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Changes in Russian air connectivity in response to airspace restrictions

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ABSTRACT

This paper examines the adaptation of Russia's international air transport network during the first year following its invasion of Ukraine on February 24, 2022. Using data from the Official Airline Guide (OAG), the article explores the response of the Russian international air transport network to airspace restrictions imposed on Russian airlines. Despite an initial 41% decline in international capacity, Russia's air connectivity rebounded to near pre-invasion levels by January 2023, with only a 4% overall decrease, suggesting that sanctions were largely ineffective. The geographical reconfiguration was substantial, with country connections, primarily European, dropping from 64 to 34. Simultaneously, Türkiye and the UAE emerged as the top two international markets for Russia, with Istanbul (IST) and Dubai (DBX) airports benefiting strategically. Former Soviet republics in Central Asia, especially Armenia, experienced air seat capacity growth. Within Russia, Moscow's airports remained the main international gateways, while Sochi airport (AER) emerged as a new entry point. Aeroflot maintained its position as the leading international Russian airline, despite capacity reduction, while other Russian airlines showed significant growth. This research contributes to understanding how geopolitical events can reshape international air transport networks, providing empirical evidence of the Russian air transport sector's resilience and adaptability in the face of significant international sanctions.

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Russia; Ukraine; Russo-Ukrainian War; air connectivity; airspace bans

Introduction

Sudden large-scale disruptive events, such as industrial actions, natural disasters, COVID-19, terrorist attacks, and wars, have had well-documented impacts on air services in terms of volume and geography (Janić 2015). For example, strikes by air transport staff can lead to delays, rerouting, and cancelations (Janić 2015; Jong and Lieshout

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2021). Natural disasters, such as volcanic eruptions, involve ash ejection into the atmosphere, which can damage aircraft engines and increase the risk of aircraft accidents (Kueppers et al. 2014), and thus heavily disrupt air travel (Budd et al. 2011; Takebayashi, Onishi, and Iguchi 2021). COVID-19 had a significant impact on air transport (Graham et al. 2023; Suau-Sanchez, Voltes-Dorta, and Cugueró-Escofet 2020), threatening the survival of many airlines and often necessitating government support (Martín-Domingo and Martín 2022). Terrorist attacks are typically followed by a decrease in passenger demand, particularly for tourism-dependent destinations (Corbet et al. 2019), and have prompted major global security policy changes, such as those introduced after the September 11 attacks in the US (Blalock, Kadiyali, and Simon 2007). The ongoing conflict between Russia and Ukraine represents a unique case, particularly due to Russia's initiation of the war, the extended duration of the crisis – surpassing the disruptions caused by the COVID-19 pandemic – and the significant size of Russia's air market.

The invasion of Ukraine on February 24, 2022, was followed by various economic, financial, and trade sanctions (Chepeliev, Hertel, and van der Mensbrugghe 2022). One day later, 36 countries, including the EU, the UK, and the US, closed their airspace to Russian airlines. In response, Russia banned airlines from most of those countries from entering or flying over Russia (IATA 2022). The air traffic of Ukraine and Moldova was the most affected as their airspaces were closed entirely (IATA 2022). Ostroumov, Ivashchuk, and Kuzmenko (2022) estimated that during the first seven weeks after February 24, 2023, 1 million seats were canceled. The total air traffic of Central Asian countries Tajikistan and Kyrgyzstan relied heavily on flights passing through Russian and Ukrainian airspace, with Ukraine and Russia accounting for 86% and 73% of their total passenger numbers, respectively. Although total air traffic share levels were not comparable to those from Central Asia, some European countries still had high traffic volumes with Russia. Some examples include Cyprus with 12%, Türkiye with 8%, and Poland with 7% of their total air traffic during 2021.

The implications of the conflict for Ukraine, as the invaded country, have been more severe than for Russia. Due to Ukraine's smaller geographical size, all of its international airports have been impacted, effectively halting its air transport. Kuzmenko and Ostroumov (2022) analyzed the sharp decline in passenger volumes and operational disruption, while Ostroumov, Ivashchuk, and Kuzmenko (2022) examined broader infrastructural and economic fallout for Ukrainian aviation. However, the ramifications of this conflict extended far beyond Ukraine's borders, reshaping air transport networks and operations. Conflict-induced airspace closures disrupt performance metrics and market mechanisms, forcing aircraft operators to shift capacity to accessible airspace (Efthymiou 2023). The closure of Russian airspace, in particular, has had profound effects on international aviation, forcing airlines to adapt their routes and strategies. Conflict-induced airspace closures disrupt performance metrics and market mechanisms, forcing aircraft operators to shift capacity to accessible airspace. For example, airspace restrictions over Russia have forced European airlines flying to Asia to resort to longer routes, increasing costs. Air France's Paris-to-Tokyo flights, for instance, required an additional two hours due to these detours (Sopamena 2022). In response to these challenges, some European carriers suspended some of their flights to China (Topham and Transport 2024).

Sopamena (2022) argues that “the decision to close airspace for many countries became a policy that brought the world back to conditions similar to those in the Cold War era” (163). One example of airspace closure during the Cold War is the period between 1962 and 2016, during which there were no commercial flights between the United States and Cuba. Córdoba (2022) studied the evolution of Cuba’s air transport network after its connectivity to the US was halted, examining how the country adapted its routes and developed alternative connections to sustain its air transport network. However, the current situation with regard to Russia presents an even more pertinent case, given the country’s significant role in global air traffic. With Russia accounting for 5.2% of global international air traffic in 2021 (IATA 2022), the impact of recent airspace restrictions was therefore expected to be far more substantial on a global scale. These developments highligths the importance of examining how Russia managed to reduce the impact of these extraordinary circumstances on its air transport system. To address this gap in the literature, this study aims to analyze the adaptation of Russia’s international air transport system in the face of airspace restrictions imposed following the invasion of Ukraine. The article is organized as follows: firstly, the literature review is presented; second, the methodology is explained; thirdly, the results of the analysis and the discussion are provided in the same section; and lastly, conclusions are drawn.

Literature review

Closures of airspace have become more common in the first two decades of the twenty-first century. The US closed its airspace for two days following the September 11 attacks in New York in 2001 (Rodrigue 2024), which appears to have had a relevant short-term impact on air transport passenger demand (Lee, Oh, and O’Leary 2005), with major US airlines struggling with profitability (losses of 30 billion USD during 2000-2005) and several filing for bankruptcy (Goetz and Vowles 2009). Most of the Northern European states closed their airspaces for one week after the eruption of the Icelandic volcano Eyjafjallajökull in 2010, affecting more than 100,000 flights, 10 million passenger journeys, and costing the airline industry more than $1.7 billion in lost revenue (Budd et al. 2011). Saudi Arabia, the United Arab Emirates (UAE), and up to seven other allies closed their airspace to Qatari planes in June 2017 for almost three years, a blockade in response to Qatar’s perceived support of terrorist organizations and relationship with Iran (Gardner 2021). This eliminated Qatar Airways’ access to key markets in Saudi Arabia and the UAE, forcing the airline to reroute flights and incur higher operational costs (Abeyratne 2018; Umar and Ghurab 2023). In February 2019, Pakistan closed its airspace for five months to India in response to an air strike carried out by India in Pakistan-administered Kashmir. Combined losses for both Pakistan Civil Aviation Authority and Pakistan International Airlines (PIA) are estimated to have been around 100 million USD (Costas 2024). It can be observed that there has been a shift from “incidental” measures that aim to enhance the safety and security of airspace towards more “systemic” measures that are implemented for a longer time and are driven by more profound political and strategic motives (Mendes de Leon 2021), although Costas (2024) indicates that airspace closures are not effective at changing a target state’s behavior. The Russian case, falling into the latter category, presents a pertinent example of this outcome.

The conflict between Russia and Ukraine has a complex history that escalated in 2014 when Russian-backed separatists seized control of Crimea and parts of the Donbas region. On February 21, 2022, President Putin recognized the self-proclaimed independence of the Donbas region. Just three days later, on February 24, Russia launched a military operation in Ukraine, citing self-defense as justification. This action was met with widespread international condemnation and significant sanctions (Tong 2024). Since the end of February 2022, the EU has prohibited Russian carriers from accessing EU airports or flying within EU airspace. The EU also banned the export of aviation technology to Russia. The US, Canada, and the UK have implemented similar restrictions. These sanctions have prevented Russian airlines from purchasing aircraft, spare parts, or equipment necessary to properly maintain 75% of their aircraft fleets. The International Civil Aviation Organization (ICAO) also condemned violations of international aviation rules, including violating Ukraine's airspace, double registration of aircraft stolen from aircraft leasing companies in Russia, and allowing Russian airlines to operate these aircraft on international routes (EU 2023).

Russia responded to EU sanctions on February 28, 2022, by banning European airlines from overflights of Russian territory. Russian airspace is key to traffic between Europe and Asia, and this closure has resulted in longer flights and increased operational costs (Ennen and Wozny 2024; Sopamena 2022). Since the start of the war, many Russian citizens have left the country for different destinations around the world. The first mobilization of 300,000 Russian soldiers since WWII, announced by Putin in September 2022, triggered a new wave of Russian citizens leaving the country (Sauer 2022). It is estimated that, in total, approximately 500,000 Russian citizens have left the country since the war started in February 2022 (Khrushcheva 2023).

