The Importance of Business Travel for Trade: Evidence from the Liberalization of the Soviet Airspace*

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Abstract

Despite decades of intense globalization, empirical research provides robust evidence that the distance elasticity of trade is significant, not declining and largely unaccounted for by conventional explanations such as transport costs. One hypothesis is that face-to-face interaction through business travel is important for trade, and that transporting people is costly. I use the liberalization of Soviet airspace for civil aviation to test this hypothesis. The opening of Soviet airspace radically reduced travel time between Europe and East Asia. Using a difference-in-difference approach, I show that shorter flight routes were associated with a rapid and substantial increase in trade volumes. I also show that the increase in trade was proportional to the reduction in flight distance, that results hold for goods not typically transported by air, and that the impact was larger for differentiated goods.

Keywords: trade costs, air travel, face-to-face communication

JEL: F14, F15, R4

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1 Introduction

While the world becomes more globalized, geographical distance still has a remarkably strong negative impact on trade. Trade frictions generated by distance are also not well understood, despite being a key component of most empirical trade models. In a review of the literature, Head and Mayer (2013) conclude that the distance elasticity of trade is large, not declining, and largely unaccounted for by conventional explanations such as transport costs and tariffs. This conclusion stands in stark contrast to much of the popular writing on the current wave of globalization usually describing a shift to a global economy where physical distance does not matter.[1]

One hypothesis is that physical interaction is still important for trade and that transporting personnel comes at a significant cost (Baldwin, 2016). If travel costs are significant and increase with distance, it could provide an explanation for the large and persistent negative impact of physical distance on trade.[2] While the face-to-face explanation is plausible, it is hard to disentangle from other channels that also correlate with distance. For instance, unfamiliarity with remote business partners, differences in preferences, or uncertainty about foreign legal systems. Another issue is reverse causality, as trade creates an incentive to provide better transportation which may bring down the cost of face-to-face communication.

A number of papers, not explicitly studying trade, have used exogenous travel cost shocks to better isolate the impact of face-to-face communication.[3] Causal evidence on the impact of travel cost on trade, however, is surprisingly limited. One reason

[1]The book *The World is Flat* by Thomas Friedman (2005) is perhaps the most notable example popularizing the notion of a borderless global economy.

[2]Similar ideas have been put forward several scholars, see for instance Leamer and Storper (2001), and Storper and Venables (2004).

[3]For instance, Bernard et al. (2015) use an expansion of high-speed railway in Japan as a source of exogenous variation to study firm-to-firm linkages, Giroud (2013) uses the introduction of new flight routes between headquarters and plants in the United States to study plant investments, Bernstein et al. (2016) use a similar identification strategy to study venture capitalists' involvement with portfolio companies in the United States, Campante and Yanagizawa-Drott (2018) use a discontinuity in flight staffing requirements to examine air links on spatial allocation of economic activity, and Catalini et al. (2016) use the introduction of new low fare air routes to study the impact on scientific collaboration within the United States. In contrast, Hovhannisyan and Keller (2015) use an instrumental variable approach to examine the impact of business travel on patenting.

might be that direct flight connections changes travel costs between cities, while trade data is usually recorded between countries. Instead, a number of studies have focused on correlations, rather than establishing a pure causal relationship. Studies that find a positive link between travel and trade include for instance Kulendran and Wilson (2000), Shan and Wilson (2001), Cristea (2011), Alderighi and Gaggero (2017), and Yilmazkuday and Yilmazkuday (2017). A notable exception in this stream of literature is Startz (2016), who uses a structural estimation approach to establish a causal link between the cost of face-to-face interaction and trade, in a developing country context. Using transaction-level data from Nigerian traders, Startz shows that higher costs of travel to meet foreign suppliers lowers both trade and welfare.

The purpose of this paper is to establish a causal relationship between business travel cost and trade by introducing a new exogenous travel cost shock. The shock consists of the sudden liberalization of Soviet airspace at the end of the Cold War. During most of the Cold War, almost no airline had permission to overfly the Soviet Union. This added significant flight time to a large number of international routes, primarily between Europe and East Asia. Nearly every flight from Europe to East Asia was routed either through Anchorage, Alaska, or the Middle East. In 1985, however, Soviet leaders started to permit non-Soviet airlines to make non-stop overflights over its territory. This meant that the shortest flight from London to Tokyo, which would typically take 18 hours, now could be done non-stop in less than 12 hours. The liberalization partly had to do with a general reorientation of Soviet policy towards the West at the end of the Cold War. Another important motivation for granting overflight rights was that the air traffic control fees that the Soviets could charge airlines became a vital source of foreign currency. Between 1985 and 1995 the number of non-stop passengers, non-stop routes and airlines that received overflight rights increased rapidly.

I gather novel non-digitized timetable data from the British Library to map flight patterns during the 1980s. Using a difference-in-difference approach, I then show that shorter flight routes between Europe and East Asia coincides with an immediate and substantial increase in trade volumes. The elasticity of trade to smaller distance is approximately one. The magnitude of the effect suggests that travel distance for people is a key source of geographical friction that affects gravity.

Results hold up when restricting the analysis to trade in goods that are not typically transported by air. Hence, the impact on trade is not driven by lower transportation costs for goods shipped by air.[4] Furthermore, trade in differentiated goods, which plausibly requires more business travel, experience a larger increase compared to trade of homogeneous goods.

My paper is related to a vast literature that tries to explain the negative impact of distance on trade and other forms of economic exchange. While no consensus about the main causes of the persistent negative impact of distance on trade has been established, several hypothesis has been put forward. One competing hypothesis to the face-to-face explanation is that locally biased preferences, rather than actual trade barriers, might be an important factor for the negative distance effect (Trefler, 1995; Head and Mayer, 2013; Atkin, 2013; Bronnenberg et al., 2012; Ferreira and Waldfogel, 2013; and Blum and Goldfarb, 2006). Another hypothesis is that unfamiliarity with foreign countries and institutions increases with distance creating trade frictions (Coeurdacier and Martin, 2009; Peri, 2005; Griffith et al., 2011; Hortaçsu et al., 2009; Chaney, 2014; Lendle et al., 2016, Huang, 2007; Dixit, 2003; Anderson and Marcouiller, 2002, Ranjan and Lee, 2007; and Turrini and van Ypersele, 2010). As unfamiliarity at least partly can be overcome by business travel, the unfamiliarity hypothesis can be seen as both a complementary and a competing explanation to the face-to-face hypothesis. A third hypothesis is that changes in the composition of trade has been biased towards goods that are more sensitive to distance (Duranton

[4]The empirical literature suggests that transport costs generally account for a small share of total trade costs. For instance, Glaeser and Kohlhase (2003) find that for 80% of all shipments by value, transport costs make up less than 4% of the value of the good.

and Storper, 2008; Hummels and Schaur, 2013; and Evans and Harrigan, 2005).[5] Methodologically, this paper is also related to a large literature that uses shocks in travel and transport costs to study various economic outcomes (e.g., Pascali, 2016; Donaldson, 2010; Donaldson and Hornbeck, 2016; Feyrer, 2009*a*; and Feyrer, 2009*b*).

