



Aviation Value Chain

An analysis of investor returns in 2022 within the aviation value chain

Since 2005, IATA has looked at value creation across the aviation value chain. This report, including baseline quantitative analysis conducted by McKinsey & Company¹, has resulted in several reports examining the entire value chain, covering aircraft and engine original equipment manufacturers (OEMs); lessors; airports; air navigation service providers (ANSPs); ground handlers; maintenance, repair, and maintenance, repair, and overhaul (MRO) providers; catering companies; airlines; global distribution systems (GDSs); freight forwarders and, since this year, downstream fuel producers.

This document provides insight and interpretation from IATA into the 2022 economic performance of the aviation value chain. This is done through the lens of economic benefit, defined as the difference between the return on invested capital (ROIC) and the weighted average cost of capital (WACC). ROIC measures the earnings available to pay debt and equity investors in relation to the capital invested. WACC can be seen as the opportunity cost for the investor, as it is a measure of the alternative return the investor could have had if the capital were invested in an asset with a similar risk profile. The difference between the two indicates the level of economic profitability. If the ROIC is greater than the WACC, then the value is being created. Conversely, if the ROIC is lower than the WACC, then the economic value is lost.

First, we provide an overview of the performance of the value chain as a whole, and then we turn to our insight into the trends seen at a subsector level.

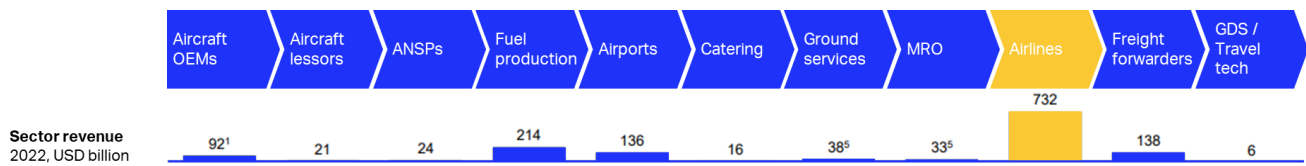
Overview of the Value Chain Economic Performance

The aviation value chain consists of a diverse set of sectors in terms of size, structure, and performance. All the actors work together creating an impressive network that enables 4.5 billion passengers to travel safely and efficiently across the globe.

The aviation sector has revolutionized the way we travel, connect with others, and conduct business. Aviation generates positive social and economic externalities, both in countries and cities which are home to major aviation hubs, and in remote locations which benefit from easier access to the global economy. The airline industry is the biggest subsector in terms of revenue at USD 732 billion in 2022, followed by fuel production companies at USD 214 billion, freight forwarders at USD 138 billion, and airports at USD 136 billion. Revenue of other subsectors amounted to USD 230 billion in 2022.

¹ As noted in applicable charts and tables

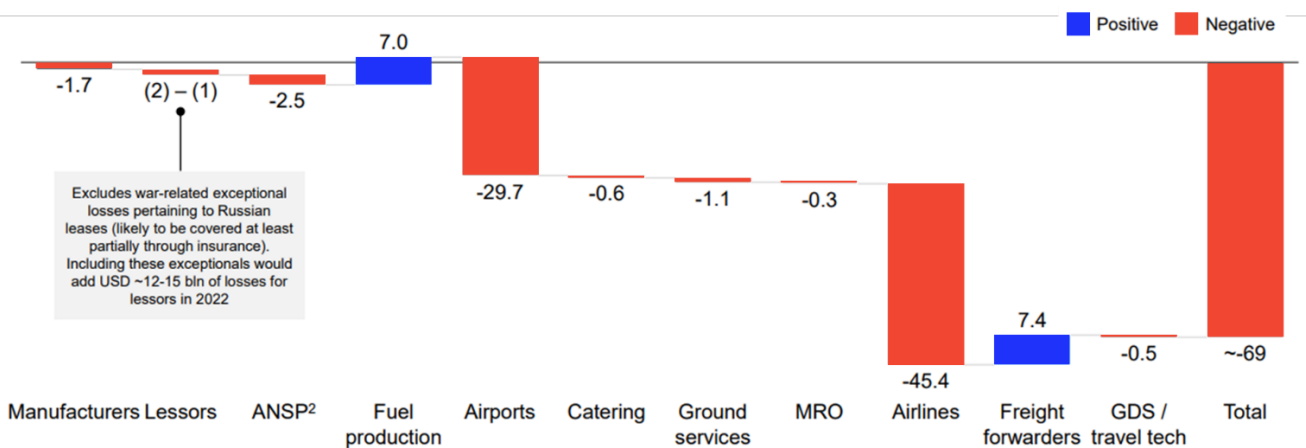
Aviation value chain revenue by subsector, 2022, USD billion