Increasing evidence indicates a strong correlation: Nations with liberal air services agreements are likely to see a rise in air traffic growth, whereas countries following stricter aviation regulations are likely to experience comparatively slower growth (Njoya and Isah 2023). Furthermore, the availability of air transport capacity serves as a clear indicator of market accessibility and stimulates international tourism and trade, leading to enhanced economic growth and social welfare (Hussain 2023; Kuok, Koo, and Lim 2023). The WTO (2023) estimates that the volume of Russian exports from March to November 2022 showed only a slight decrease. However, the sharp rise in the price of goods in the primary sector, such as fuels, fertilizers, and cereals, meant that these exports experienced a notable increase of 15.6 per cent in value. While these apparently variable results in the context of the broader international market suggest the inevitable need for adaptation by international aviation systems, it is important to note that aircraft operators, seeking to maximize the utilization of their most expensive assets, often respond to such disruptions by redeploying planes to new routes, a step that is both relatively easy and quick to implement (Efthymiou and Christidis 2023). This paper aims to draw specific attention to the adaptations made by international airlines in order to sustain the performance of Russia's aviation sector.

Methodology

The primary objective of this study is to analyze the impact of airspace restrictions on Russian airlines during the first year of the Russia-Ukraine conflict. It aims to assess how these have affected international air connectivity to and from Russia and to interpret the resulting changes in global air transport patterns. Changes are interpreted based on academic literature, relevant news coverage, knowledge of the economic and demographic attributes of the locations involved, as well as the overall geopolitical context.

The data used to analyze the Russian international air transport sector were sourced from the Official Airline Guide (OAG)[1], a database frequently used by the air transport research community. For instance, Burghouwt (2014) has employed it to analyze intra-European and intercontinental scheduled services, while Fageda, Suau-Sanchez, and Mason (2015) have used it to study the evolution of the European Low-Cost Airline business model. Additionally, the AOG database has been utilized to investigate traffic responses to external shocks; for example, Corbet et al. (2019) analyzed the impact of terrorist attacks on European tourism using this dataset. As one of the largest collections of air travel data, the OAG database offers one of the largest collections of air travel data, offering a highly accurate, comprehensive, and up-to-date set of information on available seats per flight and route (Corbet et al. (2019). While this robust data source offers comprehensive point-to-point seat capacity information, it's important to note that it doesn't differentiate between seats occupied by direct passengers and those used by travelers making connections. This paper focuses on scheduled passenger flights rather than cargo.

The analyzed data includes the six different time periods shown in Figure 1.

Each time period analyzed includes one week of Russian and total international air seat capacity. OAG weekly data provides a representative snapshot of airline seat capacity for an entire season, which airlines tend to maintain consistently, barring special events or notable dates. This approach offers an efficient compromise between data granularity and manageability. The data periods were extracted at different points to reflect capacity before the invasion on February 24, 2022 (P1) and after the invasion (P2, P3, P4, P5, and P6). Airlines tend to have at least two programs yearly (winter and summer). As shown in Figure 1, periods were selected to include data from different seasonal periods. To facilitate comparison, the two winter seasons analyzed (2022 and 2023) include periods falling in the same fourth and eleventh weeks of the corresponding years (i.e. P1-P5 and P2-P6). The periods were selected to exclude holidays and therefore avoid any distortion of the results.

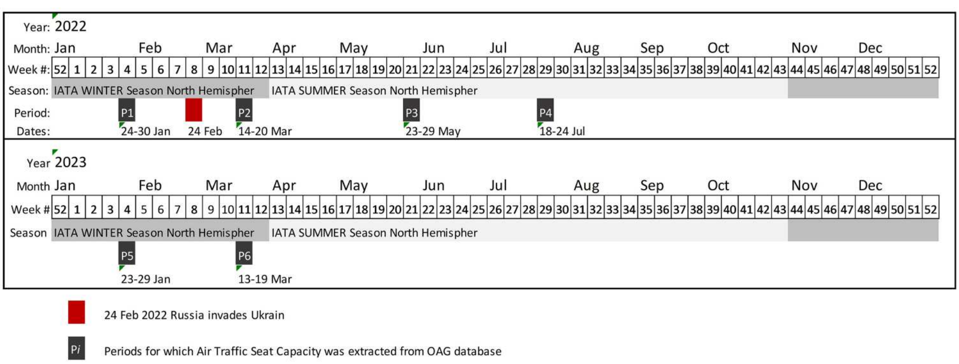

Figure 1. Time periods when OAG available seat data was extracted (Source: Authors).

Results and discussion

Overall capacity trends

The response of international Russian air traffic to the restrictions and changed circumstances occasioned by the Ukraine invasion is presented at different levels of analysis. Firstly, changes to Russian international air seat capacity (supply of air transport) are compared with the world's total international air traffic capacity. Secondly, the number of countries connected to Russia by air is compared between January 2022 (before the invasion) and January 2023 (one year later). Thirdly, the countries connected to Russia in January 2023 are analyzed regarding air traffic capacity volume, measured by the number of available seats, and compared with volumes before the invasion. Lastly, a similar capacity analysis is carried out for the airports, routes, and airlines connecting Russia on international flights in January 2023.

Figure 2 below shows the changes to available seats for all the periods under analysis, with P1 (January 2022) serving as the reference period (100). The indices represent the relative air seat capacity of global and Russian international air transport.

The number of international seats offered worldwide increased during the northern hemisphere summer season of 2022, with a 62% increase in P3 (May 2022) and 86% in P4 (July 2022). These high growth levels on internationally available seats continued

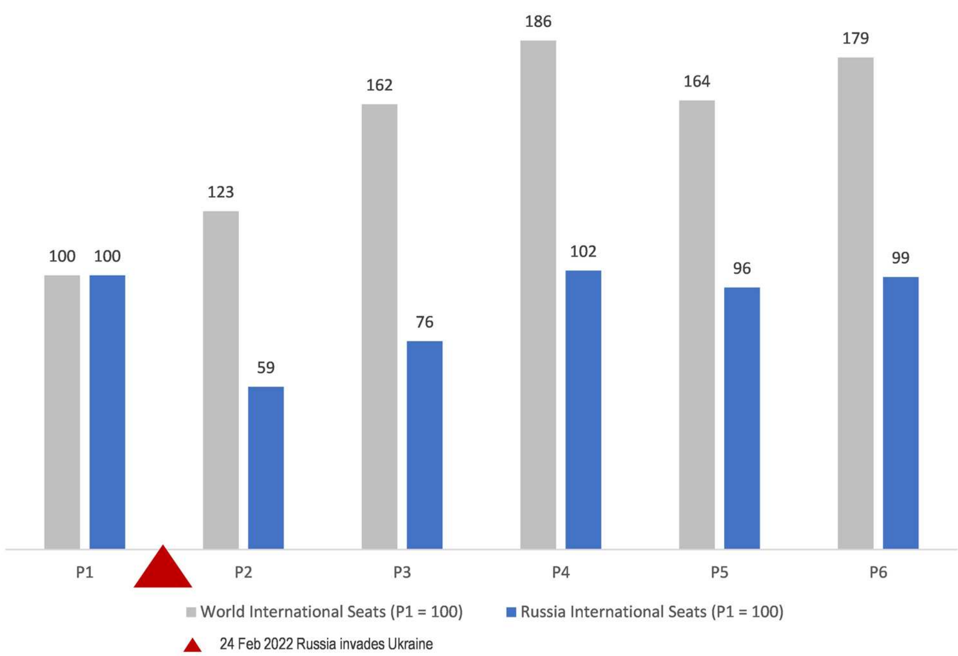

Figure 2. Worldwide and Russian international air seat capacity from January 2022 to March 2023 (Source: Authors, using OAG (2023) data).

Note: Six periods of worldwide and Russian international air seat capacity changes from January 2022 to March 2023. P1: January 24-30, 2022; P2: March 14-20, 2022; P3: May 14-20, 2022; P4: July 18-24, 2022; P5: January 23-29, 2023; P6: March 13-19, 2023; February 24, 2022 was when Russia invaded Ukraine.

during the following year's winter season periods, with 64% in P5 (January 2023) and 79% in P6 (March 2023), as shown in Figure 2 (IATA 2023).

Russian international traffic, however, evolved very differently. It was clear that the negative impact of the invasion was more evident during the month right after the invasion (P2 – March 2022), when there was a 41% decrease in air seat capacity. Subsequently, the air seat capacity recovered to the level of the previous period before the invasion at differing rates. In P3 (May 2022), capacity decreased by 24%, but the volume of seats in the last three periods analyzed (P4 – July 2022, P5 – January 2023, and P6 – March 2023) reached levels similar to those before the invasion (P1 – January 2022). To analyze the substitution effects after the imposition of Western sanctions, this study uses matching weekly periods – P5 (January 2023) and P1 (January 2022) – representing the same week of the year in two different years, so as to identify which countries, cities, routes, and airlines benefited from the Russian invasion.

Country network changes

Figure 3a and 3b below show the countries connected by air transport with Russia in periods P1 (January 2022) and P5 (January 2023), respectively. The total number of countries connected to Russia before the invasion of Ukraine was 64, and this was reduced to almost half (34 countries) a year after. The countries with flight connections to Russia in January 2022 but lost their connectivity in January 2023 were 22 countries from the EU (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Poland, Portugal, Romania, Slovenia, Spain and Sweden), as well as the Dominican Republic, Georgia, Japan, Kuwait, Saudi Arabia, Singapore, Mexico, Moldova, Norway, Switzerland, UK, US, and Vietnam.