2 Data

To map changes in flight patterns due to the liberalization of the Soviet airspace, I obtain city-to-city flight data from the International Civil Aviation Organization (ICAO) between 1982 and 2000. A limitation of the ICAO data is that, before 1989, it only records the city of departure and destination for direct flights. A direct flight is a flight where the same flight number is maintained. A direct flight can either be a non-stop flight from city A to city B or a flight that departs from city A, makes a stopover in city X, and then continues to city B. Regardless of which route the flight might take, ICAO data prior to 1989 only record city A as the city of departure and B is the city of destination and leave out any information on stopovers. Consequently, before 1989, I am not able to distinguish non-stop flights between Europe and East Asia taking the shorter route over Soviet airspace from longer direct flights that avoided Soviet airspace and made stopovers in cities such as Anchorage. The Soviet Union started to liberalize its airspace in 1985, four years prior to when more detailed data is available.[6]

To separate non-stop flights from flights taking a detour around the Soviet Union

[5]The degree to which the composition hypothesis is a competing or complementary explanation to the face-to-face hypothesis depend on how one explains the cause of the sensitivity to distance. Hummels and Schaur (2013) and Evans and Harrigan, 2005 focus on the idea that the share of goods where time to market is more important has been increasing. Increased importance of time to market is a competing explanation to the face-to-face hypothesis, as it has to do with the time cost of transporting goods rather than people. In contrast to this, Baldwin (2016) argues that the composition if trade has been biased towards goods where face-to-face interaction is vital. Baldwin's argument suggest that the negative impact of the cost of meeting face-to-face has been magnified over time by the changing composition of world trade.

[6]The direct flight data is obtained from ICAO's On-Flight Origin and Destination data set (OFOD). The OFOD data comprise all scheduled international direct flights reported to the ICAO. The data include city of departure, city of arrival, airline, and number of passengers carried.

before 1989, I gather supplementary flight timetable data from the British Library. The archival data is truly novel as it is based on a vast set of non-digitized flight timetables called the *ABC World Airways Guide*.[7] Using the timetables, I obtain information on the frequency of non-stop flights and estimate the number of non-stop passengers on all routes between Europe and East Asia from 1980 to 1988.[8]

From 1989, ICAO records non-stop flight data.[9] For instance, the London-Anchorage-Tokyo flight is recorded as two separate legs, one from London to Anchorage and one from Anchorage to Tokyo. Thus, from 1989 I am able to distinguish flights that made detours around Soviet airspace from those that flew non-stop over Soviet airspace without using additional timetable data.[10] In sum, data from the ICAO and the *ABC World Airways Guide* allow me to identify all air traffic between Europe and East Asia that were routed over Soviet airspace between 1980 to 2000.[11]

I obtain the trade data from the UN COMTRADE database which include variables that identify the exporting and importing country, commodity on the 4-digit level based on the second revision of Standard International Classification codes (SITC), and the value of trade. I supplement the COMTRADE data with customs data from Eurostat of all goods traded between the EU and East Asia by product

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[7] The *ABC World Airways Guide* was published monthly from 1950 until 1996. Timetables are typically updated in April and November, so I study every April issue from 1980 to 1989. While there exist no direct flight data from ICAO before 1982 it is evident from the timetable data alone that there existed no non-stop flights between Europe and East Asia prior to 1983.

[8] To be able to estimate the number of non-stop passengers flying between Europe and East Asia I also gather information airline and airplane types from the flight timetables. Using the archival timetable data, together with the ICAO non-stop flight data, I compute an estimated figure for the annual number of passengers flying non-stop between Europe and East Asia. See Section A.2 in the Appendix for a more detailed description of the procedure of estimating the number non-stop passengers.

[9] I obtain non-stop flight data between 1989 and 2000 from ICAO's Traffic by Flight Stage dataset (TFS). The TFS data contain information on city of departure and destination, airplane model, number of departures, passenger load factor, average distance over the number of passengers carried, and the number of seats available.

[10] Two non-stop routes avoided Soviet airspace. Section 3 describe the non-stop flights that avoided Soviet airspace in close detail.

[11] As the number of non-stop flights between 1980 to 1988 is based on different data compared to the period between 1989 and 2000 I also collect direct flight data from 1989. I then identify the non-stop flights from the direct flight data using the timetables from 1989 and compare it with the non-stop flight data from ICAO's TFS dataset for the same year.

and mode of shipment. I use this dataset to analyze the impact of Soviet airspace liberalization on goods not typically transported by air as a robustness check.

I also obtained a number of control variables commonly used in gravity regression from the CEPII Gravity Dataset. The CEPII data include information on country pair-year-level and contains variables related to geographical distance between country pairs, shared borders, common language, common colonizer, and free trade agreements. It also includes information on GDP and GDP per capita.[12] I obtained product-level data on the degree of differentiation of goods from Rauch (1999) and U.S. consumer price index data from the World Bank to deflate trade values.

3 Historical Background

The emergence of non-stop air traffic between Europe and East Asia traversing Soviet airspace was an intricate process affected by international flight regulation, Cold War politics, geography, and technology.

Rights to fly over foreign countries are negotiated bilaterally and typically regulated in accordance with the Chicago Convention, first signed in 1944. Article 5 of the Convention stipulates that a signatory country allows other members to fly over its territory. The Soviet Union never signed the Chicago Convention and could restrict other countries from flying over its airspace. With very few exceptions, the Soviet Union did not allow non-Soviet airlines to fly over its territory during most of the Cold War era. A few airlines received rights to enter Soviet airspace beginning in early 1970s. However, all flights between Europe and East Asia that entered Soviet airspace was required to make a mandatory stop in Moscow. The number of such flights was limited and the share of passengers who flew between Europe and East Asia via Moscow was small. For instance, of all passengers flying directly from London to Tokyo, just above 10% made a stopover in Moscow prior to liberalization

[12] See Mayer and Zignago (2011) for a comprehensive description of the CEPII dataset.

of the Soviet airspace, (see Figure A.1 in the Appendix).[13]

Instead of flying via Moscow, most air traffic was either rerouted north via Anchorage, Alaska, or south over the Middle East, which added significant flight time (Jaffe, 2016). The London-Anchorage-Tokyo route is shown in Figure 1.[14]

Figure 1: The London-Anchorage-Tokyo route

The Soviet Union lifted the strict restrictions on their airspace in 1985 when Japanese Airlines was granted rights to fly non-stop between London and Tokyo

[13]The share of passengers that flew via Moscow from London to Tokyo would be considerably smaller if one also would count the number of passengers that made a transfer and thereby switched flight number on this route. Due to the structure of the *ABC World Airways Guide* timetables it is hard to gather all flight traffic between Europe and East Asia via Moscow. The route between London and Tokyo is, however, likely to have been the direct flight that carried most passengers via Moscow.

[14]There were two exceptions where airlines operated non-stop flights between Europe and East Asia prior to 1985, that did not enter Soviet airspace. The first exception is Finnair, which introduced a weekly non-stop route between Helsinki and Tokyo in 1983 (*Aviation Week and Space Technology*, 1983). Due to Helsinki's proximity to Tokyo and the willingness of airplane manufactures to accommodate Finnair's need to increase its maximum operating distance, the non-stop flight to Tokyo was routed over the North Pole to avoid Soviet airspace (Wegg, 1983). While Helsinki-Tokyo was the only non-stop flight between Europe and East Asia at the time, it represented a negligible share of the total passenger traffic between Japan and Europe. The second exception was Cathay Pacific introduced a weekly non-stop route avoiding Soviet airspace between London and Hong Kong in 1984. Initially, Cathay Pacific only flew non-stop from London to Hong Kong, but added a weekly non-stop flight in the other direction in 1985. This service accounted for a very small share of passengers flying between Hong Kong and Europe.

