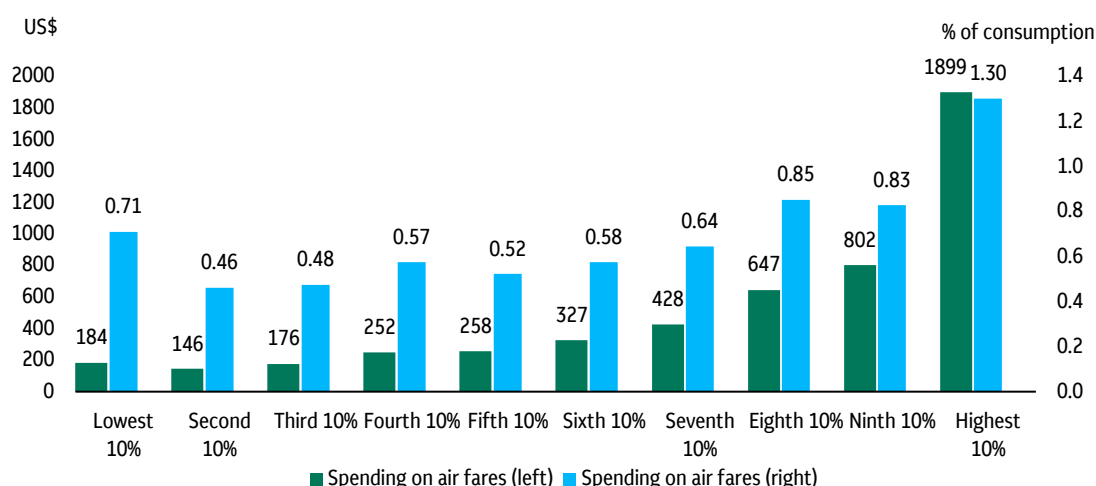
8. A similar survey for the UK shows similar results with travel frequency much greater in high-income cohorts than lower-income cohorts.

Fortunately, more quantitatively specific data are available. The US Consumer Expenditure Surveys provide a wealth of granular data on the spending patterns of US consumers and allow an analysis of these spending patterns by income cohort and over time.

Figure 23 shows a snapshot of spending on air travel by different income cohorts.⁹ What it makes clear is that high-income earners spend much more on air travel than low-income cohorts – the top decile of earners spend more than double the amount on air fares (\$US1,899 per year) that the next highest decile spends (\$US802), and more than seven times the amount of the fifth decile (\$US258).

But spending doesn't only rise in level terms – it also rises as a share of consumption.¹⁰ This is particularly pronounced for the top decile of earners where spending on air fares is currently 1.3% of total spending, whereas for all consumers it is 0.81%, and for those in the middle of the income distribution it is around 0.5-0.6% of total consumption. This is consistent with air travel being a luxury good – once the basics of life are provided, any extra available income is for spending on things such as air travel, and its share of total consumption rises. Indeed in terms of the uplift in spending as households climb the income ladder, spending on air fares can account for as much as 2% of additional spending.¹¹

Figure 23:
Spending on air fares increases – in level and share terms – as income rises¹²



Source: US Consumer Expenditure Survey – 2019 (<https://www.bls.gov/cex/tables.htm#calendar>).

9. The data are for 2019, which are the most recent data we have available. This is also the last year not distorted by COVID-19.

10. Data for the UK show exactly the same picture of sharply rising nominal spending on air travel at the very top of the income distribution and an increasing share of spending.

11. It is worth noting, however, that as a share of income the percentages across income cohorts is more stable because high income earners save a much higher share of their income.

12. We also examined changes in spending on air fares through time for each cohort and compared them to changes in income growth. The results pointed to very strong growth in spending through time and a very high multiple across virtually all cohorts. Some of the results were, however, nonsensically strong, particularly when looked at in real terms, so we excluded the results from the paper. But they are available upon request.