During the same period, the United Nations issued four special resolutions in reaction to Russia's military operation in Ukraine: SR1 was a demand that Russia withdraw its military forces from Ukraine; SR2 focused on the humanitarian consequences of the invasion and called for an immediate cessation of hostilities; SR3 suspended Russia from in the UN Human Rights Council; and SR4 declared Russia's attempted annexation of Ukrainian territories illegal and demanded immediate withdrawal. For different geopolitical reasons, most of the 34 countries connected to Russia by air in January 2023 have not endorsed some of the sanctions imposed on Russia after the invasion (Haddad 2023). There are some exceptions, with Israel, Maldives, Serbia, Seychelles, South Korea, and Türkiye endorsing all four resolutions. However, these countries have maintained flight connections to Russia during the war with Ukraine, as their airspaces remained open to Russian airlines and vice versa. Türkiye was the foremost international market in terms of seat numbers to and from Russia in January 2022. During the period from Jan 2022 to Jan 2023, while Russia experienced a 4% decline in its international seats, Türkiye saw a remarkable 39% increase in seats to and from Russia.

The Russia-Ukraine war has profoundly impacted the aircraft leasing industry, as Western sanctions imposed in response to the invasion forced lessors to terminate contracts with Russian airlines, leaving more than 400 leased aircraft stranded in Russia and triggering legal disputes involving an estimate $8-15 billion in assets. Sanctions have restricted leasing and insurance, while Russian countermeasures have included the

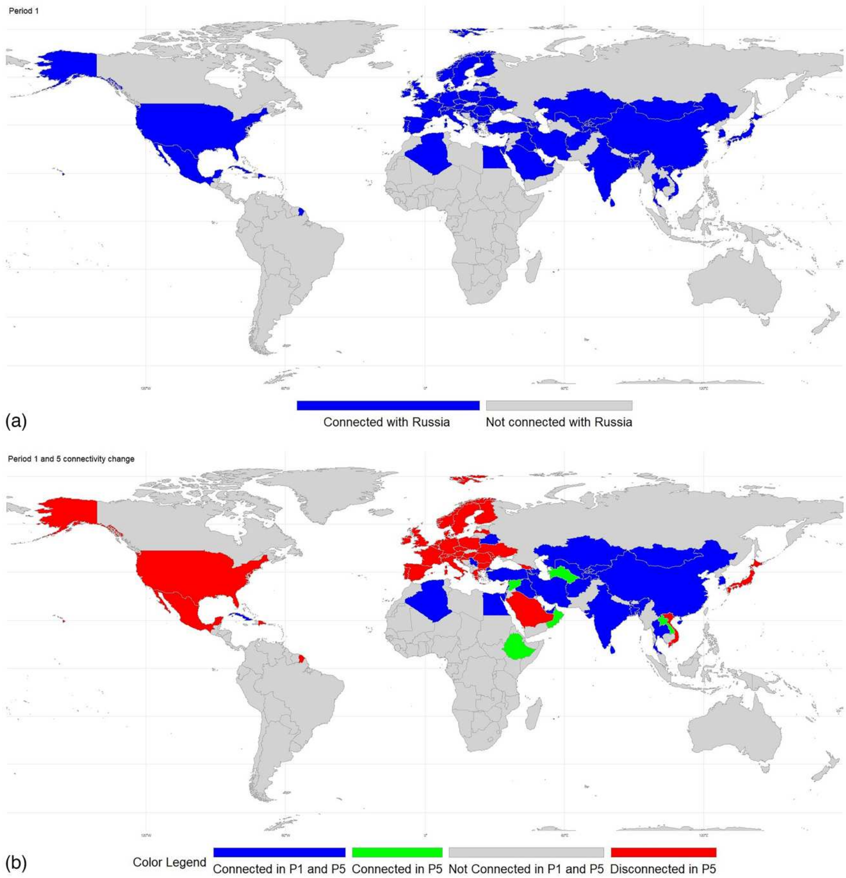

Figure 3. (a). Countries/territories connected to Russia (in blue) by air in January 2022 (Source: Authors, using OAG (2023) data). 64 countries had direct air connections with Russia in January 2022: Afghanistan, Algeria, Armenia, **Austria**, Azerbaijan, Bahrain, Bangladesh, Belarus, **Belgium**, **Bulgaria**, China, **Croatia**, Cuba, **Cyprus**, **Czech Republic**, **Denmark**, **the Dominican Republic**, Egypt, **Finland**, **France**, **Georgia**, **Germany**, **Greece**, **Hungary**, India, Iran, Iraq, **Ireland**, Israel, **Italy**, **Japan**, Kazakhstan, South Korea, **Kuwait**, Kyrgyzstan, **Latvia**, Lebanon, Maldives, **Mexico**, **Moldova**, Mongolia, **Netherlands**, **Norway**, **Poland**, **Portugal**, Qatar, **Romania**, **Saudi Arabia**, Serbia, Seychelles, **Singapore**, **Slovenia**, **Spain**, Sri Lanka, **Sweden**, **Switzerland**, Tajikistan, Thailand, Türkiye, UAE, **UK**, **US**, Uzbekistan, **Vietnam. 35 countries (in bold)** were connected to Russia in January 2022, but not in January 2023. (b). Connection of countries/territories to Russia by air in January 2022 and January 2023 (Source: Authors, using OAG (2023) data). Note: Blue represents countries/territories connected to Russia in January 2022 and January 2023; Green represents countries/territories connected to Russia in January 2023 only; and red represents countries/territories connected to Russia in January 2022 and not in January 2023. On February 24, 2022, Russia invaded Ukraine. 34 countries were connected to Russia in January 2023: Afghanistan, Algeria, Armenia, Azerbaijan, Bahrain, Bangladesh, Belarus, China, Cuba, Egypt, **Ethiopia**, India, Iran, Iraq, Israel, Kazakhstan, South Korea, Kyrgyzstan, **Laos**, Lebanon, Maldives, Mongolia, **Oman**, Qatar, Serbia, Seychelles, Sri Lanka, **Syria**, Tajikistan, Thailand, Türkiye, **Turkmenistan**, UAE, Uzbekistan. **5 countries (in bold)** were connected to Russia in January 2023 but not in January 2022. 35 countries were connected to Russia in January 2022 (P1) but not in January 2023 (P5): Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, the Dominican Republic, Finland, France, Georgia, Germany, Greece, Hungary, Ireland, Italy, Japan, Kuwait, Latvia, Mexico, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Saudi Arabia, Singapore, Slovenia, Spain, Sweden, Switzerland, UK, US, Vietnam.

unilateral re-registration of planes that now only fly within Russian territory. The insurance market faces unprecedented losses directly linked to the conflict and the associated sanctions, with aviation-related insurance claims on grounded and expropriated aircraft estimated at up to $10 billion. Some lessors have secured settlements, but many claims remain unresolved, illustrating how the war and ensuing sanctions have reshaped risk allocation between lessors, airlines and insurers (OECD 2022; O'Connor 2024). Meanwhile, the war has created significant maintenance, repair, and overhall (MRO) challenges for Western aircraft in Russia. In contrast, despite sanctions, Russian airlines have obtained critical components through smuggling and third-country intermediaries, leading to the emergence of black markets. It is estimated that in 2022, $14.4 million worth of US-made aircraft parts were illegally imported into Russia (Rains 2023). Russian companies have resorted to "cannibalizing" their own aircraft and seeking supplies from countries like India and China, allowing Russian carriers to keep a substantial portion of their Western-made fleet operational (Rains 2023).

In terms of air seat capacity, significant differences exist in the seating capacity offered in January 2022 and January 2023. Figure 4 shows the countries/territories connected to Russia in relation to air seat capacity in January 2023 and the variation compared to January 2022.

The top three countries with air connections to Russia in January 2023, i.e. Türkiye, UAE, and Tajikistan, were already in the top five list one year before. Interestingly, those countries also showed significant growth levels compared to January 2022. While Russia offered 4% fewer international air seats in January 2023, those markets to Russia were growing substantially, with increases of 39%, 47%, and 65%, respectively. A significant outlier represented in Figure 4 is Thailand, where the number of air seats in January 2023 grew by 550% compared to January 2022, and its country ranking jumped from 19th in January 2022 to 5th in January 2023. Thailand was already a popular winter

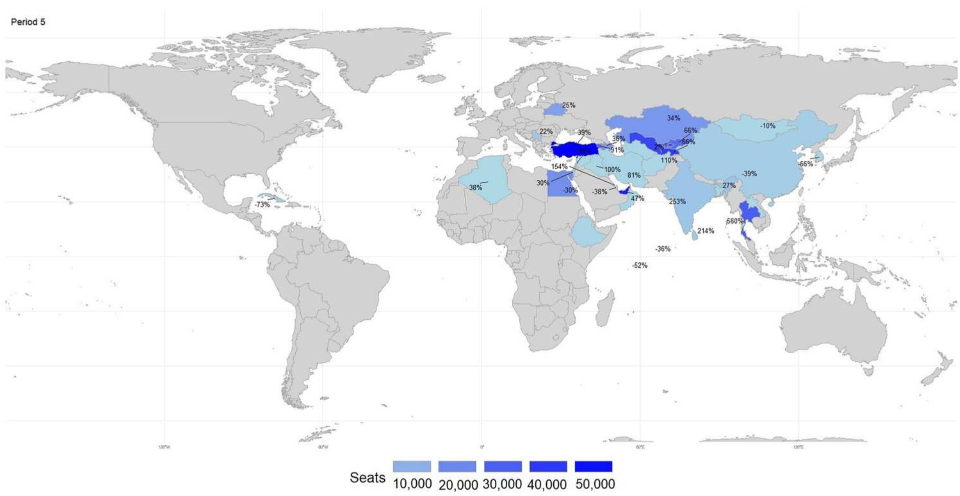

Figure 4. Russian international air seat capacity by country/territory in January 2023 (Source: Authors, using OAG (2023) data).