(*Aviation Week and Space Technology*, 1985). Shortly after, the Soviet Union granted Japanese Airlines and Air France rights to fly between Paris and Tokyo. A second route over Soviet airspace became available in 1986 when a number of airlines were granted rights to fly non-stop between Europe and Hong Kong. Due to the strained relationship between the Soviet Union and China, however, airlines were not allowed to cross the border between the two countries. All airplanes had to pass through a neutral country first, which in practice meant that non-stop flights to Hong Kong still had to be routed south of the Himalayas instead of over central China (*Flight International*, 1986). Still, being able to traverse Soviet airspace on the way to Hong Kong represented a major reduction in flight distance.[15]

The sudden opening up of the Soviet airspace came after years of fruitless negotiations between Soviet leaders and various airlines.[16] The motivation for Soviet leaders to liberalize its airspace had partly to do with a general reorientation of policy towards the West at the end of the Cold War. Another important factor for granting overflight rights was that the air traffic control fees that the Soviets could charge airlines became a vital source of foreign currency. The influx of foreign currency was important as the economic situation deteriorated further during the 1980s (Gaidar, 2007).

The number of non-stop passengers flying over Soviet airspace expanded quickly after 1985, as shown in Figure 2.[17] Cities that obtained non-stop connections early include Amsterdam, Copenhagen, Frankfurt, Helsinki, Milan, and Paris in Europe and Tokyo and Hong Kong in East Asia. The possibility of flying over Soviet airspace represented a significant reduction in flight distance for all routes between Western Europe and East Asia. As non-stop flights between Europe and East Asia were initially limited, these flights were typically targeted at frequent business travelers

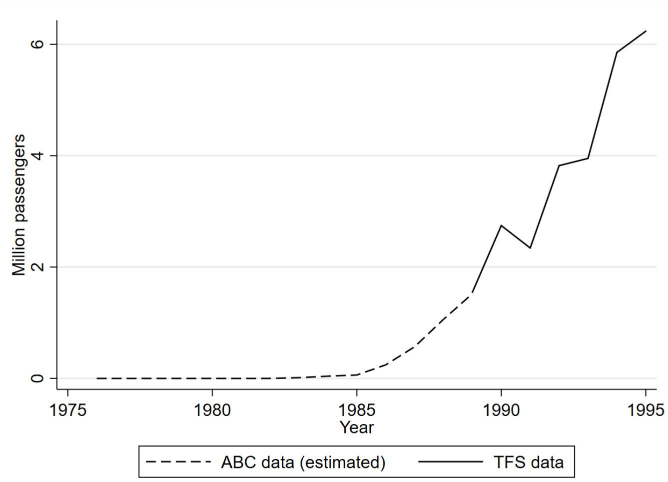
[15]At least for Cathay Pacific, the route south of the Himalayas represented the shortest route between Europe and Hong Kong until 1996 (*Flight International*, 1996).

[16]For instance, Wegg (1983) describes how Finnair failed to reach a deal for non-stop flights to Tokyo after negotiations that started in the mid-1970s, partly due to the large fees demanded by Soviet air traffic control.

[17]The estimated figures based on timetable data are validated by the fact that the estimated numbers of non-stop passengers almost exactly equals the number of observed non-stop passengers in the overlapping year in 1989.

while the transpolar service was targeted at the vacation traveler and the remaining business community (*Aviation Week and Space Technology*, 1986). As the number of permitted overflights increased rapidly, polar traffic via Anchorage declined and ended by 1993. Hong Kong and Japan came to dominate the non-stop traffic from Europe until the early 2000s when China surpassed Hong Kong in terms of non-stop passengers.[18]

Figure 2: Non-stop passenger traffic between Western Europe and East Asia



The number of non-stop passengers prior to 1989 is estimated based on data from the *ABC World Airways Guide* along with non-stop flight data from ICAO's TFS dataset. See Section A.2 in the Appendix for details on how the number of passengers is estimated. Data from 1989 to 1995 is based on actual non-stop traffic data from the TFS dataset.

[18]The signing of the Sino-British Joint Declaration in 1984 helped to establish Hong Kong as a key hub for intercontinental air traffic. The declaration stipulated that Hong Kong would return to Chinese rule in 1997 when Britain's lease of the territory ended. The declaration also contained administrative arrangements about how Hong Kong would be governed, including a section on civil aviation. The Chinese leaders decided that civil aviation in Hong Kong would not see any major changes after 1997, removing significant uncertainty about future operations for airlines in the region (Davies, 1997).

4 Impact of the Liberalization on the Cost of Travel

The liberalization of the Soviet airspace reduced the cost of business travel between Western Europe and East Asia primarily by reducing the time cost of travel. Firms need to pay their workers while travelling which makes it more costly to do business far away. However, the overflight fees charged by the Soviet Union did not generally affect ticket prices. At the time of the Soviet airspace liberalization, ticket prices were negotiated between the airlines and the International Air Transport Association (IATA) and were typically based on the city of departure and arrival. Thus, a trip from London to Tokyo was priced the same, regardless if it was routed via Anchorage or non-stop over the Soviet Union.

I am not able to measure the reduction in flight time as I do not observe the complete set of international routes and how many stopovers were required when travelling between different cities in different countries. Only a small share of affected country pairs received a non-stop connection shortly after the liberalization. Still, the flight time between country pairs without non-stop connections declined as well as flights were routed through larger hubs that did receive such connections. For instance, a flight between Copenhagen and Tokyo could have been routed via London and Anchorage before 1985, while only through London and across Soviet airspace after 1985. However, even if I did know the complete set of routes, flight connections are likely to be endogenous to the trade relations between countries. For instance, it is not surprising that the first non-stop route was set up between London and Tokyo, while there is no non-stop connection between Brussels and Seoul even today. Instead of using variation in flight time, I gauge the impact of the liberalization by estimating the change in the shortest possible air route between the country pairs affected by the liberalization of the Soviet airspace. I first compute the shortest distance around Soviet airspace between every affected country pair. For every country, I use the coordinates from the city with the most departing international passengers in 1985 according to the OFOD dataset to compute distance. I map the detour routes using the geoprocessing software ArcGIS. I estimate the shortest distance between country pairs after the liberalization of the Soviet airspace by computing the geodetic distance between the affected countries. The geodetic distance is the same as the distance the crow flies. The reduction in distance between the detour distance and the geodetic distance is the exogenous variation I use to study changes in bilateral trade. I also estimate the exogenous change in travel time and use that variation as a robustness check.[19]

To identify exactly which country pairs that were affected by the liberalization of the Soviet airspace, I map routes avoiding Soviet airspace in ArcGIS and compare those to current flight routes using flight tracking imagery from uk.flightaware.com.[20] This method leaves me with a group of country pairs where I can safely verify a reduction in flight distance, primarily between Europe and East Asia.[21] However, there is also a number of uncertain cases where country pairs might have been marginally affected. For instance, a few routes between Europe and Southeast Asia might have experienced a slight reductions in distance. As the impact was small, I treat these routes as unaffected in the analysis. However, I also carry out several robustness checks where I include these routes in the treatment group.[22]

Another issue is how to deal with the Soviet Union and other countries belonging to the the Eastern Bloc. As the Soviet Union negotiated new bilateral air agreements with both European and East Asian countries during the liberalization of its airspace,

[19]See Section A.7 in the Appendix for details on how the exogenous change in travel time is estimated.

[20]This is arguably the most reliable way of verifying the impact of the Soviet airspace liberalization as I do not have access to a large enough set of flight maps from airlines that operated in or close to the Soviet airspace during the 1980s.

[21]Figure A.2 in the Appendix depicts an overview of how countries are divided into larger regions.