1. Value of commercial aircraft deliveries
 2. Estimated outsourced market size
 Source: IATA-McKinsey aviation value chain analysis, GCSI, The Airline Analyst, CapitalIQ

In 2022, most industries in the aviation value chain continued their post-Covid recovery, but the value chain remained loss-making, generating a total economic loss of USD 69 billion. Fuel and freight forwarders were the only value-creating subsegments, with their economic benefit relating to aviation activities estimated at USD 7.4 billion and USD 7 billion, respectively. The breakdown of the relative economic profit/loss across the value chain in 2022 is presented in the chart below.

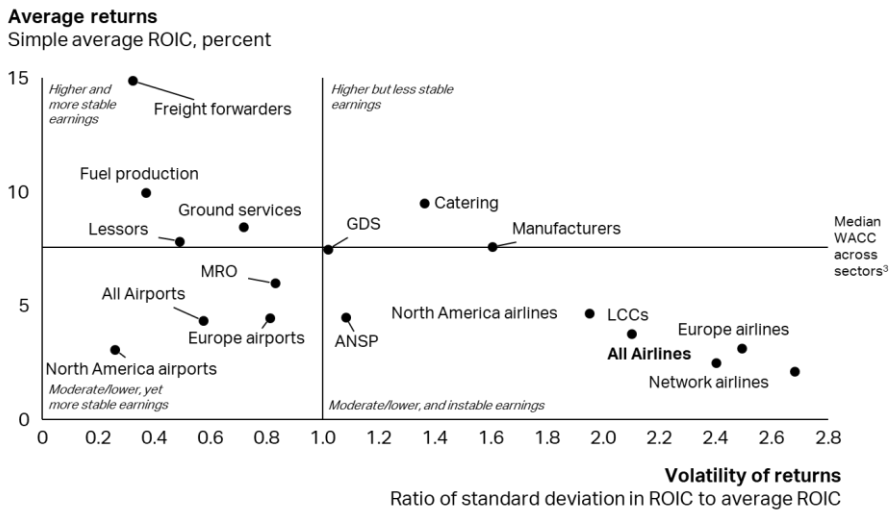
Economic profit/loss (including goodwill) by subsector¹, 2022, USD billion



1. Based on invested capital including goodwill, extrapolated to total industry. Not a zero-sum setup, possible for all subsectors and the value chain as total to be positive
 2. Air Navigation Service Providers
 Source: IATA-McKinsey aviation value chain analysis, The Airline Analyst, CapitalIQ, Company reports

The airline industry is the largest building block of the aviation value chain but historically, it has been the worst performer. In 2022, airline companies generated a net economic loss of USD 45.6 billion. The airline industry remains highly challenging, where shareholders are not rewarded with the return they should expect based on the risk profile of the investment. Even before the pandemic, airlines were the only value chain subsector where investors did not get a return above the cost of capital over an extended period. This has its roots in several factors: low entry and high exit barriers, a high share of fixed costs, high sensitivity to external demand shocks, a fragmented industry, and a more concentrated supplier landscape, to name a few.