Note: Darker blue indicates higher volumes of air seat capacity, lighter blue indicates lower volumes of air seat capacity destination for Russian holidaymakers. However, since Vladimir Putin ordered the invasion, traffic has clearly surged. Between November 1, 2022 and January 21, 2023, more than 233,000 Russians arrived in Phuket, many of whom had not taken the flight for a short winter holiday but to escape the war and probable conscription or to otherwise emigrate (Duangdee 2023).

Another country with high growth rates in air connections to Russia is India, with a 252% increase. New air services were launched between Moscow and Goa in India in November 2022 (Shiraz 2022). In April 2023, Russia and India announced negotiations for a free trade agreement between the two markets (Partington 2023). In early 2023, the bilateral air services agreement between Russia and India was revised, increasing the number of weekly flights from 52 to 64 flights a week, and the Russian carrier Aeroflot has plans to connect six Indian cities with Russia (Ellichipuram 2023). Thus, the growth between the two countries observed in January 2023 is expected to increase further due to this revised negotiation.

The third country by growth of seats available in January 2023 was Sri Lanka, with a 213% growth. Russia was already Sri Lanka's first source of visitors in January 2022, accounting for 13,478 arrivals and 16.4% of all foreign visitors (SLTDA 2023). The number was drastically reduced following the occupation of Ukrainian territory. In addition, Aeroflot stopped its flights to the capital, Colombo, in June 2022, following the grounding of one of its Airbus 330s ordered by the Commercial High Court of the Western Province in Colombo due to a commercial dispute with an Irish leasing company. Conversations at the presidential level of both countries resulted in Aeroflot resuming flights in October 2022. Other airlines followed suit; for example, the Russian Red Wing launched new flights between Moscow and the southern port town of Hambantota (AFP 2022; Mehta 2022). In January 2023, 25,254 Russian visitors traveled to Sri Lanka, making Russia the leading source of foreign visitors with a 24.5% share of total arrivals (SLTDA 2023).

In terms of air seat capacity, two countries lost a significant market as they had been among the 15 top countries with air connections to Russia by air seat capacity in January 2022, but did not have any connections in January 2023: Germany with 12,093 weekly seats and the Dominican Republic with 10,049 in January 2022. The other, and even more significant market, was Ukraine, with 23,185 weekly seats in January 2022. However, it is essential to highlight the following anomaly in this case: this entire figure for air seat capacity represented those available between Russian airports and the Simferopol Airport (SIP) in Crimea. Although this airport is officially in Ukrainian territory, it has been considered Russian territory since the annexation of Crimea by the Russian Federation in March 2014 (Panasiuk and Zubrytska 2021).

Airport-level shifts

Countries connected to Russia by air have often had more than one gateway, contributing to greater seat capacity between the two countries. One more analysis of the seating capacity connected to Russia can be undertaken at the airport level. Figure 5 below shows the airports connected to Russia in January 2023. The 15 airports with the largest capacity in January 2023 accounted for 72% of Russian international air seat capacity.

In January 2023, the two major hub airports offering the highest seat capacity to Russia were Istanbul New Airport (IST) and Dubai International Airport (DXB), experiencing

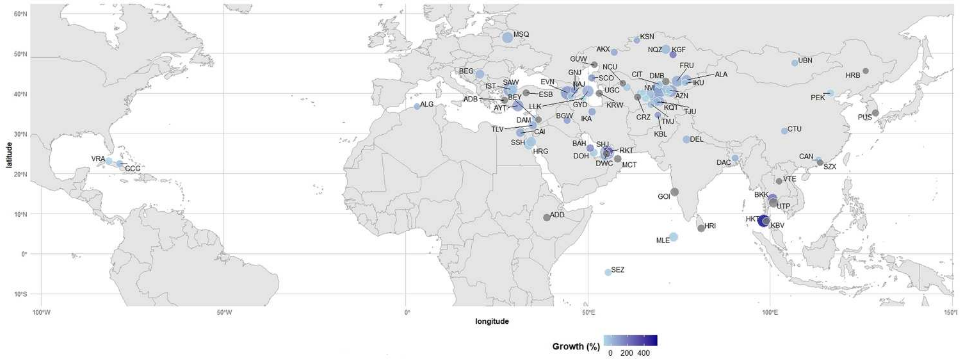

Figure 5. Russian international destinations in January 2023 by air seat capacity (Source: Authors, using OAG (2023) data).

Note: The bubble size is proportional to the volume of available seats in January 2023. The darkness of the color indicates the growth compared to January 2022.

seat capacity growth rates of 59% and 27%, respectively. Both airports had already been among the leading hubs for Russia-bound traffic, ranking 3rd and 1st, respectively, in January 2022. As a result, apart from handling direct traffic, these two airports are anticipated to serve as significant transit points for Russian passengers heading to various global destinations. This includes passengers traveling on routes that, in January 2022, still had direct connections to Russia but subsequently lost them due to economic and trade sanctions.

Zvartnots International Airport (EVN) in Armenia, an important destination for Russians and the third airport on the list in January 2023 in terms of air seat capacity, exhibited a noteworthy relative growth rate of 112%, ranking as the second-highest growth after Phuket Airport (HKT) in Thailand. In their study, Melkumyan and Melkonyan (2023) identified several factors that attract immigration to Armenia from Russia. These factors include a lenient migration policy towards Russian citizens, access to Russian banks from Armenia, the ability to communicate in Russian, and the convenience of short distances and frequent flights between Russia and Armenia. However, the same authors also discovered that some Russians could not attain a reasonable standard of living in Armenia, and they perceived a potential threat due to the close connection between Armenian and Russian authorities. Additionally, the ongoing threat of Azerbaijan's aggression towards Armenia served as a disincentive, leading some Russian emigrants to leave Armenia.

Airports in Central Asian nations also hold top positions in air seat capacity for Russia and in recent growth rates. Traditionally, a significant portion of the workforce from these Central Asian countries has been employed in Russia. For instance, over 1.5 million Tajiks, out of a total population of 9 million, have worked as immigrant laborers in Russia (Pazhwak 2022). They have contributed to approximately one-quarter of Tajikistan's GDP through remittances (Pazhwak 2022). However, with Russia's invasion of Ukraine, "migrant worker" dynamics flipped. Since 2022, Russians have taken on the role of migrant workers in Central Asia, contributing to the remarkable growth rates of regional airports, including Dushanbe Airport in Tajikistan (Kluczewska 2022).

The research community has credibly validated the connection between international trade and air transport (Baldwin and Pustay 2004; Button 2008). This connection can elucidate some of the growth in air seat capacity between Russia and Central Asia. In this context, Chupilkin, Javorcik, and Plekhanov (2023) observed that the reduction in exports to Russia from the EU, the UK, and the US due to economic sanctions led to a rerouting of trade by Central Asian countries. These countries experienced increased imports from the EU and the UK and a rise in exports to Russia.

Elsewhere, in January 2023, two Egyptian Red Sea destinations in the top 15 airports with connections to Russia experienced negative growth rates. Sharm saw a 28% decrease, and Hurghada had a 46% decline. Russian flights to the Red Sea were suspended in 2015 after a plane crash in the Sinai Peninsula, resuming only in 2021. Before Russia invaded Ukraine, Russians and Ukrainians constituted about 30% of Red Sea tourists. Flights were interrupted due to the invasion and only resumed in the winter season of 2022 (Tabikha 2022; Trenin 2016).

The analysis of impacted airports reveals significant shifts in Russia's international air connectivity following the Ukraine invasion. Major European hubs were disconnected from Russian market traffic, while Istanbul Airport (IST) and Dubai Airport (DBX) solidified their positions as crucial transit points, with seat capacity growth of 59% and 27%, respectively. Central Asian airports saw remarkable increases, reflecting shifting migration patterns and trade routes. Within Russia, Sochi International Airport (AER) emerged as a prominent new international entry point, experiencing a 284% increase in international seat capacity. This reconfiguration demonstrates the adaptability of Russia's air transport network in response to geopolitical pressures, highlighting a clear pivot from European hubs towards Middle Eastern and Central Asian airports.

Route network restructuring

Moving from airport analysis to route analysis, we can better understand how the reconfiguration of Russia's international air network has affected not just the volume of traffic at airports, but also the specific connections between cities and countries. Figure 6 below illustrates the Russian international routes network in January 2022 and January 2023.

The total number of international Russian routes fell by 32% from 535 in January 2022–360 in January 2023. The decrease in route numbers was even more critical for international routes out of Moscow's four international airports, accounting for approximately two-thirds of the total Russian international air seat capacity, which decreased by 42% from 235 to 135 routes. The top 15 international routes from Russia primarily consist of 13 routes connecting the airports serving the Moscow area for scheduled commercial flights, one connecting Sochi International Airport (AER), and one connecting Pulkovo International Airport (LED) in Saint Petersburg. Some of the most prominent Russian international destinations in terms of seat capacity, including Zvartnots (EVN), Istanbul (IST), and Phuket (HKT), were also the international routes achieving the most significant growth rates: Vnukovo Airport – Zvartnots Airport (VKO – EVN) with 2,445%; Sochi Airport – Istanbul New Airport (AER – IST) with 877%; and Sheremetyevo Airport – Phuket Airport (SVO-HKT) with 558%. It is interesting to highlight that the route between Sochi and Istanbul rose in the ranking from 226th to 13th,

Figure 6. International Russian routes in January 2022 and January 2023 (Source: Authors, using OAG (2023) data).

which again confirms the strong air connections between Russia and Türkiye and the new role assumed by Sochi International Airport (AER).