[22]There are also a number of routes where I lack enough information to determine if minor changes of routes potentially could have occurred as a consequence of the liberalization of the Soviet airspace. One example is the route Cairo-Tokyo which today passes over Chinese airspace. I have very limited information on routes over China and how these routes changed during the period of interest. Another example is Copenhagen-Istanbul which today is routed over Poland and Romania. I do not know how flights between Denmark and Turkey were routed during the 1980s and I do not know if they changed around the time of the Soviet airspace. Neither Poland or Romania were part of the Soviet Union, but it is plausible that Soviet satellite states were influenced by the decision of Soviet leaders also in terms of airspace policy. To deal with the uncertainty of flights that were routed close or over the Eastern Bloc and China, I run robustness checks where I exclude all such routes from the control group. Details about the excluded routes can be found in Section A.9 in the Appendix.

air traffic to and from the Soviet Union is also likely to have changed. However, it is unclear how flight patterns changed as no country in the Eastern Bloc reported data to the ICAO. Due to the lack of information of flight patterns in the region, I choose to include countries in the Eastern Bloc in the control group.[23]

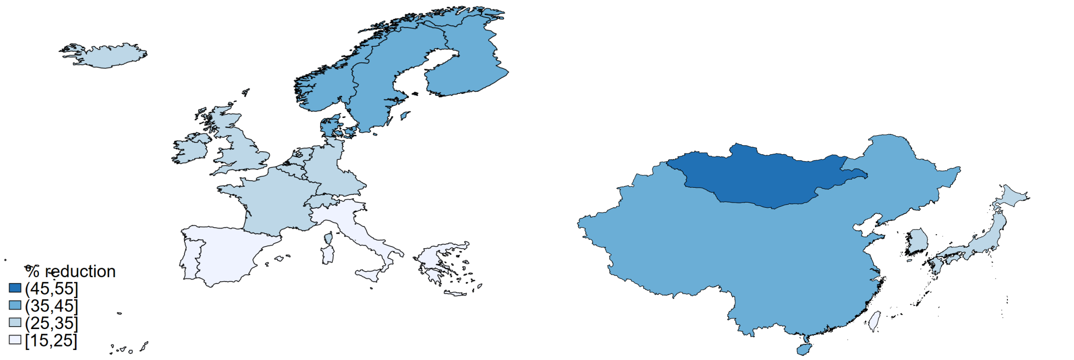
The group of country pairs where I can safely verify a reduction in flight distance, are all pairs where one country is located in Western Europe and the other in East Asia. This constitute the group of treated subjects. The control group consist of all other country pairs of the world. The countries belonging to Western Europe and East Asia are listed in Section A.3 in the Appendix. In total, 126 country pairs were affected and the median reduction in distance was 28 percent, or 3700 kilometers.[24] To illustrate how the intensity of treatment varies across countries, I present the average distance reduction for every affected country in Figure 3. We see that Northern Europe along with China and Mongolia experienced the largest average reduction in in distance.[25]

[23]Since the control group is very large, as it consist of all country pairs that were not affected by the Soviet airspace liberalization, results do not change much when instead eliminating countries belonging to the Eastern Bloc in the analysis.

[24]The right tail of the distribution of the reduction in distance among the group of treated countries mostly involves Mongolia, which received very little air traffic around the period of interest.

[25]The distribution of the reduction in distance among the affected country pairs is shown in Figure A.7 in the Appendix.

Figure 3: Average percentage reduction in distance across treated countries

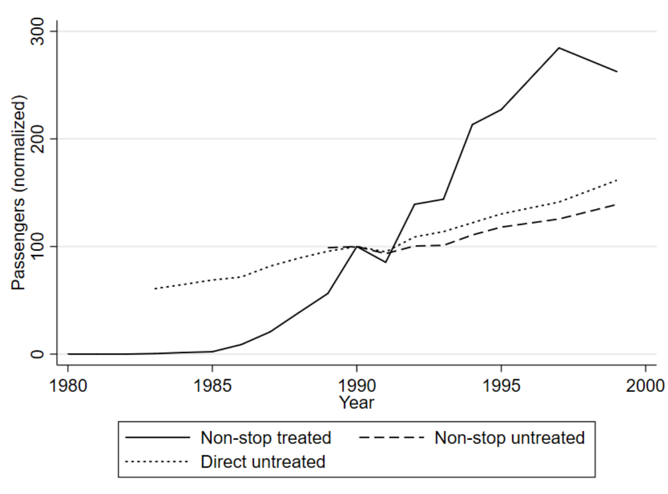


The average percentage reduction is computed as the average reduction in distance between a country being affected by the Soviet airspace liberalization and all countries to which the distance was reduced. For instance, the average value for France is the average reduction in distance between France and all countries in East Asia. Hong Kong and Macao are hard to see due to their small size. The average reduction for Hong Kong is 19% and the average reduction for Macao is 18%.

The flight data show substantial differences in flight patterns among the treated country pairs compared to the control group. Figure 4 compares passenger traffic among treated and untreated country pairs. Values are normalized and the base year is set to 1990. As I do not observe non-stop flights before 1989 for the control group, I also display the normalized number of direct flight passengers flying between the country pairs in the control group. We see that the control group experienced a gradual increase of passengers. The treatment group, on the other hand, goes from practically having no passengers before 1985 to several millions just a few years after the liberalization.[26]

[26] The growth in non-stop passenger traffic between Western Europe and East Asia also stand out when breaking down air traffic to a more disaggregate levels, see Figure A.3 in the Appendix.

Figure 4: Passenger traffic among treated and untreated country pairs



The number of non-stop passengers flying between Western Europe and East Asia was approximately 2.7 million in 1990, five years after the liberalization of the Soviet Airspace.

While the data show a rapid increase in the number of non-stop passengers, few treated country pairs actually received a non-stop connection. In 1990 only about 15% of the country pairs had a non-stop connection and about 25% had a direct connection, see Figure A.4 in the Appendix.[27] Thus, while many passengers travelling between Western Europe and East Asia could enjoy shorter flight routes, most passengers still needed to transfer flights in major hubs.[28]

To conclude, the liberalization of the Soviet airspace had a substantial impact on the time cost of travel between Europe and East Asia. The liberalization was largely unanticipated and was primarily driven by domestic factors within the Soviet Union. I am not able to perfectly observe the reduction in flight time. Instead, I use the reduction in flight distance as the main source of exogenous variation and the estimated reduction in flight time as a robustness check. The data show that

[27]Revisit Section 2 for an explanation of the difference between non-stop and direct flights.

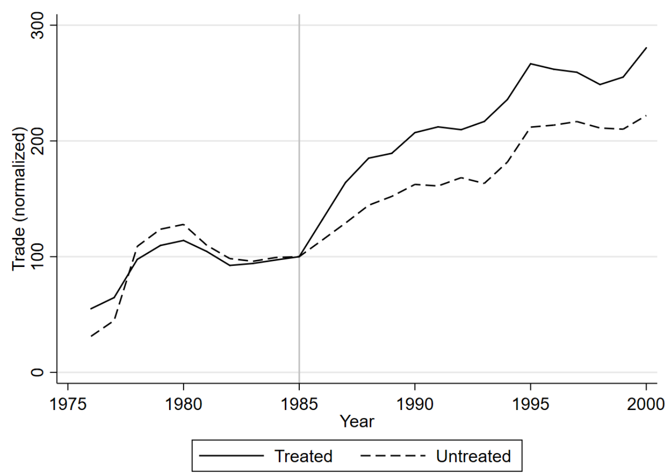
[28]For further descriptive statistics see Figure A.5 in the Appendix which shows the number of country pairs in the treatment group that had at least a weekly non-stop connection. Figure A.6 in the Appendix shows the number of weekly departures between the busiest non-stop routes among the treated country pairs.

the liberalization was associated with a substantial increase in non-stop air traffic between the affected regions. Yet, only a minority of the treated country pairs obtained a non-stop connection.