Aviation value chain subsector volatility of ROIC and average ROIC level¹, 2012-2022



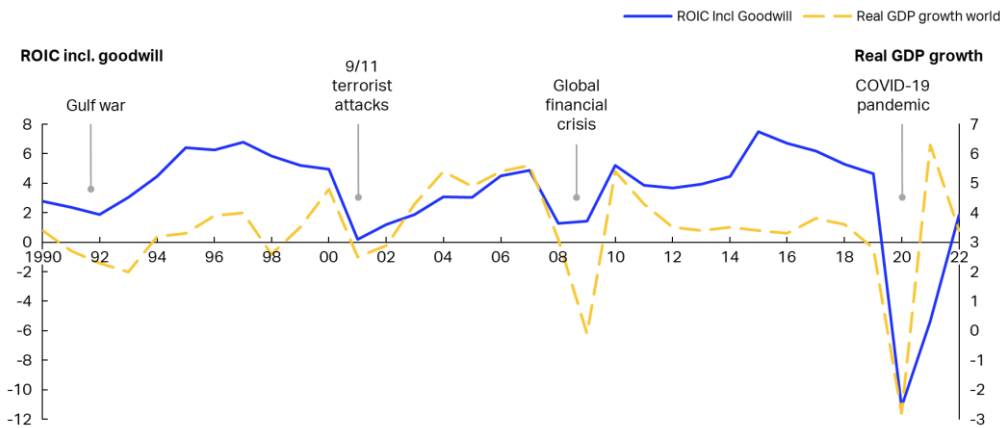
1. After-tax ROIC incl. goodwill. ROIC as NOPAT/Invested capital
 Source: IATA-McKinsey aviation value chain analysis, The Airline Analyst, CapitalIQ, Company reports

As shown in the chart above, the value chain participants differ significantly in terms of average returns and the volatility of these returns. Volatility of financial returns refers to the degree of fluctuation in profits over a period of time. It is an important metric for investors and analysts to assess the financial health of a company. High volatility indicates that the company’s profits are more susceptible to external shocks, such as changes in market conditions, economic downturns, or other unforeseen events. In addition to low profitability levels, airlines have also demonstrated the highest volatility of ROIC. Suppliers to the airline industry have higher returns and lower variability due to their higher degree of industrial concentration, as well as thanks to the long-term nature of contracts in place which limits their exposure to travel demand shocks.

Airlines

Airlines were on the road to financial profitability in 2022 but still generated a substantial economic loss. The airline industry is highly sensitive to external macro-economic factors (including fuel prices, geopolitical considerations, and natural disasters) both on the revenue and cost side. As the economy grows, demand for air travel increases, which in turn drives up airline revenues. Conversely, during economic downturns, demand for air travel decreases, leading to lower revenues and profits for airlines.

Return on invested capital for the airline industry vs real GDP growth¹, 1990-2022, percent

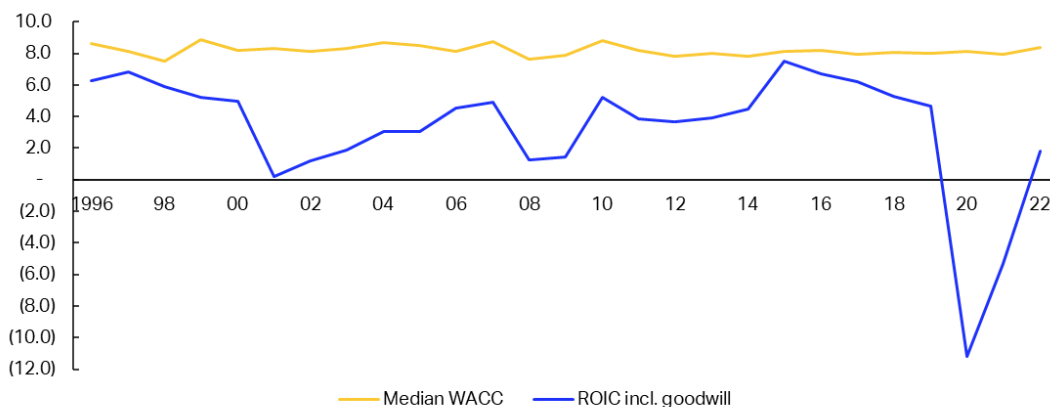


1. Aggregated after-tax operating profits divided by aggregated invested capital adjusted for leases
 Source: IATA-McKinsey aviation value chain analysis, The Airline Analyst, CapitalIQ, Company reports, IMF

Looking at the past 30 years, there has been a positive correlation between ROIC and real GDP growth rate. All major global shocks had a negative impact on the return on invested capital, showing that the airline industry is truly global.