In 2022, Sochi International Airport (AER) was developed as a new domestic and international hub by Rossiya Airlines, which belongs to the Aeroflot group and is the largest operator of Russian regional jet Superjet 100 (SSJ100) with 72 aircraft. As of April 2022, it launched 17 new destinations: Armenia (Yerevan), Egypt (Cairo), Israel (Tel Aviv), Türkiye (Istanbul, Antalya, Bodrum, and Dalaman), Uzbekistan (Tashkent, Samarkand, Bukhara, Fergana, and Urgench) and Kazakhstan (Aktau, Aktobe, Almaty, Atyrau, and Nur-Sultan) (RAI 2022). The consequence was a 284% increase in international seat capacity in January 2023 when compared to January 2022.

The increased traffic on the routes from Russia to Phuket could also represent a shift in winter Russian tourism from other long-haul destinations. For example, the route VKO-LRM (Vnukovo Airport – La Romana Airport in the Dominican Republic) was the 12th largest route in January 2022 and did not offer any seats in January 2023.

Moscow gateway dynamics

A detailed analysis of Moscow's international airports is essential for understanding Russia's air transport adaptability under sanctions, as they handle two-thirds of the country's international seat capacity and serve as primary gateways. The four major international airports are Sheremetyevo (SVO), Vnukovo (VKO), Domodedovo (DME), and Zhukovsky (ZIA), the newest Moscow airport which only opened in 2016 (ZIA 2023). Figure 7 below shows Moscow's airport network.

The concentration of international flights in January 2023 at Moscow's four airports, with 13 out of the 15 busiest routes and two-thirds of the total international seats, also holds true at the domestic level. Tarkhov (2017) ascribed the rapid expansion of the

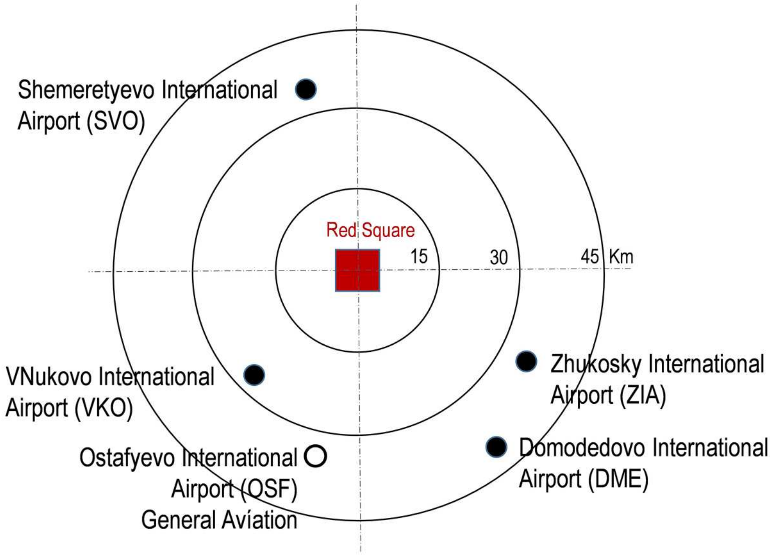

Figure 7. Moscow's network of international airports (Source: Authors).

domestic air network between 1990 and 2015 to the "over-centralization of Moscow". Sheremetyevo (SVO), the central hub of Aeroflot, was the most globally connected Russian airport in Jan 2022, with 36% of international seats. It had also served as the SkyTeam Alliance's home airport in Moscow. However, following the invasion of Ukraine, SkyTeam and Aeroflot agreed to temporarily suspend the latter's SkyTeam membership in April 2022 (SkyTeam 2022).

Domodedovo (DME) is the main base for the Russian private S7 Airline, in 2019 accounting for 44% of all its flights (Calzada, Fageda, and Safronov 2022). DME was also the main Russian base for One World Alliance members since S7 joined in 2010 until April 2022, when it was interrupted (Boon 2022). Thus, in January 2023, DME lost connection with many other Oneworld hubs, such as London Heathrow (LHR) and Madrid Barajas (MAD). DME is also an essential gateway to Commonwealth of Independent States (CIS) destinations, experiencing some high growth in January 2023. For example, Yuzhny Airport (TAS) in Uzbekistan and Zvartnots Airport (EVN) in Armenia saw a growth in the number of seats of 98% and 455%, respectively. DME is also the Moscow airport used by Emirates to connect its hub in Dubai, and was ranked as the second largest international route in January 2023.

The other two commercial airports serving Moscow are Vnukovo International Airport (VKO) and Zhukovsky International Airport (ZIA). VKO is located 28 km southwest of the center of Moscow and is the main base of Turkish Airlines. It has the largest seat capacity between Moscow and Istanbul Airport (IST), with 9,105 seats in January 2023, accounting for a 58% growth compared to January 2022. Pobeda Airlines, the low-cost carrier from the Aeroflot group, has its central hub at VKO and provides high-seat capacity to the most prominent Russian international destinations, including Istanbul and Dubai. ZIA is the fourth international airport in Moscow, located 36 km southwest of the city center, from which the two Russian airlines operating international flights are Red Wings (WZ) and Ural Airlines (U6).

Airline adaptations

Figure 8 below shows the list of the 15 airlines providing 80% of the total Russian international seat capacity in January 2023. Aeroflot and Ural Airlines accounted for the largest share in both periods. Both saw a decrease in capacity in January 2023 due to having a more extensive network that included many destinations that were terminated. This is especially clear in the case of the other Russian airline, S7, which experienced a seat capacity decrease of 72% due to the termination of routes between Oneworld member hubs in April 2022 (Drum 2022).

The split between Russian and international airlines was very even (7 Russian airlines vs. 8 international airlines in January 2023, similar to one year earlier). The Russian airlines with the most considerable growth in January 2023 were Red Wings Airlines (308%), UTair Aviation (209%), and Azimuth (329%). The international carriers with the highest growth were SCAT Airlines from Kazakhstan (1,098%), Air Arabia (725%), and Uzbekistan Air (224%). The airlines connecting the most significant international gateways (IST and DBX) also achieved substantial growth in P5: Turkish Airlines (117%) and Emirates (53%). The most negatively affected airlines were European airlines. For instance, Wizz Air, Finnair, and KLM, which ranked 19th, 21st, and 24th in seat capacity in January 2022, canceled all their capacity one year later.

Figures 9–11 show seating capacity for the two periods among Moscow and the three destinations with the largest capacity in January 2023: Istanbul in Türkiye (22,968 seats), Dubai in the UAE (22,025 seats), and Yerevan in Armenia (14,814 seats). These three cities recorded growth rates of 34%, 25%, and 154% in January 2023 compared with January 2022.

As shown in Figure 9, Aeroflot and Turkish Airlines mainly provided extra seats between Moscow and Istanbul. There was an additional 10% contribution in January 2023 by Red Wings (WZ). The capacity provided by Turkish Airlines can be assumed to include connecting to other destinations. During the preparation of this article, in early December 2023, a Google Flight search was conducted between Moscow (all airports) and three major European cities (Paris, London, and Frankfurt) for December 15. In all three cases, Turkish Airlines offered the shortest flight itineraries via IST. Another popular international gateway for Moscow's international traffic is Dubai. Figure 10 shows the seating capacity between Moscow and Dubai for the periods January 2022 and January 2023.

Two airlines from the UAE state-owned Emirates Group (Emirates and its low-cost airline Fly Dubai) provided the 25% extra capacity of January 2023 (P5). Part of the traffic between Moscow and Dubai, the same as between Moscow and Istanbul, is assumed to be connecting traffic, taking into account the wide range of international destinations from DBX: 22 in Africa, 44 in Asia and the Pacific, 40 in Europe, 18 in the Americas, and 14 in the Middle East (Emirates 2023).

In contrast to the capacity for Moscow-Istanbul and Moscow-Dubai, where the connecting traffic is assumed to account for a significant amount of the total, Yerevan airport (ENV) in Armenia, the third largest Russian international destination in January 2023 (P5), is not considered an airport hub, and therefore, the connecting traffic to other destinations is expected to be very limited. Figure 11 shows the seating capacity between Moscow and Yerevan for the periods January 2022 (P1) and January 2023 (P5).