5 Empirical Analysis

Before proceeding to the main analysis, I provide a descriptive overview of the evolution trade among the treated and untreated country pairs. Figure 5 shows that the treatment and control group follow similar trends prior to 1985. After the liberalization, however, trade among the treated country pairs experience a sudden boom in 1986 and 1987. From 1988, growth in trade in the treatment group returns to comparable levels as in the control group.

Figure 5: Normalized trade among treated and untreated country pairs

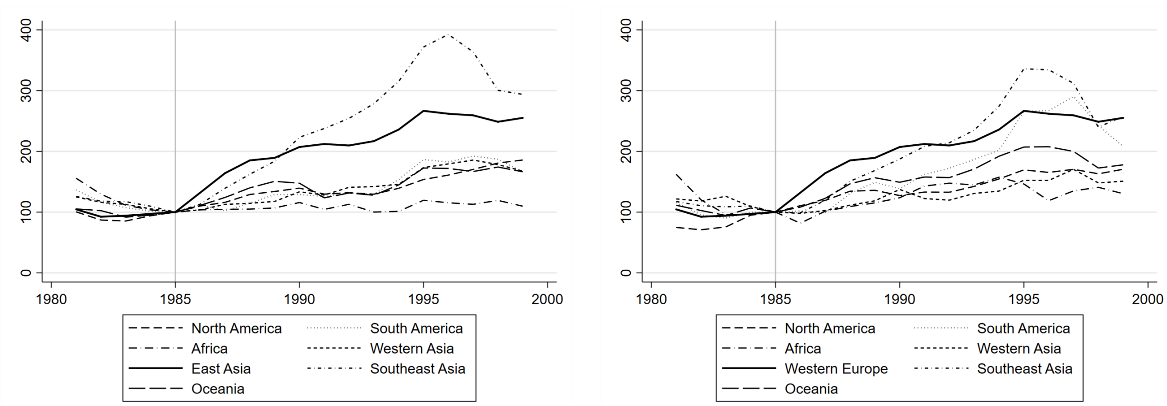


The growth in trade among the group of treated country pairs also stand out when solely focusing on the trade of Western Europe and East Asia. Figure 6 compares normalized trade flows between Western Europe as well as East Asia and the rest of the world by region. We see that trade between Western Europe and East Asia grows the fastest for both regions after the liberalization of the Soviet airspace in

1985.[29]

Figure 6: Normalized trade between Western Europe/East Asia and the rest of the world by region

(a) Western Europe (b) East Asia



Trade between Western Europe and East Asia is captured by the solid line in both figures.

5.1 Baseline Results

To asses the causal impact of shorter flight routes on trade, I estimate a standard difference-in-difference model. I use a continuous treatment variable that captures the change in flight distance between treated country pairs when the Soviet airspace became available in 1985.[30] I estimate the treatment effect using the following regression:

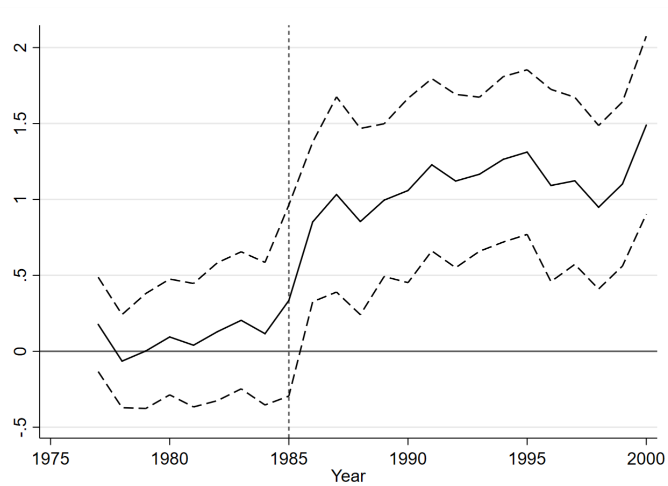
$$ln(Trade)_{ijt} = \alpha + \sum_{t=1977}^{2000} \beta_t \Delta\, Dist_{ij} \times \varphi_t + \gamma_{ij} + \varphi_t + \varepsilon_{ijt} \quad (1)$$

[29]Figure 6 also show that normalized trade with Southeast Asia surpasses trade between East Asia and Western Europe around 1990. The growth in trade with Southeast Asia coincides with the boom in offshoring to this region. While the growth in trade is remarkable, it is not unique for Western Europe and East Asia. For instance, trade between North America and Southeast Asia experience similar growth from the late 1980s and onward.

[30]Revisit Section 4 for details on how the continuous treatment variable is constructed.

where $ln(Trade)_{ijt}$ is the log of total deflated trade between country i and j in year t. $\Delta\, Dist_{ij}$ denotes the percentage reduction in flight distance, which is zero for untreated subjects and strictly positive for the treated ones. φ_t and γ_{ij} capture year and country pair fixed effects respectively. ε_{ijt} is the error term. β_t captures the percentage increase in trade between country pairs due to a given percentage reduction in flight distance. I obtain a coefficient for every year between 1977 and 2000 where 1976 is the base year.[31]

Figure 7: Difference-in-difference impact of Soviet airspace liberalization on trade



Effect with 95% confidence interval. SE clustered at country pair level.
Fixed effects at country pair and year level. 1976 = base year.

Figure 7 show a sudden and large increase in trade after the decision of the Soviet Union to allow non-stop flights over its territory. The estimated coefficients of around one, post treatment, indicates that the increase in trade is proportional to the reduction in flight distance. Hence, the magnitude of the impact is as large as most estimates of the distance parameter in a normal gravity regression which suggests that the travel cost explanation could potentially account for a major share of the unobserved trade fractions affecting global trade.

[31]For a proper interpretation of the difference-in-difference effect, imagine the regression $ln(Trade)_{ijt} = \alpha + \beta\Delta\, Dist_{ij} + \varepsilon_{ijt}$. β_t in Equation 1 for year n can be expressed as $\beta_n = (\beta_n^{Treated}/\beta_{1976}^{Treated})/(\beta_n^{Untreated}/\beta_{1976}^{Untreated})$.

The fact that most of the effect occur within just a few years after treatment might seem surprising. One could expect more time for the impact on trade to materialize if shorter flight routes reduced search costs for customers and firms gradually discover trading opportunities between Europe and East Asia. However, the rapid increase in trade can be explained by the large concentration of firms that traded goods between Europe and East Asia. Figure A.8, in the Appendix, depict the concentration of Swedish firms that trade goods between Sweden and East Asia in 1997.[32] Figure A.8 shows that the top 15 out of 5,382 exporters account for over half of all exports to East Asia and the top 50 out of 7,510 importers accounted for over half of all imports from East Asia. The large concentration of trade suggests that changing trade behaviour of a small number of the highest ranked firms could have a large aggregate impact. The heavy concentration of trade to a few firms also suggests that it is plausible that firms that already traded goods between Western Europe and East Asia accounted for most of the increase in trade volume, rather than new firms entering into trade.