Since 1996, the industry's ROIC has remained below WACC, though the gap almost closed in 2015. The worst-ever result was observed during the pandemic in 2020. Since then, the gap has started to decrease, however, at a slow pace. Due to the introduction of high interest rates in major economies, the cost of capital has risen and is unlikely to drop significantly in 2023 and 2024, likely limiting the pace of improvement in economic value creation over this horizon.

Airline industry ROIC including goodwill vs. median WACC, 1996-2022, percent

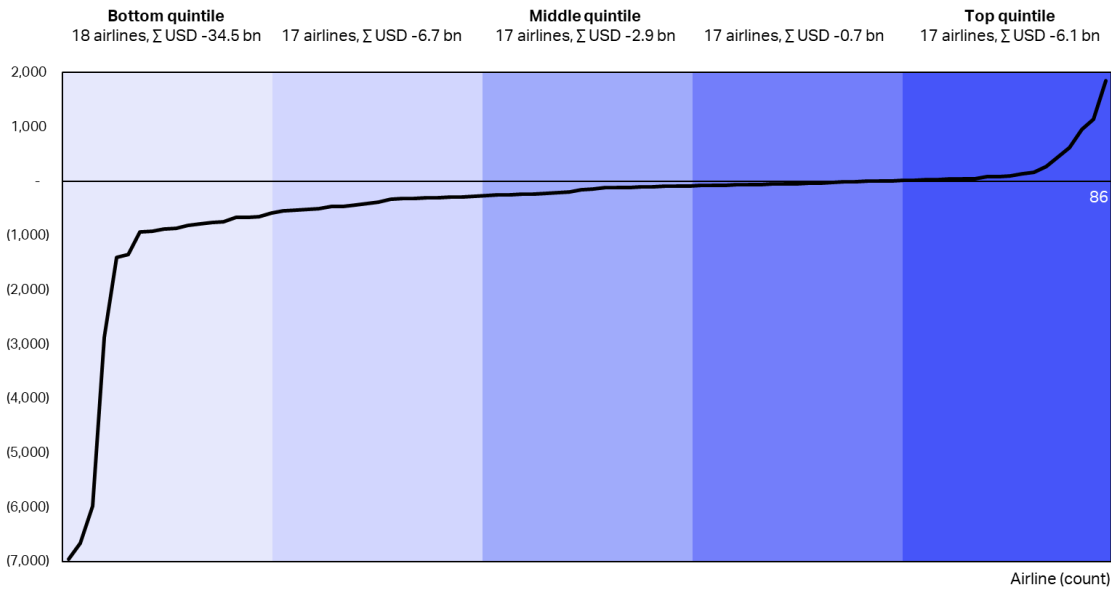


Source: IATA-McKinsey aviation value chain analysis, The Airline Analyst, CapitalIQ, Company reports

The economic profit power curve (see chart below) shows an uneven distribution of airlines that is heavily tilted to the loss-making side. In the sample², 78% of airlines were loss-making in terms of economic benefit. In spite of the pronounced skew to the downside in airlines' economic performance, there is nevertheless a small number of airlines that consistently achieve a ROIC in excess of their cost of capital.

² Airline sample consisting of 86 companies

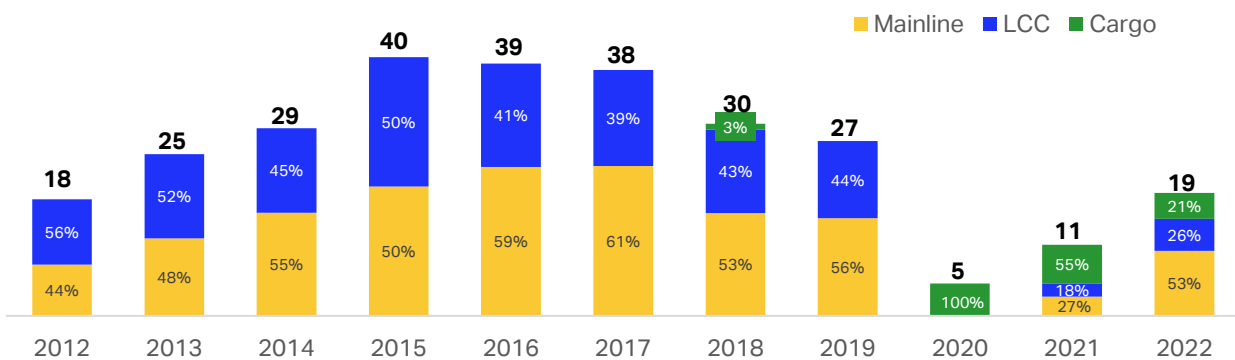
Airline industry economic profit power curve¹, 2022, USD million