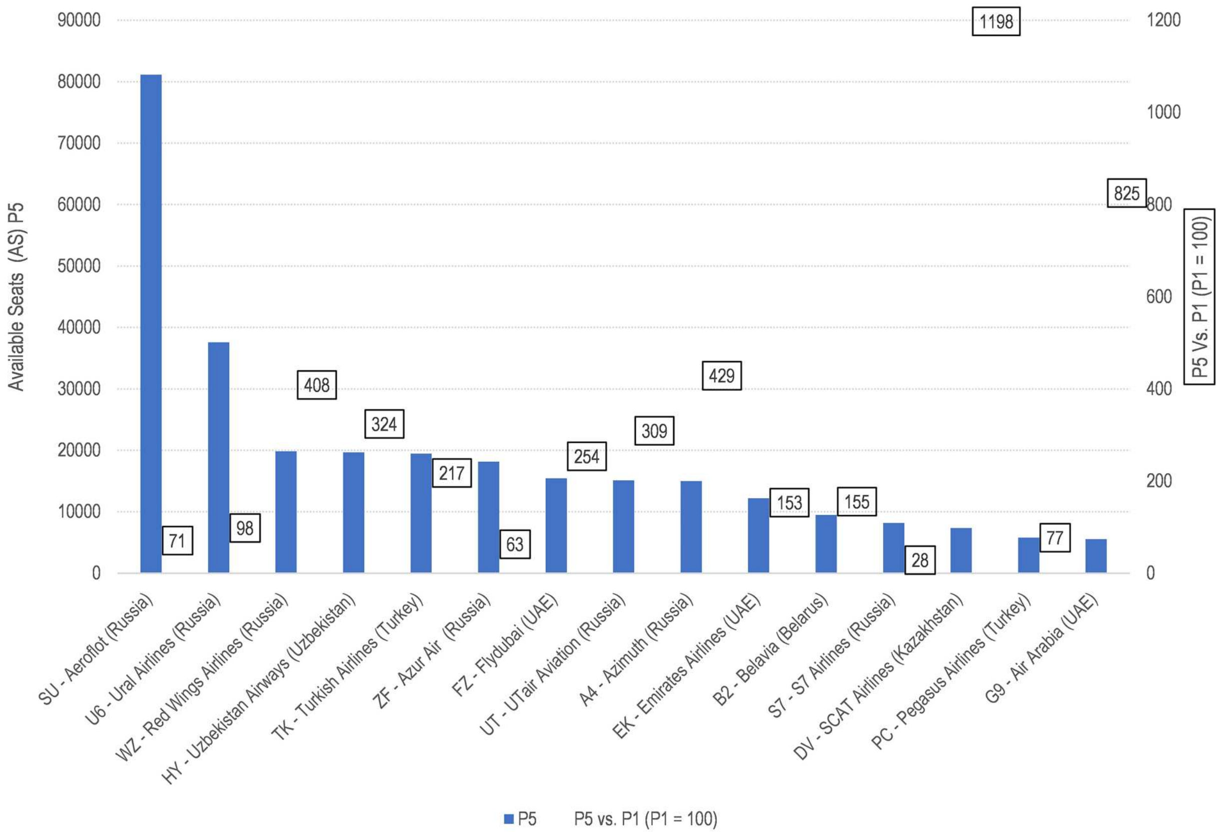

Figure 8. Top 15 airlines by international air seat capacity in the Russian market in January 2023 (Source: Authors, using OAG (2023) data).

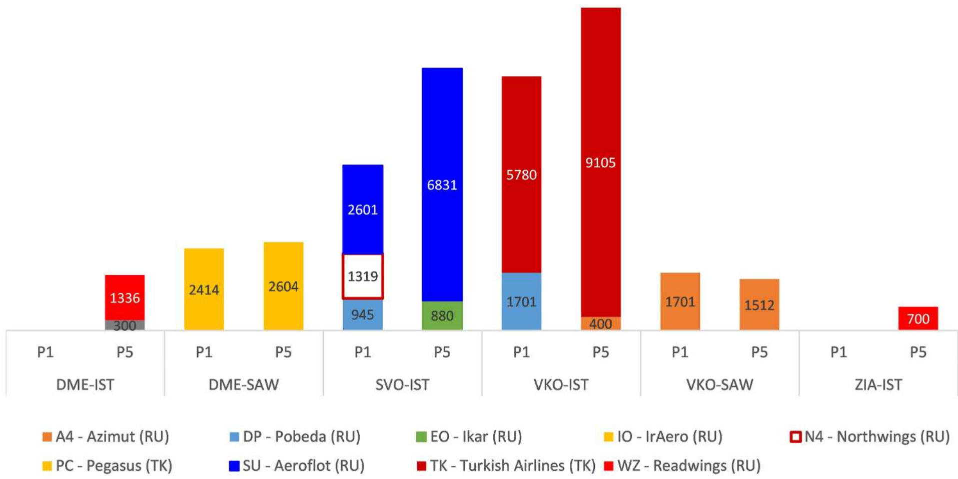

Figure 9. Air seat capacity between the cities of Moscow and Istanbul in January 2022 (P1) and January 2023 (P5) (Source: Authors, using OAG (2023) data).

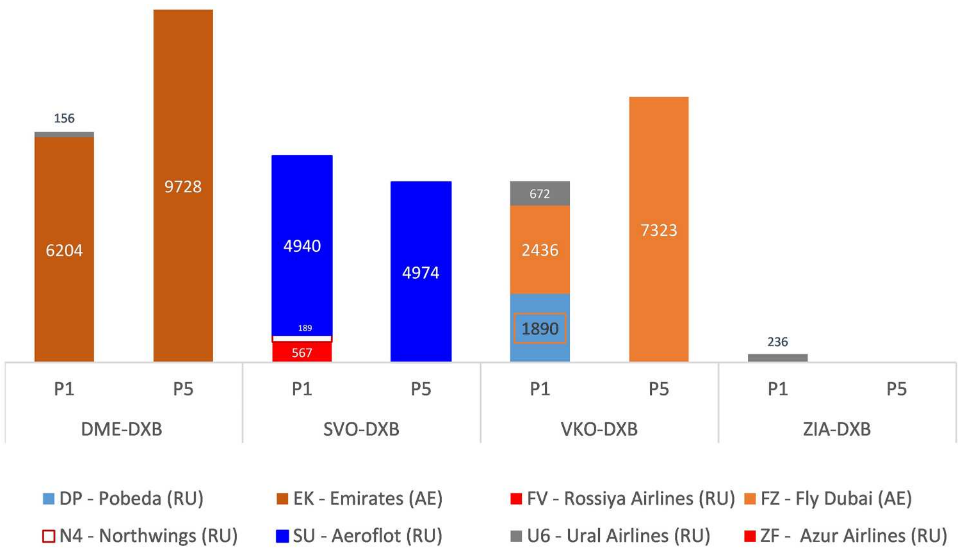

Figure 10. between the cities of Moscow and Dubai in January 2022 (P1) and January 2023 (P5) (Source: Authors, using OAG (2023) data).

In this case, the three Moscow airports (DME, SVO, and VKO) principally accounted for the increase in traffic to Yerevan airport (EVN). The growth was split among several airlines, mainly from Armenia (3F – FlyOne, G6 – Fly Arna, and 6A – Armenian Airways), Russia (SU – Aeroflot, A4 – Azimut, UT Air), and one charter airline registered in Canada (5G – Skyservice).

The analysis of seat capacity associated with the most popular Russian international routes offers a compelling demonstration of the adaptations made in response to geopolitical disruptions. The Moscow-Istanbul route emerged as the top international

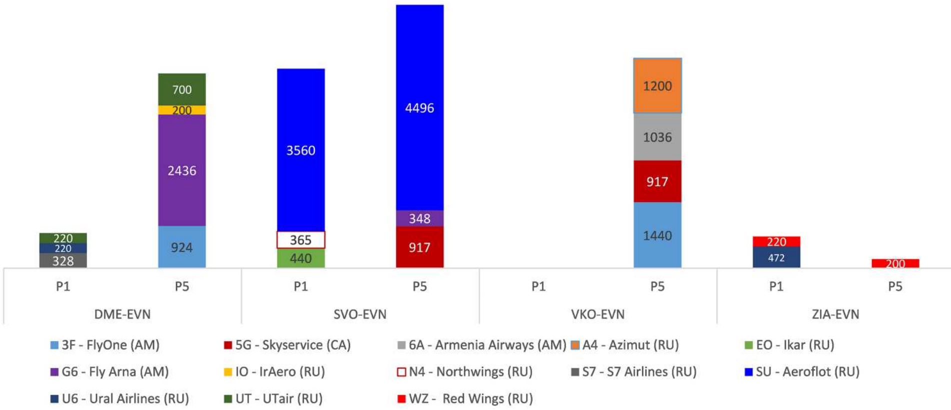

Figure 11. Air seat capacity between the cities of Moscow and Yerevan in Jan 2022 (P1) and Jan 2023 (P5) (Source: Authors).

destination by January 2023, showing a 34% increase in capacity, primarily driven by Aeroflot and Turkish Airlines. The Moscow-Dubai route experienced a 25% capacity increase, mainly due to UAE carriers Emirates and Fly Dubai. Most notably, the Moscow-Yerevan route saw a dramatic 154% growth in capacity, distributed across multiple airlines from both Russia and Armenia. These route-specific adaptations highlight the resilience and flexibility of the Russian air transport sector in redirecting capacity to markets that remained accessible and in high demand, effectively mitigating the impact of sanctions and airspace restrictions on overall international connectivity.

Conclusions

The Russia-Ukraine conflict has significantly reshaped international air transport networks, revealing unexpected resilience and adaptability in the face of unprecedented geopolitical disruption. Initially, within the first month after the invasion, sanctions and airspace closures triggered a dramatic 41% decline in Russia's international air seat capacity. However, the Russian air transport sector demonstrated remarkable flexibility, rebounding to near pre-invasion levels by January 2023, with only a 4% overall decrease in international capacity compared to January 2022. This rapid recovery suggests that the sanctions imposed on Russian airlines in 2022 were largely ineffective in restricting air connectivity.

The geographical reconfiguration of Russia's air connections was substantial. The number of countries connected to Russia plummeted from 64 before the invasion to just 34 a year later, with Europe experiencing the most severe cut in services. Germany, having previously been Europe's primary market for Russian air travel in January 2022, was particularly affected. Several European airlines and airports, especially those previously with strong ties to Russia through alliances or geographical proximity, and which discontinued flight connections after the invasion, have borne the most adverse effects.