The concentration of trade also provides an explanation for why the impact of the liberalization was so sudden, despite the fact that the number of non-stop flights over Soviet airspace was initially limited. The Soviet Union gradually increased the number of permitted non-stop flights over its territory after 1985. Figure 2 shows that about a million passengers travelled between Western Europe and East Asia in 1987, compared to over six million in 1995. When capacity was limited, airlines targeted frequent business travellers for their non-stop flights, while other passengers had to fly the detour routes (*Aviation Week and Space Technology*, 1986). The strategy to target frequent business flyers suggests that even if capacity over the Soviet Union initially was limited, the available non-stop seats was likely to have been channeled to the travellers that generated a big fraction of trade between Western Europe and East Asia.

The baseline results show to be robust to a number of alternative specifications. To be able to display results in a more condensed way, I estimate the treatment effect using a post-treatment dummy. I set the pre-treatment period to be 1980 to 1985

[32] 1997 is the first year where Swedish firm level trade data is available.

and the post-treatment period to be 1986 to 1990. The regression for the robustness checks is specified as follows:

$$ln(Trade)_{ijt} = \alpha + \beta \Delta Dist_{ij} \times D_t^{Post} + \varphi_t + \gamma_{ij} + \varepsilon_{ijt} \quad (2)$$

where $ln(Trade)_{ijt}$ is the log of trade between country i and j in year t, $\Delta Dist_{ij}$ is the continuous treatment variable, D_t^{Post} is a dummy variable that takes the value one for years between 1986 and 1990, φ_t and γ_{ij} capture year and country pair fixed effects and ε_{ijt} is the error term. β captures the average difference-in-difference effect between the pre-treatment and the post-treatment period. All results are presented in Table 1. I also carry out most of the robustness checks in Table 1 using the specification of Equation 1, which produces a treatment effect for every year. These results are presented in Section A.8 in the Appendix.

One cause of concern about the validity of the baseline results is that the continuous treatment variable might suffer from measurement error. I use the percentage change in flight route distance as a proxy for the reduction in the time cost of travel between the treated country pairs. While it is reasonable to assume that flight distance and time cost of travel is positively correlated, the correlation might not be perfect. For instance, some countries received non-stop connections after the liberalization while others did not. Moreover, countries lacking a non-stop connection also differed in proximity to hubs that had such connections. To address this concern I use alternative treatment variables in Panel A. Regression 1 use the baseline treatment variable capturing the reduction in flight distance as a point of reference. In Regression 2 I use a binary treatment variable that takes the value one if the country pair is treated. In Regression 3 I use a continuous treatment variable that captures the percentage reduction in flight time based on simulated flight routes using the geoprocessing software ArcGIS.[33] Both regressions show positive and significant effects

[33] Details on the construction of the time change variable using ArcGIS can be found in Section A.7 in the Appendix.

of the liberalization of the Soviet airspace on trade.[34]

The first three columns of Panel B addresses the concern that the comparatively high growth in trade between the treated countries might be driven by other factors than lower time cost of travel between Western Europe and East Asia. In regression 4, I examine if the strong growth in trade between the affected country pairs was instead driven by lower costs of transporting goods by air rather than lower time cost of transporting people. I test the hypothesis that the baseline results are driven by a reduction in air transport costs by running Equation 2 using trade in goods not typically transported by air as the dependent variable. I use data from Eurostat from 2002-2004 to identify product codes not typically transported by air. The data cover all trade between EU and East Asia divided on 6 digit HS product codes and the mode of shipment. The Eurostat data cover a period over a decade and a half after the liberalization of the Soviet airspace. However, Hummels (2007) documents a monotonic decline in the air-to-sea freight price ratio which implies that goods not shipped by air in the early 2000s are even less likely to be shipped by air in the mid-1980s. As the Eurostat data use a different product classification compared to the Comtrade data, I am not able to classify certain products. I define a good as not typically transported by air if less than 20 percent of the value of trade between the EU and East Asia of a good cross the EU border by air. The share of non-air goods is approximately 65 percent of total trade around the period of treatment. Regression 4 show a significant and slightly larger effect of treatment compared to the baseline regression. This implies that the treatment effect is still present for goods that were unlikely to be have been affected by a reduction in the cost of air transport.

Another possible reason for for the strong growth in trade among the group of treated country pairs could stem from higher levels of growth or liberal trade reforms. I account for such channels in Regression 5, where I run a version of Equation 2 with a number of time varying gravity controls, including GDP, GDP per capita and free

[34]The lower estimated coefficient of the binary treatment model reflect a larger variation in the treatment variable. The higher estimated coefficient of the model that uses time change is a result of lower variation in the continuous treatment variable. The reason for the lower variation in the time change treatment variable is because it takes into account the detour airplanes had to fly to avoid parts of the Chinese airspace that persisted until 1996.

trade agreement status. The estimate of Regression 5 show that the inclusion of gravity controls only reduces the effect by roughly 15%.

While it is reassuring that results are robust to growth and trade policy, there might be other unobserved trends driving the growth in trade between the pool of treated countries after the liberalization of the Soviet airspace. To control for all country specific time trends I run a regression with a complete set of country-time fixed effects in Regression 6. The estimated effect is positive and significant. However, the size of the effect is reduced by about one third compared to the baseline estimate.

The last two columns of Panel B addresses the concern that the baseline results might be driven by small countries that do not trade much. In the baseline specification trade between Malta and Iceland is given the same weights as trade between Japan and the United States. In Regression 7 I drop the 10th smallest percentile of trade flows. In Regression 8 I carry out an importance weight procedure where every country pair is weighted by its share of world trade in 1985. The procedure involves multiplying the left hand side variable with the square root of the weights. As a consequence, the value of the estimate does not have a straight forward interpretation. Regression 7 and 8 show both positive and significant estimates. The estimate of Regression 7, which can be directly compared to the baseline results, actually shows a larger treatment effect.

Finally, in Panel C, I address a number of concerns related to the composition of the pool of treated and control subjects. First, while it is hard to verify, some routes between Western Europe and Southeast Asia might have experienced marginal reductions in distance as a consequence after the liberalization of the Soviet airspace. Regression 9, however, shows that adding this group of country pairs to the treatment group does not change the results.[35]

In addition to a few routes between Western Europe and Southeast Asia, there are a number of country pairs that could have been affected by the liberalization of

[35]Trade between Western Europe and Southeast Asia experienced substantial growth after 1990 which coincides with the boom in offshoring to the region. For instance, similar trends in trade can be seen between North America and Southeast Asia.

the Soviet airspace. Common to the pool of potentially treated country pairs is that they would have been connected by routes that would have passed directly over, or close, to the Eastern Bloc or China. Yet, it is difficult to historically verify whether any of these country pairs were to some degree affected.[36] To address this issue, I drop all potentially treated country pairs from the control group.[37] Regression 10 shows that excluding the pool of potentially treated country pairs increases the baseline effect by about 10%. A related concern is how to treat countries belonging to the Eastern Bloc. In the baseline specification, trade with the Eastern Bloc is included in the control group. The estimate of Regression 11 shows that results are practically unchanged when dropping all trade with the Eastern Bloc from the sample.

One could also question whether the parallel trend assumption hold for all country pairs in the control group. For instance, trade among African countries might be on a very different trend compared to the country pairs in the treatment group. To address this, I choose to reduce the control group by only keeping country pairs where at least one country belongs to Western Europe or East Asia. Regression 12 shows that the estimated effect actually increases marginally when reducing the control group.[38]

[36]See Section 4 for a more detailed discussion of potentially treated country pairs.

[37]A detailed description of which country pairs that are dropped can be found in Section A.9 in the Appendix.