1. Every dot making up the line is one airline. Based on ROIC including goodwill
 Source: IATA-McKinsey aviation value chain analysis, The Airline Analyst, CapitalIQ, Company reports

The reason why some airlines perform better than others can be attributed to both the market context and to airline-specific factors. For instance, some airlines may operate in more established markets where capacity growth is in line with underlying demand growth. Other airlines may excel in areas that are crucial for attracting customers or maximizing asset productivity, such as ancillary sales, a unique network portfolio, and operational excellence³.

Count of value-creating carriers (economic profit incl. goodwill > 0) by year, 2012-2022



Source: McKinsey Value Chain Study, The Airline Analyst, CapitalIQ, Company reports

In 2022, there were 19 value-creating airlines in the sample, and most of them (53%) were network carriers. Low-cost carriers represented almost a third of the sample while cargo, after a couple of exceptionally good years, constituted 22% of the sample. Air cargo was a standout business segment during the pandemic with soaring ROIC. Grounded passenger jets around the world meant that there was less belly capacity, (which

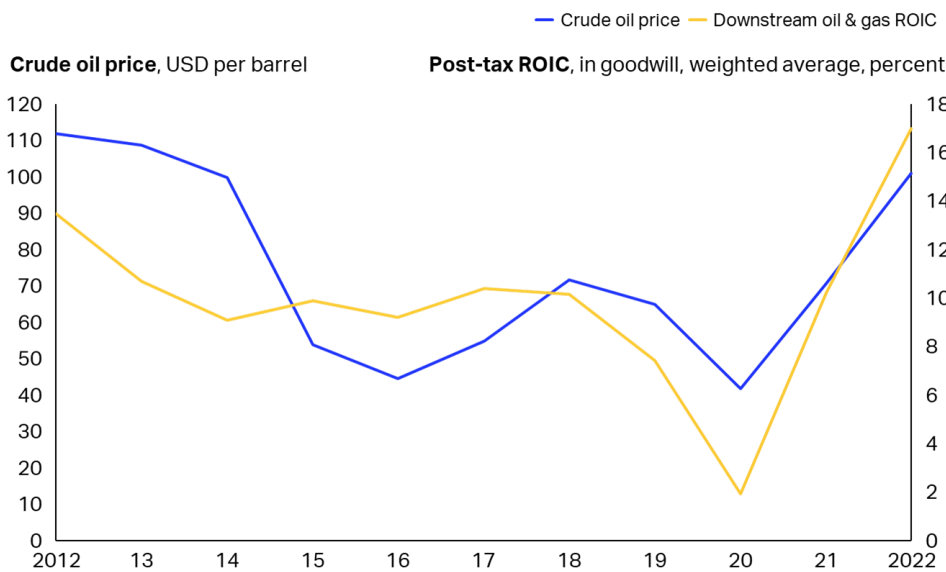
³ Jaap Bouwer, Alex Dichter, Vik Krishnan, and Steve Saxon, "The six secrets of profitable airlines", McKinsey, June 28, 2022.

historically accounted for 50% of total cargo volumes) pushing the freight rates up. In 2022, belly capacity returned and cargo yields decreased.

Aviation Fuel Production

Aviation fuel production companies, along with freight forwarders, were the only two subsegments of the aviation industry that created value in 2022. The aviation fuel subsector generated an economic benefit of USD 7 billion that year. With an estimated revenue of USD 214 billion, jet fuel producers achieved an impressive 17%⁴ ROIC (compared to 2% for the airlines).

Crude oil price development versus. fuel production ROIC (incl. goodwill > 0) by year, 2012-2022



Source: IATA-McKinsey aviation value chain analysis, CapitalIQ

The ROIC of the downstream oil and gas companies is correlated with the price of crude oil that increased by 44%, since the outbreak of the war in Ukraine. The average price of Brent crude reached USD 101 per barrel in 2022.