Simultaneously, strategic alternative markets emerged. Türkiye and the UAE, previously among the top three international Russian markets, ascended to become the two largest, experiencing substantial growth in air seat capacity, 39% and 47%, respectively. Despite Istanbul Airport (IST) and Dubai Airport (DBX) having already been among the three top connections, the conflict has substantially increased their share and further established them as crucial transit hubs for Russian international traffic. Additionally, former Soviet republics in Central Asia, especially Tajikistan and Armenia, experienced notable air seat capacity growth, with increases of 65% and 91%, becoming in January 2023 the third and sixth largest Russian international markets, respectively.

Within Russia, Moscow's four international airports remained the primary gateways, handling two-thirds of international seat capacity. Interestingly, Sochi International Airport (AER) emerged as a prominent new international entry point. Despite the challenging environment, Russian airlines undertook a variety of adaptations. Aeroflot, the leading state-owned international airline, experienced a 29% reduction in air seat capacity. However, other Russian airlines such as Red Wings and Azimut demonstrated substantial growth rates of 308% and 329%, respectively.

This study is limited by its focus on comparing Russian international seat capacity in only two consecutive winter seasons following the invasion of Ukraine. Additionally, while the OAG data provides comprehensive point-to-point seat capacity information, it does not differentiate between seats occupied by direct passengers and those used by connecting travelers. The analysis is based on specific time periods, which may not capture all seasonal variations or short-term fluctuations in air traffic.

This research offers a rare empirical examination of how geopolitical events can fundamentally transform international air transport networks. By documenting the Russian air transport sector's response to unprecedented sanctions, the study contributes critical insights into the resilience, adaptability, and strategic reconfiguration of international air connectivity under extreme geopolitical pressure. Future research opportunities include analyzing diverse timeframes, including summer periods, to enhance the current literature. Moreover, further investigation into Russian international traffic directed towards final destinations could provide a more precise analysis of the flow of international passengers in Russia.

Note

1. Available at: https://analytics.oag.com/analyser-client/home.

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References

Abeyratne, Ruwantissa. 2018. "Politics of Air Transport: The Qatar Issue." *Issues in Aviation Law and Policy* 17 (2): 179–192.

AFP. 2022. "Sri Lanka Welcomes New Russian Flights after Tourism Plea." https://www.zawya.com/en/world/indian-sub-continent/sri-lanka-welcomes-new-russian-flights-after-tourism-plea-jetfb2pz.

Baldwin, Gordon, and Michael W. Pustay. 2004. "Trade and Transportation: The Impact of the 1995 Transborder Air Services Accord." *Transportation Journal* 43 (2): 5–15.

Blalock, Garrick, Vrinda Kadiyali, and Daniel H. Simon. 2007. "The Impact of Post-9/11 Airport Security Measures on the Demand for Air Travel." *The Journal of Law and Economics* 50 (4): 731–755. https://doi.org/10.1086/519816.

Boon, Tom. 2022. "Russia's S7 Airlines Temporarily Leaves The Oneworld Alliance." Simple Flying, April 20. https://simpleflying.com/russia-s7-airlines-leaves-oneworld-alliance/.

Budd, Lucy, Steven Griggs, David Howarth, and Stephen Ison. 2011. "A Fiasco of Volcanic Proportions? Eyjafjallajökull and the Closure of European Airspace." *Mobilities* 6 (1): 31–40. https://doi.org/10.1080/17450101.2011.532650.

Burghouwt, Guillaume. 2014. "Long-Haul Specialization Patterns in European Multihub Airline Networks – An Exploratory Analysis." *Journal of Air Transport Management* 34 (January): 30–41. https://doi.org/10.1016/j.jairtraman.2013.07.008.

Button, K. 2008. *The Impacts of Globalisation on International Air Transport Activity, Global Forum on Transport and Environment in a Globalising World 10-12 November 2008*. Guadalajara, Mexico: OECD/ITF.

Calzada, Joan, Xavier Fageda, and Roman Safronov. 2022. "How Do Global Airline Alliances Affect Flight Frequency? Evidence from Russia." *Journal of Air Transport Management* 98 (January): 102156. https://doi.org/10.1016/j.jairtraman.2021.102156.

Chepeliev, Maksym, Thomas Hertel, and Dominique van der Mensbrugghe. 2022. "Cutting Russia's Fossil Fuel Exports: Short-Term Economic Pain for Long-Term Environmental Gain." *The World Economy* 45 (11): 3314–3343. https://doi.org/10.1111/twec.13301.

Chupilkin, Maxim, Beata Javorcik, and Alexander Plekhanov. 2023. *The Eurasian Roundabout: Trade Flows into Russia through the Caucasus and Central Asia*.

Corbet, Shaen, John F. O'Connell, Marina Efthymiou, Cathal Guiomard, and Brian Lucey. 2019. "The Impact of Terrorism on European Tourism." *Annals of Tourism Research* 75 (March): 1–17. https://doi.org/10.1016/j.annals.2018.12.012.

Córdoba, Hilton A. 2022. "The Evolution of Cuba's Air Transport Network in the Embargo Era: 1967–2017." *Journal of Transport Geography* 98 (January): 103259. https://doi.org/10.1016/j.jtrangeo.2021.103259.

Costas, Samantha. 2024. "Controlling the Skies: Leveraging Airspace as a Foreign Policy Tool." Ph.D., Loyola University Chicago. https://www.proquest.com/docview/3100841321/abstract/BDAB1E9FAE8740D5PQ/1?sourcetype=Dissertations%20&%20Theses.

Drum, Bruce. 2022. "S7 Airlines Is Suspended from the Oneworld Alliance." World Airline News. https://worldairlinenews.com/2022/04/21/s7-airlines-is-suspended-from-the-oneworld-alliance/.

Duangdee, Vijitra. 2023. *Russians Make Thailand a Refuge as Ukraine War Enters Second Year*. https://www.aljazeera.com/economy/2023/2/22/russians-make-thailand-a-refuge-as-ukraine-war-enters-second-year.

Efthymiou, Marina. 2023. *Air Traffic Management: Principles, Performance, Markets*. Taylor & Francis.

Efthymiou, Marina, and Panayotis Christidis. 2023. "Low-Cost Carriers Route Network Development." *Annals of Tourism Research* 101 (July): 103608. https://doi.org/10.1016/j.annals.2023.103608.

Ellichipuram, Umesh. 2023. "Aeroflot Increases Flight Services to India." *Airport Technology*, March 28. https://www.airport-technology.com/news/russias-aeroflot-flight-services-india/.

Emirates. 2023. "All Emirates Flight Routes | Where We Fly |." https://www.emirates.com/es/english/destinations/route-map/.

Ennen, David, and Florian Wozny. 2024. "Airspace Closures Following the War of Aggression in Ukraine: The Impact on Europe-Asia Airfares." *Transportation Research Procedia, 25th Euro Working Group on Transportation Meeting* 78 (January): 103–110. https://doi.org/10.1016/j.trpro.2024.02.014.

EU. 2023. "EU Sanctions against Russia Explained." https://www.consilium.europa.eu/en/policies/sanctions/restrictive-measures-against-russia-over-ukraine/sanctions-against-russia-explained/.

Fageda, Xavier, Pere Suau-Sanchez, and Keith J. Mason. 2015. "The Evolving Low-Cost Business Model: Network Implications of Fare Bundling and Connecting Flights in Europe." *Journal of Air Transport Management* 42 (January): 289–296. https://doi.org/10.1016/j.jairtraman.2014.12.002.

Gardner, Frank. 2021. *Qatar Crisis: Saudi Arabia and Allies Restore Diplomatic Ties with Emirate*. January 4. https://www.bbc.com/news/world-middle-east-55538792.

Goetz, Andrew R., and Timothy M. Vowles. 2009. "The Good, the Bad, and the Ugly: 30 Years of US Airline Deregulation." *Journal of Transport Geography, Airline Industry Liberalization* 17 (4): 251–263. https://doi.org/10.1016/j.jtrangeo.2009.02.012.

Graham, Anne, David Warnock-Smith, John F. O'Connell, Marina Efthymiou, and Xingwu Zheng. 2023. "Market Developments on Chinese International Air Passenger Markets in Light of COVID-19 Policy Measures." *Sustainability* 15 (2): 2. https://doi.org/10.3390/su15021525.

Haddad, Mohammed. 2023. "Where Does Your Country Stand on the Russia-Ukraine War?" https://www.aljazeera.com/news/2023/2/16/mapping-where-every-country-stands-on-the-russia-ukraine-war.

Hussain, Muhammad Noshab. 2023. "Evaluating the Impact of Air Transportation, Railway Transportation, and Trade Openness on Inbound and Outbound Tourism in BRI Countries." *Journal of Air Transport Management* 106 (January): 102307. https://doi.org/10.1016/j.jairtraman.2022.102307.

IATA. 2022. "The Impact of the War in Ukraine on the Aviation Industry." https://www.iata.org/en/iata-repository/publications/economic-reports/the-impact-of-the-conflict-between-russia-and-ukraine-on-aviation/.

IATA. 2023. *Air Passenger Market Analysis - Jan* 2023. https://www.iata.org/en/iata-repository/publications/economic-reports/air-passenger-market-analysis—january-2023/.

Janić, Milan. 2015. "Modelling the Resilience, Friability and Costs of an Air Transport Network Affected by a Large-Scale Disruptive Event." *Transportation Research Part A: Policy and Practice* 71 (January): 1–16. https://doi.org/10.1016/j.tra.2014.10.023.