[38]Another pool of subjects that plausibly would have been affected by similar trends to the treatment group are all country pairs that can be formed between the United States along with Canada and East Asia. Instead of running a regression, as this control group only consists of 14 country pairs, I compare normalized aggregate trade flows between these regions. Figure A.21 in the Appendix show that trade between the United States along with Canada and East Asia exhibit a fairly constant growth between 1980 and 1995, while for the treated country pairs, trade is declining between 1980 and 1985 and then increases rapidly after the Soviet Union liberalized its airspace.

Table 1: Robustness checks

Panel A. Different treatment variables

	(1) Baseline	(2) Binary treatment	(3) Time change
Effect	0.744***	0.445***	1.188***
	(0.119)	(0.046)	(0.157)
Obs.	63,924	63,924	63,924

Panel B. Altering sample and adding controls

	(4) Non-air trade	(5) Gravity controls	(6) Time-Country FE	(7) No small obs	(8) Weighted
Effect	0.842***	0.662***	0.500***	0.834***	0.096***
	(0.119)	(0.114)	(0.128)	(0.090)	(0.016)
Obs.	60,566	62,541	63,924	57,447	63,924

Panel C. Altering treatment and control group

	(9) SE Asia treated	(10) No close routes	(11) Drop Eastern Bloc	(12) Reduced controls
Effect	0.763***	0.817***	0.738***	0.771***
	(0.114)	(0.121)	(0.119)	(0.120)
Obs.	63,924	45,815	56,968	31,863

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. All regressions are based on Equation 2. Standard errors are clustered at the country pair level.

5.2 Distribution of Effect

While all treated country pairs experienced a change in air routes, some country pairs received non-stop connections while others required multiple transfers. To analyze how the aggregate impact is distributed across individual countries, I run separate regression with individual countries in the treatment group. I use the same pool of control subjects and include one treated country at a time. For instance, the first regression include all untreated country pairs along with all treated country pairs where Austria is included. I use the same regression specification as in Equation 2. I plot the estimates in a frequency table, where I separate results that are significant on the five percent level and those that are not.

Figure 8: Distribution of impact for individual countries

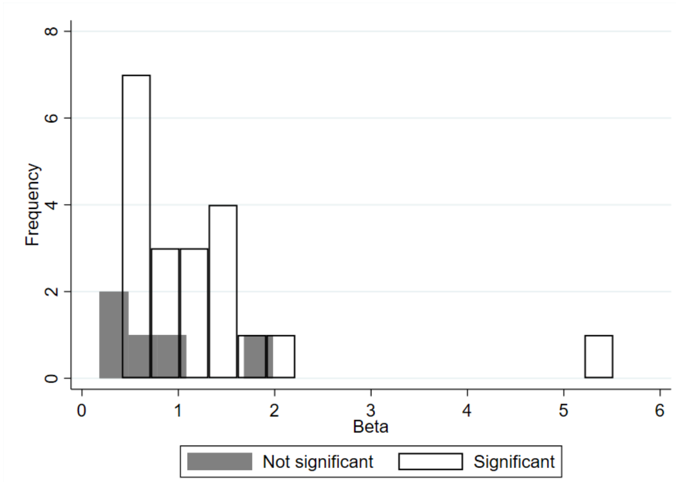


Figure 8 shows a positive impact for all treated countries and most estimates are also statistically significant. Malta represents the outlier country. The mean estimate for the remaining countries is very close to one. These results indicate that baseline results are not driven by a few country pairs but rather that the positive impact on trade is seen in all countries in the treatment group. Also, removing Malta from the treatment group does not alter the baseline results.

5.3 Product Level Analysis

While the baseline results suggest that shorter travel distance causes trade to increase, it is not self evident that lower costs of meeting face-to-face is what drives these results. To examine the face-to-face channel, I compare goods that are likely to rely on business travel to different degrees. If trade increased due to lower costs of business travel, goods that rely more intensively on business travel should also experience a larger impact of the treatment. Empirical evidence show that trade in differentiated goods is subject to more informational frictions and consequently require closer cooperation between the transacting parties, compared to homogeneous goods, (see Rauch, 1999; and Nunn, 2007). If differentiated goods require more communication between buyers and sellers, lower business travel cost should impact this category of goods to a larger extent.

To identify homogeneous and differentiated goods I use the classification from Rauch (1999), which distinguishes between goods that are traded in organized exchanges, goods that are reference priced, and all other goods. The two former categories are considered homogeneous while the last category is considered differentiated. I then estimate the following triple difference-in-difference model:

$$\begin{aligned} ln(Trade)_{ijnt} =& \alpha + \beta_1 D_{ij}^{Tr} \times D_t^{Post} \times D_n^{Diff} \\ &+ \beta_2 D_{ij}^{Tr} \times D_t^{Post} + \beta_3 D_{ij}^{Tr} \times D_n^{Diff} + \beta_4 D_t^{Post} \times D_n^{Diff} \\ &+ \varphi_t + \gamma_{ij} + \theta_n + \varepsilon_{ijnt} \end{aligned} \tag{3}$$

where D_{ij}^{Tr} is a treatment dummy, D_t^{Post} is a post-treatment time dummy and D_n^{Diff} is a product dummy that takes the value one if the product is differentiated. Products are defined by 4-digit SITC product codes. β_1, the coefficient of interest, captures the differential impact of treatment across differentiated and homogeneous goods within the treatment group when the Soviet airspace is liberalized.

Table 2 show that goods that are differentiated experienced 19 percent larger impact compared to homogeneous goods. The fact that trade increased more for goods that are likely to require more business travel provides further evidence that lower cost of face-to-face meetings is the channel driving the main results.

Table 2: Triple difference-in-difference analysis

Treated × Diff × Post	0.191***
	(0.0401)
Treated × Diff	0.827***
	(0.0693)
Treated × Post	0.527***
	(0.0461)
Diff × Post	0.0743***
	(0.00933)
Observations	10,869,731
R-squared	0.424

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Fixed effects at year, country pair and product level. SE clustered at the country pair level.

6 Conclusion

Robust evidence shows that standard barriers to trade, including tariffs and transport, cannot account for the negative impact of geographical distance on trade. One hypothesis is that the business travel is a necessary but costly input to trade. Hence, the cost of business travel makes firms want to trade with partners that are geographically closer. I examine the causal impact of the cost of business travel on trade using the liberalization of the airspace in the Soviet Union as a source of exogenous variation. The liberalization meant that non-Soviet airlines could fly non-stop over the Eastern Bloc, radically reducing the flight distance between Europe and East Asia. I show that this reform was associated with a rapid and substantial increase in bilateral trade between the affected country pairs, proportional to the reduction in flight distance.

Results hold for trade in goods not typically transported by air, which indicates that results are not driven by a reduction in air shipping costs. The analysis also shows that the liberalization of Soviet airspace had a significant positive impact on almost all affected country pairs, despite the fact that a fairly small share of country pairs had direct or non-stop connections. Finally, I show that trade in differentiated goods, which typically requires more business travel, experienced a larger impact compared to trade in homogeneous goods.