Refining a barrel of crude oil results in a variety of products. Jet fuel is one of them, and on average it represents 8% of refined output. Jet fuel was the most expensive refined product in 2022. The jet fuel crack spread (the difference between the refined product and the crude oil price) spiked in 2022 due to refining capacity closures in 2020 and 2021, planned and unplanned outages especially in Europe, and constrained exports (chiefly out of China). Consequently, the price of jet fuel soared to USD 139 per barrel, pushing the ROIC up for the fuel producers and putting downward pressure on airlines' financial and economic profitability.

Manufacturers

OEMs, like other participants in the value chain, continued their recovery in 2022, with ROIC turning positive the first time since 2018. The achieved ROIC, however, did not increase to a level allowing to cover WACC, consequently posting a net economic loss of USD 1.7 billion. Supply chain issues persisted which prevented the recovery from reaching full speed. Airlines seeking to acquire more fuel-efficient and quieter equipment

⁴ Jet fuel is just one output of a refinery, and it is not possible to produce only jet fuel. To estimate economic profit of jet fuel purchased, the economic profit margins of downstream (companies focused on refinery and marketing of oil & gas products) is applied to the jet fuel spend of the airline sector.

have continued to place large orders for new commercial jets. The number of new aircraft deliveries will reach 1,777 in 2024 and 2,075 in 2025 according to current schedules – a record in the history of commercial aviation, signaling a strong outlook for the subsector.

Lessors

Lessors earned a return on equity of about 9% pre-pandemic. 2022 ROE amounted to 7.6% as lease rates increased and demand recovered. The leasing market has high barriers to entry but is fairly fragmented. Some consolidation has occurred in recent years, but new companies are entering the market as well. It is a sector where there is value in diversifying portfolios, to spread risk and tap into different growth rates.

Following the Russian invasion of Ukraine in 2022, over 400 Western-owned planes were stranded in Russia. This exceptional event represents between 12 and 15 billion worth of losses, and it remains to be seen how much will be covered through insurance.

Airports and Air Navigation Services

Airport returns were mixed in 2022, affected by different traffic recovery profiles and regulatory regimes. The notable absentees from the top quartile are airports in Asia who represented 15 of the economic profit generators in 2019, but only two made that ranking in 2022. We expect this trend to reverse as traffic returns.

The global figures are also pulled down by North American airport business models that operate on an equity-free cost-recovery basis. The difference is quite visible when comparing ROIC volatility and average return for a longer period. European and global airports have higher earnings on average than their North American counterparts.

The ANSP sector is highly fragmented at the macro level, with many individual ANSPs, but highly concentrated at the local level, with typically one such provider per country. The ANSP sector reported profits above WACC levels pre-pandemic. Given high fixed costs and reduced level of flight activity, the ROIC for the subsector was at -1% in 2022 with a corresponding economic loss of USD 2.5 billion.

Freight Forwarders

Freight forwarders' track record is one of profitable operations over the past decade. Their profitability was further boosted by the pandemic as the activity is linked with air cargo volumes and freight rates. In 2022, this segment generated USD 7.4 billion of economic profit and an impressive ROIC of 27%. As more cargo belly capacity has come back, freight rates have declined. In turn, the ROIC and economic benefit of freight forwarders may start to converge to the pre-pandemic levels.

Global Distribution Systems – Travel Tech

GDS showed a strong ROIC year-on-year recovery in 2022 but still had a significant gap to bridge versus pre-pandemic levels and consequently posted an economic loss of USD 0.5 billion. This is mostly explained by slower uptake in the indirect booking of corporate travel, mostly powered by GDS.

Catering, Ground Handling and MRO

Pre-pandemic, the catering, ground handling, and MRO sectors outperformed the airline sector consistently in terms of ROIC.

Ground handlers' revenues are driven by passenger and freight volumes and the industry has lower fixed costs compared to other aviation subsectors. In 2022, the economic loss of the ground handling industry amounted to USD 1.1 billion and ROIC stood 5.2 percentage points below the pre-pandemic levels.