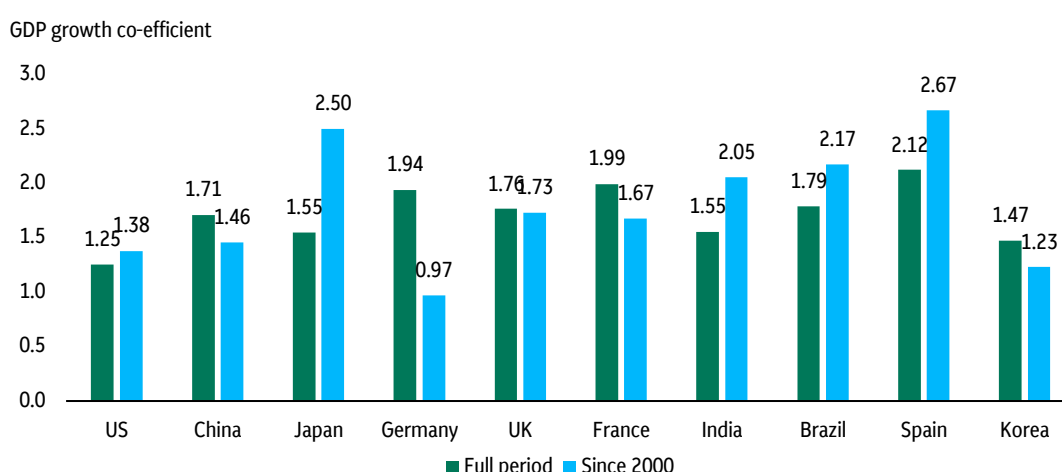
Another way to analyse the relationship between incomes and air travel is to use data at the national level to examine the relationship between growth in GDP (a proxy for income) and growth in air travel. There is a rich data well to draw on here, with passengers-carried data by country going back to the 1970s. We performed extensive statistical analysis of these data and the relationship between growth in passenger numbers and growth in GDP. Three main points stand out from the data and our analysis of it:

1. The relationship between travel volumes and GDP is very strong. It is consistent across countries and through time, and the co-efficient is almost always above 1. Figure 24 shows the regression co-efficient on GDP for a range of countries (selected based on economic size and investor interest) for both the full period for which we have both data sets (1980 to now) and from 2000 to now. We compared the two time periods to check the robustness of the relationships.

- In all but one case (Germany in the 2000s) the co-efficient is above 1, indicating that travel volumes grow faster than GDP.
- Indeed, a decade-by-decade examination of the 15 largest developed world and 15 largest emerging world economies since 1980 (producing a total of 120 (30 × 4) data points) shows that in only 28 instances was the co-efficient below 1.
- For the great majority of countries the multiplier is somewhere between 1.2x and 2.0x.

Figure 24:

Co-efficient on GDP growth across countries – almost all are above 1



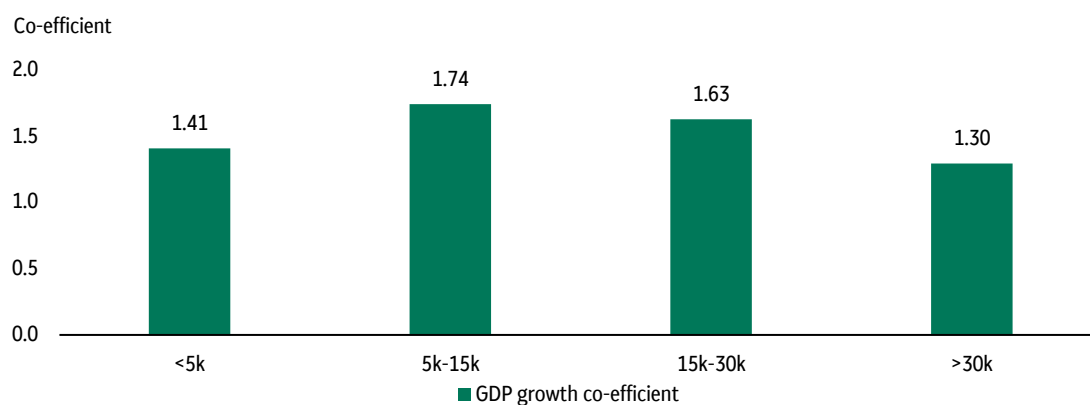
Sources: World Bank, IMF (November 2021).