Jong, Gerben de, and Rogier Lieshout. 2021. "Disruption in the Air: The Impact of Flight Rerouting Due to Air Traffic Control Strikes." *Transportation Research Part D: Transport and Environment* 90 (January): 102665. https://doi.org/10.1016/j.trd.2020.102665.

Khrushcheva, Nina L. 2023. "How Russians Fight | by Nina L. Khrushcheva." Project Syndicate. https://www.project-syndicate.org/commentary/weakening-russian-support-for-ukraine-war-by-nina-l-khrushcheva-2023-04.

Kluczewska, Karolina. 2022. "Roles Flip as Russians Become Migrant Workers in Tajikistan." openDemocracy. https://www.opendemocracy.net/en/odr/tajikistan-russia-migrant-workers-moblisation-war-ukraine/.

Kueppers, U., C. Cimarelli, K.-U. Hess, J. Taddeucci, F. B. Wadsworth, and D. B. Dingwell. 2014. "The Thermal Stability of Eyjafjallajökull Ash versus Turbine Ingestion Test Sands." *Journal of Applied Volcanology* 3 (1): 4. https://doi.org/10.1186/2191-5040-3-4.

Kuok, Rockie U. Kei, Tay T. R. Koo, and Christine Lim. 2023. "Interaction Effects of Air Services on Tourism Demand." *Annals of Tourism Research* 101 (July): 103582. https://doi.org/10.1016/j.annals.2023.103582.

Kuzmenko, Nataliia, and Ivan Ostroumov. 2022. "Modeling of Air Traffic Losses Caused by War in Ukraine." *2022 IEEE 3rd KhPI Week on Advanced Technology (KhPIWeek), October* : 1–4. https://doi.org/10.1109/KhPIWeek57572.2022.9916485.

Lee, Sangkwon, Chi-Ok Oh, and Joseph T. O'Leary. 2005. "Estimating the Impact of the September 11 Terrorist Attacks on the US Air Transport Passenger Demand Using Intervention Analysis." *Tourism Analysis* 9 (4): 355–361. https://doi.org/10.3727/108354205789807238.

Martín-Domingo, Luis, and Juan Carlos Martín. 2022. "The Effect of COVID-Related EU State Aid on the Level Playing Field for Airlines." *Sustainability* 14 (4): 4. https://doi.org/10.3390/su14042368.

Mehta, Devansh. 2022. "Colombo Denies Involvement In Aeroflot Airbus A330 Seizure." Simple Flying. https://simpleflying.com/colombo-denies-involvement-in-aeroflot-airbus-a330-seizure/.

Melkumyan, Yuliana, and Nvard Melkonyan. 2023. "Immigration of Russian Citizens to Armenia during the Russian-Ukrainian War That Began in 2022: Pull-Push Factors." *Journal of Political Science: Bulletin of Yerevan University* 2 (1(4)): 137–147. https://doi.org/10.46991/JOPS/2023.2.4.137.

Mendes de Leon, Pablo. 2021. "The End of Closed Airspace in the Middle East: A Final Move on the Regional Chess Board?." *Air and Space Law* 46 (2): 229–308. https://kluwerlawonline.com/api/Product/CitationPDFURL?file=Journals\AILA\AILA2021015.pdf.

Njoya, Eric Tchouamou, and Aliyu Buhari Isah. 2023. "Assessing the Economic Impact of the Single African Air Transport Market: The Case of Tanzania." *Research in Transportation Economics* 101 (November): 101351. https://doi.org/10.1016/j.retrec.2023.101351.

OAG. 2023. "Flight Database & Statistics | Aviation Analytics." https://www.oag.com.

O'Connor, Deanna. 2024. "Aviation's Asset Recovery Business and the Leased Aircraft Lost to Russia since Ukraine War Broke out." *The Irish Times*. https://www.irishtimes.com/special-reports/2024/01/25/aviations-asset-recovery-business-and-the-leased-aircraft-lost-to-russia-since-ukraine-war-broke-out/.

OECD. 2022. *Impact of the Russian Invasion of Ukraine on Insurance Markets. Business and Finance Policy Papers*. Paris: OECD. https://doi.org/10.1787/731d1305-en.

Ostroumov, Ivan, Oleg Ivashchuk, and Nataliia Kuzmenko. 2022. "Preliminary Estimation of War Impact in Ukraine on the Global Air Transportation." *2022 12th International Conference on Advanced Computer Information Technologies (ACIT), September* : 281–284. https://doi.org/10.1109/ACIT54803.2022.9913092.

Panasiuk, Aleksander, and Halyna Zubrytska. 2021. "Information Support of Russian Media for the Tourist Destination of Crimea." *Sustainability* 13 (6): 6. https://doi.org/10.3390/su13063228.

Partington, Richard. 2023. "India and Russia in 'Advanced Talks' over Free Trade Agreement." Business. *The Guardian*. https://www.theguardian.com/business/2023/apr/18/india-russia-talks-free-trade-agreement-deal-ukraine.

Pazhwak, Barmak. 2022. "Russia's Ukraine War Weighs Heavily on Tajikistan." United States Institute of Peace. https://www.usip.org/publications/2022/05/russias-ukraine-war-weighs-heavily-tajikistan.

RAI. 2022. "Aeroflot Group Turns Sochi into an International Hub." Air Transport. *Russian Aviation Insider*. https://www.rusaviainsider.com/aeroflot-group-turns-sochi-into-an-international-hub/.

Rains, Taylor. 2023. "Russian Airlines Have Received Millions of US-Made Aircraft Parts since the Invasion of Ukraine." *Business Insider*. https://www.businessinsider.com/russia-airlines-received-14-million-illegal-aircraft-parts-despite-sanctions-2023-5.

Rodrigue, J. P. 2024. *The Geography of Transport Systems*. 6th ed. London: Routledge. https://doi.org/10.4324/9781003343196.

Sauer, Pjotr. 2022. "Putin Announces Partial Mobilisation and Threatens Nuclear Retaliation in Escalation of Ukraine War." World News. *The Guardian*, September 21. https://www.theguardian.com/world/2022/sep/21/putin-announces-partial-mobilisation-in-russia-in-escalation-of-ukraine-war.

Shiraz, Zarafshan. 2022. "Russian Airline Aeroflot to Launch Moscow to Goa Flight Services from November 2." *Hindustan Times*. https://www.hindustantimes.com/lifestyle/travel/russian-airline-aeroflot-to-launch-moscow-to-goa-flight-services-from-november-2-101667207461922.html.

SkyTeam. 2022. "SkyTeam and Aeroflot Agreed to Suspend Membership." https://www.skyteam.com/en/about/press-releases/press-releases-2022/skyteam-and-aeroflot/.

SLTDA. 2023. "Tourism Research and Statistics." SLTDA. https://www.sltda.gov.lk/en/statistics.

Sopamena, Chairussani Abbas. 2022. "The global impact of russian aerospace closure." *Dinamika Global : Jurnal Ilmu Hubungan Internasional* 7 (01): 01. https://doi.org/10.36859/jdg.v7i01.984.

Suau-Sanchez, Pere, Augusto Voltes-Dorta, and Natàlia Cugueró-Escofet. 2020. "An Early Assessment of the Impact of COVID-19 on Air Transport: Just Another Crisis or the End of Aviation as We Know It?" *Journal of Transport Geography* 86 (June): 102749. https://doi.org/10.1016/j.jtrangeo.2020.102749.

Tabikha, Kamal. 2022. "Russian Flights to Egypt's Red Sea to Resume on October 1." MENA. *The National*. https://www.thenationalnews.com/mena/2022/09/27/russian-flights-to-egypts-red-sea-to-resume-on-october-1/.

Takebayashi, Mikio, Masamitsu Onishi, and Masato Iguchi. 2021. "Large Volcanic Eruptions and Their Influence on Air Transport: The Case of Japan." *Journal of Air Transport Management* 97 (October): 102136. https://doi.org/10.1016/j.jairtraman.2021.102136.

Tarkhov, S. A. 2017. "Changes in Air Transport Connectivity of Russian Cities in 1990–2015." *Regional Research of Russia* 7 (2): 127–145. https://doi.org/10.1134/S2079970517020095.

Tong, Eric. 2024. "Repercussions of the Russia–Ukraine War." *International Review of Economics & Finance* 89 (January): 366–390. https://doi.org/10.1016/j.iref.2023.07.064.

Topham, Gwyn, and Gwyn Topham Transport. 2024. "BA to Axe Direct Flights from London Heathrow to Beijing." Business. *The Guardian*, August 8. https://www.theguardian.com/business/article/2024/aug/08/ba-to-axe-direct-flights-from-london-heathrow-to-beijing.

Trenin, Dmitri. 2016. "Russia in the Middle East: Moscow's Objectives, Priorities, and Policy Drivers." *White Paper from the Task Force on US Policy Toward Russia, Ukraine, and Eurasia. Carnegie Moscow Center*.

Umar, Sharique, and Salem Ghurab. 2023. "The 2017 Gulf Crisis and Changes in Qatar's Economic Landscape." In *Social Change in the Gulf Region: Multidisciplinary Perspectives*, edited by Md Mizanur Rahman and Amr Al-Azm, 69–72. Singapore: Springer Nature. https://doi.org/10.1007/978-981-19-7796-1_27.

WTO. 2023. *One Year of War in Ukraine: Assessing the Impact on Global Trade and Development*. https://www.wto.org/english/res_e/booksp_e/oneyukr_e.pdf.

ZIA. 2023. "History of Zhukovsky Airport." https://zia.aero/en/about/history/.