Catering faces similar passenger-variable revenue streams and relatively low fixed costs as the ground handler segment, with labor representing a significant share of operating expenses. In 2022, the catering subsector posted a loss of USD 0.6 billion and showed the widest gap to the pre-pandemic ROIC levels, staying behind by as much as 9.6 percentage points.

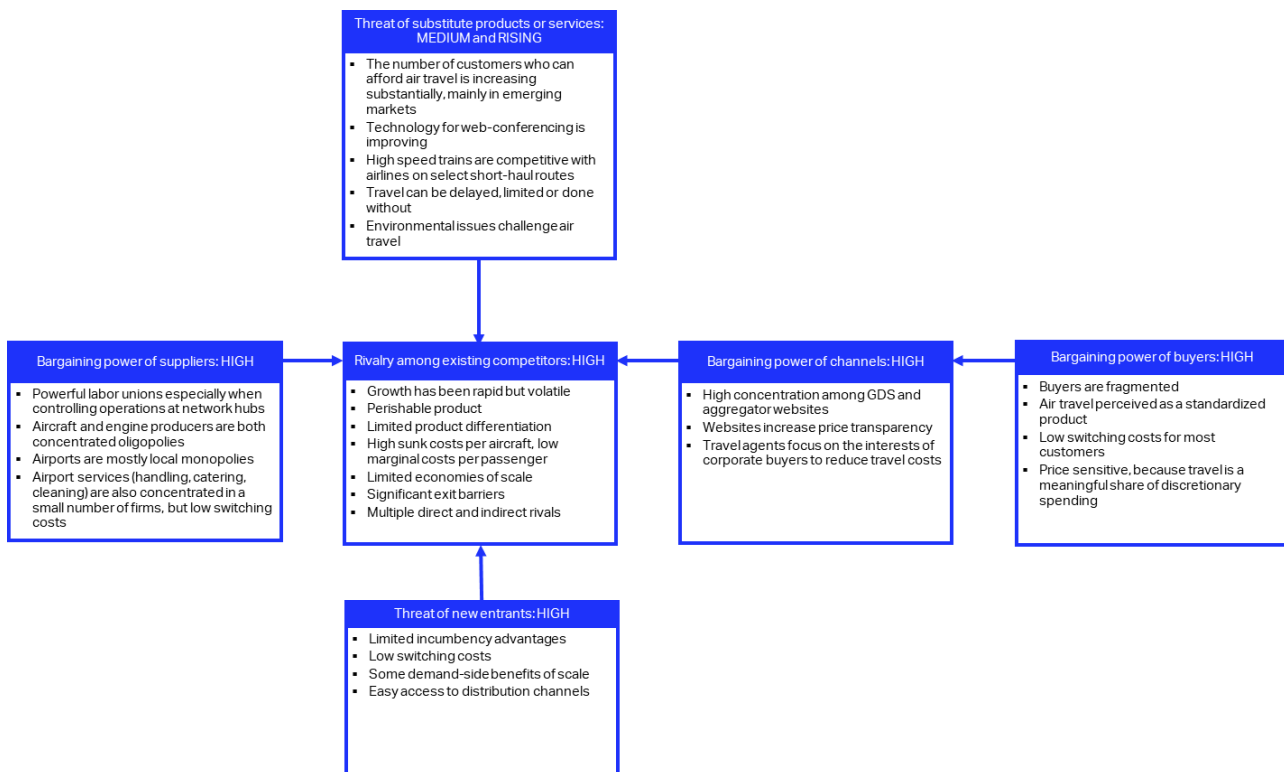
Maintenance, repair, and overhaul generated a relatively small loss of USD 0.2 billion compared to other subsectors.

Value Chain Dynamics and Ways Forward

The persisting problem with insufficient returns of the airlines points to system-wide issues being either a problem with the supply chain or the industry structure, if not both. The reason for the inequality of returns between airlines and other actors in the value chain is well illustrated by Michael Porter's framework for analyzing the operating environment of a business.

The airlines operate in an unbalanced setting. The bargaining power of suppliers in the upstream value chain is high to very high, with duopolies in the case of wide-body aircraft manufacturers and monopolies in the case of local airports. There is also a high degree of concentration among GDSs and aggregator websites.