2. The sensitivity of air travel to GDP may have increased over time. Drawing hard-and-fast conclusions on this question is tricky, but it appears that the sensitivity has been, if anything, higher over the past 20 years than during the 1980s and 1990s. For the 2000-2019 period the average co-efficient across all the countries analysed¹³ was 2.18, while the average for the prior two decades was 1.58.

3. Middle-income countries have the highest multiples. Figure 25 shows the GDP co-efficient by income group.¹⁴ Sensitivity to income growth is highest for middle-income countries (those in the \$US5,000-30,000 range). This makes intuitive sense – for those making less than \$US5,000 per year air travel isn't likely to be a priority for the marginal dollar of income earned; and for those on high incomes who fly often the constraint may be time, or simply the appetite for extra travel, rather than income. But for middle-income groups, travel (particularly air travel) is a much-desired consumption item and a marginal consumption option of choice.

Figure 25:

Air travel's sensitivity to income growth is highest for middle-income countries



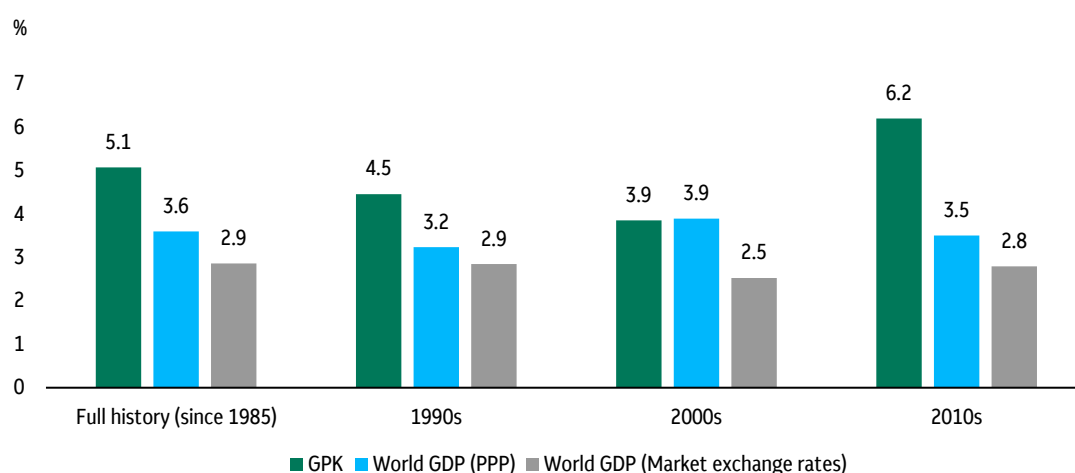
Sources: World Bank, IMF (November 2021).

13. We examined the 15 largest developed world economies and the 15 largest emerging world economies.

14. Based on IMF purchasing power parity data.

The results from Figure 24 also hold at the global level. Over the long run, air travel has tended to grow faster than GDP and be relatively resilient to shocks and recessions. From 1985 to 2019, global RPKs grew at a compound annualised rate of 5.1%, which was 1.41x the growth rate of global GDP measured on a purchasing power parity (PPP) basis, and 1.77x global GDP when it is measured on a market exchange rate basis (Figure 26). In virtually every decade since, air travel volumes have grown faster than GDP, however measured.¹⁵

Figure 26:
Global RPKs grow faster than GDP



Sources: IMF, International Air Transport Association (IATA) Air Passenger Monthly Analysis (December 2021), Boeing Commercial Market Outlook (2009, 2014, 2021).

Pricing and its impact on demand

The other variable often cited as having an impact on demand is prices. The sensitivity of demand for air travel to price changes has been examined in several academic studies. These studies focus on different levels of aggregation and the IATA's economics briefing No. 9 "Air Travel Demand"¹⁶ provides a nice summary of the results. The key points from it are as follows:

15. The only exception is the 2000s, when global air travel volumes grew 3.87%, ever so slightly slower than world GDP measured on a PPP basis (3.91%), but faster than world GDP measured on a market exchange rate basis (2.54%).