Michael Porter's Competition Framework



Source: IATA update based on original from Professor Michael Porter, 2011

Airlines have outsourced many non-core activities for a number of reasons, one arguably being the quest for greater value generation. At the current junction, there is a question as to whether airlines could lower the economic loss and spread some risks by exploring vertical integration of some contracted services, Today, risk

is unevenly distributed along the value chain, with the airlines bearing much of it, and struggling to deliver the returns to their investors that would be commensurate with that risk. This, unfortunately, weakens the entire value chain.

The airline market, compared to many other industries, is fragmented and unconsolidated on a cross-regional level. Many countries have ownership limits that restrict foreign ownership of local airlines. Consequently, the movement of capital is stifled, adding a barrier to cross-border consolidation. Consolidation could, in theory, lead to better network management, cost savings, and improved load factors. Recent delays in aircraft deliveries have limited airlines' sales growth but, at the same time, improved their load factors and profitability. Maintaining a high load factor (also known as asset turnover), is one of the key features of profitable airlines.

Aircraft seats are "perishable" in nature (cannot be stored and vanish once the plane takes off) and the marginal cost of flying an additional passenger is very low. As a result, tickets are sold at cost or even at a loss. To respond to these challenges, more and more airlines are embracing the hybrid business model, adopting features of both full-service and low-cost carriers. This strategy can deliver a better pricing strategy and improved segmentation of passengers into more comfort categories.

The value chain could also greatly benefit from leveraging the data-rich environment in which it operates. Predictive maintenance, better capacity management during demand surges, and personalized recommendations that lift ancillary revenue from upselling and cross-selling are all achievable. These could be maximized further thanks to initiatives such as airport collaborative decision-making (A-CDM), which aim to improve the operation efficiency of all airport operators.

Collaboration is paramount in achieving another goal that will shape the industry for the next 26 years – that of decarbonizing the airline industry by 2050. Decarbonization can only be accomplished if the value chain works together. Sustainable aviation fuel is expected to be the leading pathway towards this goal and requires substantial investments in refining capacity and in creating a well-functioning market. Airframe and engine OEMs must continue to develop cleaner technologies (such as hydrogen-powered aircraft) and strive for fuel-efficient designs. ANSPs can further optimize flight paths and reduce time spent in the air. All this and more can be greatly aided by collaboration and by data sharing.

Conclusion

The aviation sector is a complex ecosystem that comprises various industries of different sizes, structures, and financial performances. The aviation value chain as a whole struggles to create economic value over the long term, and the airline industry tends to be its weakest link. Given the importance of air transportation (and all forms of transportation and connectivity) in terms of economic development and people's welfare, the fragility of the aviation value chain has structural repercussions that go way beyond the aviation sector. At no point in time has this been illustrated with greater clarity than during the Covid pandemic. It is in the interest of the global and local economies, as well as in the interest of every participant in the aviation value chain, to favor a more robust airline industry with a greater capacity to weather the storms that invariably come its way. There are no easy and readily available solutions for bringing such greater robustness about though. Difficult to achieve but nevertheless essential for optimizing operations in a sector that is wholly global is the harmonization of regulation. The cost of countries failing to coordinate and the resulting policy fragmentation was vividly showcased during the Covid pandemic. A further issue without an apparent solution is the monopolistic and oligopolistic pricing power in the upstream supply chain. At the other end of the supply chain, airlines face instant price discovery among their customers on a scale that is unique to the industry. With limited influence on prices both paid and received, airlines need to find ways to compete among themselves on factors other than price.

One avenue to explore could be opportunities in terms of both vertical and horizontal integration. Technological progress, possibly involving artificial intelligence, could alter how some services are delivered,

as well as potentially reduce some of the climate-related costs that airlines already face. Moreover, participants in the value chain have much to gain from increased collaboration, notably in the fields analytics and the pooling of data - to deliver a better service along every step of the journey. Nevertheless, even without being able to resolve some of these deep-seated structural issues in the near term and faced with multiple challenges going forward, we still expect airlines to continue to improve their economic value generation over the coming years, demonstrating yet again the exceptional resilience of the industry.

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