16. Is available [here](#).

- **Price elasticity is highest at the lowest levels of aggregation.** Route-level price elasticities are higher than company-level elasticities, which are higher than national-level elasticities, which are in turn higher than supranational-level elasticities. The explanation, which makes sense to us, is that at lower levels of aggregation there are more alternatives, whether it be other destinations or other modes of transport as options.
- **Business travellers are less price sensitive than leisure passengers.** Business travellers feel the financial cost of the flight less directly than leisure travellers and are often less flexible around timing.
- **Short-haul elasticities are generally higher than long-haul.** This also makes sense as there is less intermodal substitution for long-haul flights and they may be more fixed in terms of when they are needed (visiting family and friends for specific events such as Christmas, Thanksgiving, weddings, and anniversaries).

Our analysis at the national level shows no meaningful role for prices, however. Figure 27 presents the results of regressions of growth in passengers against GDP growth and air fare prices (the t-stats are in parentheses). The results for GDP growth are very strong, but the coefficient for price¹⁷ is often the wrong sign, small, and rarely statistically significant at the 5% significance level.

Figure 27:
Coefficients on inflation and GDP as drivers of passenger volumes

	Total period (Since 1980)		1980 to 2000		2000 to 2019	
	Price	GDP	Price	GDP	Price	GDP
US	-0.19 (1.5)	1.37 (6.6)	-0.21 (1.1)	1.32 (4.9)	-0.17 (1.0)	1.49 (4.1)
China	-0.42 (0.9)	1.78 (7.2)	-0.28 (0.3)	1.98 (4.1)	-0.62 (2.1)	1.56 (9.4)
Japan	0.06 (0.3)	1.5 (4.5)	0.28 (1.6)	1.11 (4.1)	-0.29 (0.9)	2.82 (3.4)
Germany	0.36 (1.6)	1.55(3.3)	0.61 (2.8)	2.25 (4.9)	0.15 (0.4)	0.79 (1.0)
UK	0.05 (0.3)	1.73(4.6)	0.14 (0.4)	1.70 (3.2)	-0.04 (0.1)	1.76 (3.1)
France	0.23 (1.4)	1.76 (4.6)	0.28 (1.0)	1.95 (3.2)	0.19 (1.2)	1.44 (3.3)
India	-0.66 (-2.1)	1.72 (6.7)	-1.10 (2.4)	1.314 (3.1)	-0.06 (0.1)	2.06 (7.1)
Brazil	0.09 (0.4)	1.74 (5.3)	-0.10 (0.3)	1.55 (3.8)	0.22 (0.5)	1.97 (3.2)
Spain	-0.12 (0.4)	1.18 (2.6)	-0.17 (0.5)	1.67 (2.8)	-0.14(0.3)	0.62 (0.9)
Korea	-0.063 (0.2)	1.49 (7.1)	-0.01 (0.0)	1.53 (6.8)	-0.08 (0.2)	1.26 (2.5)

Sources: World Bank (November 2021), IMF (November 2021), Macrobond (November 2021).

17. Here we used data from the US Consumer Price Index and Department of Transport and extrapolated it back in time using the oil price.

In short, we find virtually no role for price at the national level as a driver of air travel volumes. How do we reconcile this finding with other, detailed studies that use very granular data and find a statistically significant negative relationship (as theory would suggest)?¹⁸ Two possibilities come to mind. First, the level of aggregation may play an important role. Other studies also show a lower sensitivity to prices at higher levels of aggregation, due to the availability of fewer substitutes. Prices may matter at the route and company level but not at the national level. Second, our regressions may suffer from omitted variable(s) bias.¹⁹

Conclusions – Income growth and pricing

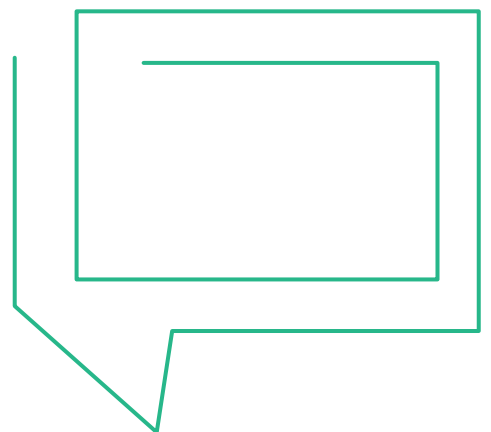
The conclusions from our analysis of GDP growth and pricing and their effects on volumes are as follows:

- There is a large amount of evidence showing a positive relationship between income level and travel intensity. Cross-country data, intra-country survey data, and detailed consumer expenditure data all provide strong support for this relationship.
- Air travel may be a middle-class consumption option of choice, with spending on air travel rising as a proportion of consumption for this group.
- There is a robust relationship between GDP growth and growth in air travel. This has held consistently across space and through time.
- The GDP growth multiplier is above 1 and is probably in the 1.2x to 2.0x range for most countries. Middle-income countries seem to have higher multipliers.
- No matter how hard we mine the data we can't find a meaningful relationship between price changes and changes in demand for air travel at the national level. We do acknowledge, however, that other studies find a statistically significant negative relationship. The level of aggregation may play an important role here, but it is equally possible that our regressions are missing an important variable or variables and this is polluting the result for the price variable.
- We net this out by reaching no hard and fast conclusion about pricing. We suspect that at the national level the relationship is not strong, and we are confident that in the great bulk of cases any price effect will be swamped by the GDP effect at this level of analysis.

18. Publishing bias could be a factor here. That is, it is generally the case that those studies that found a statistically significant relationship are the ones that become published, so there may be many unpublished studies out there that found results similar to ours.

19. We also acknowledge that this stands in contrast to the general view of many industry experts that low-cost carriers have had a positive impact on volumes. We don't really have any explanation for this. It may be that the consumer price indices' measure of airfares doesn't fully capture the low-cost carrier effect, as measured prices in real terms haven't fallen much in either the US or UK.

Conclusion: Pent-up demand swamps the Zoom effect





Air travel is rebounding, and as restrictions continue to ease, we would expect the recovery to continue and broaden. Asia is likely to be a big beneficiary of a normalisation of international travel, which may not be too far off now.

While many analysts are worried that growth in business travel will be weaker in the post-COVID-19 period because Zoom has proven that it works, we find that this effect may be really quite small. While we are reliant on survey data to assess its impact, it is likely less than one year's worth of growth in global travel volumes and could be more like six months' worth.

The big story, in our view, is pent-up demand. In the recovery following 2001, hardly any of the "lost demand" was made up once the operating environment returned to normal. And that's what most analysts seem to be assuming will occur in this recovery. But this time around the amount of lost demand is

a multiple of what it was in 2001. This fact combined with the speed of the recovery in some parts of the world (most notably US domestic air travel) as well as anecdotal evidence leads us to believe there could well be some "making up" of the travel that was missed over the past two years. If that does occur, the effect on travel volumes is large and many forecasters may have to revise their estimates upward.

When thinking about the longer run, we believe the key variable is still GDP growth. Historically, air travel has grown at a multiple of GDP growth, and that doesn't look to have changed in more recent decades. We can't find any meaningful effect for pricing at the national level. Some other studies do, although they also find that the sensitivity at the national level is lower than it is at lower levels of aggregation, such as the airline or individual route level. We don't draw any strong conclusions about the impact of price changes, but simply note that any gradual increase in prices due to the need to decarbonise and use more sustainable fuels isn't likely to have a material effect on volumes. In part this is because, in our view, the sensitivity to prices is low at the national level and because any impact is likely to be overwhelmed by GDP, which is a far more powerful driver of growth in air travel.

macq.co/MAM-Private-Markets

Pathways

For more information, or to speak to the author of this issue, Daniel McCormack, please contact your Macquarie Asset Management Relationship Manager.