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A Appendix

A.1 Passenger traffic from London to Tokyo 1982-1989

Figure A.1: Passenger traffic from London to Tokyo

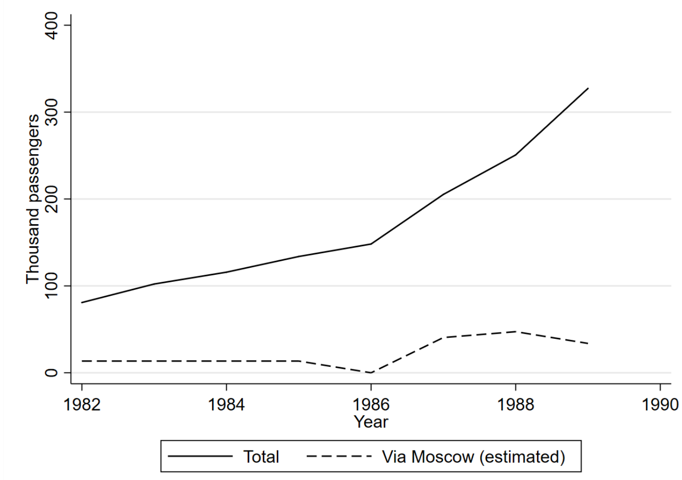


Figure A.1 is based on the number of weekly departures obtained from the *ABC World Airways Guide*. I estimate the number of passenger by using additional data from ICAO's TFS data set. See Section A.2 in the Appendix for a detailed description how the number of non-stop passengers is estimated. If one would also count the passengers that had to make at least one transfer between London and Tokyo, the fraction of flights that made stopovers in Moscow would be even smaller. The Soviet air carrier Aeroflot did not report statistics to ICAO. Hence, all passenger traffic from London to Tokyo via Moscow by Aeroflot is excluded. The timetable data, however, indicated that Aerflot's capacity was typically limited to only one or two weekly flights. Moreover, Aeroflot had a notoriously bad reputation due to inferior quality and flight safety concerns and was generally not popular in the business community.

A.2 Computing Non-Stop Passengers Prior to 1989

The number of annual non-stop passengers between East Asia and Western Europe prior to 1989 is computed using data from the *ABC World Airways Guide* timetables and the TFS dataset as follows:

$$non\text{-}stop\,passengers_{ijamt} = weekly\,departures^{ABC}_{ijamt} \times passengers\,per\,flight^{TFS}_{m} \times 52$$

i = city of departure, j = city of arrival, a = airline, m = airplane type, t = year

where $weekly\,departures$ is the average number of weekly non-stop departures obtained from the timetables and $passengers\,per\,flight^{TFS}_{m}$ is the average number of passengers per departure by airplane type taken from the TFS dataset. To compute the average number of passengers by airplane type, I use all non-stop flights between Europe and East Asia in 1989, the first year of observation, and divide the number of travelling passenger by the number of departures for each airplane type. During this time the Boeing 747 dominated the non-stop traffic between Europe and East Asia, but a few airlines also used the McDonnell Douglas DC-10. I then aggregate the number of estimated number of non-stop passengers by year.

A.3 Treated Country Pairs

The pool of treated subjects in the analysis consist of all country pairs that can be formed between Western Europe and East Asia. The control group consists of the remaining country pairs of the world. In total there are 126 country pairs in the treatment group and 11,038 country pairs in the control group.

Table 3: Treated Country Pairs

Western Europe		**East Asia**
Austria	Italy	China
Belgium-Luxembourg	Malta	Hong Kong
Denmark	Netherlands	Japan
France	Norway	South Korea
Finland	Portugal	Mongolia
West Germany	Spain	Taiwan
Greece	Sweden	Macao
Iceland	Switzerland	
Ireland	United Kingdom	

A.4 Flight and Trade Patterns

Figure A.2: World regions

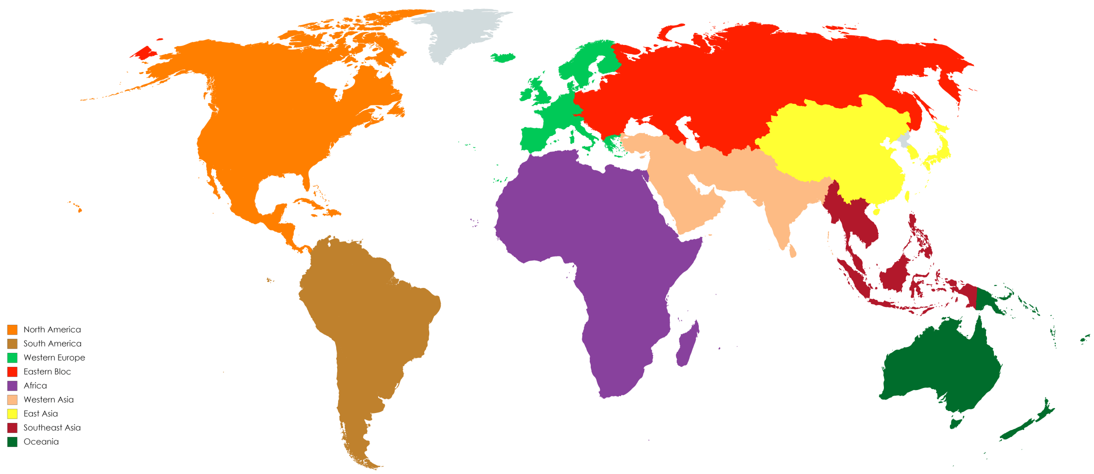
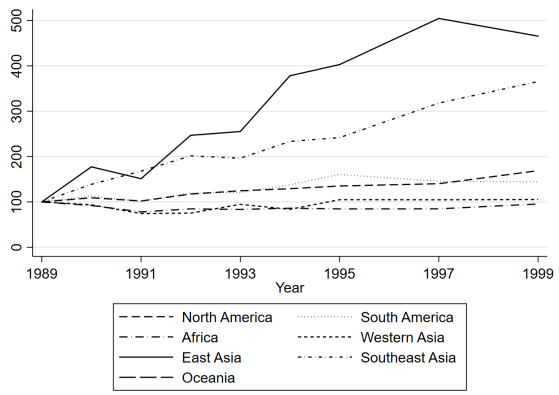
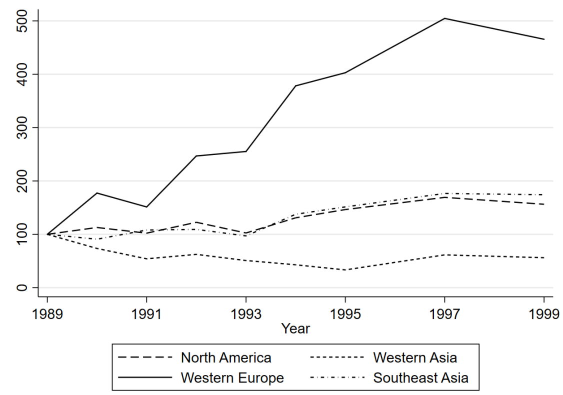


Figure A.3: Normalized air traffic from Western Europe and East Asia to the rest of the world

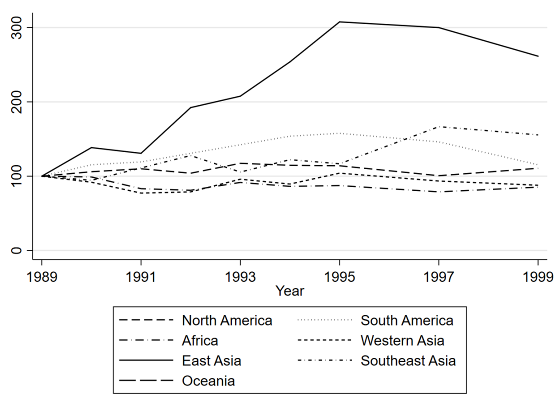
(a) Non-stop passenger traffic between Western Europe and the rest of the world



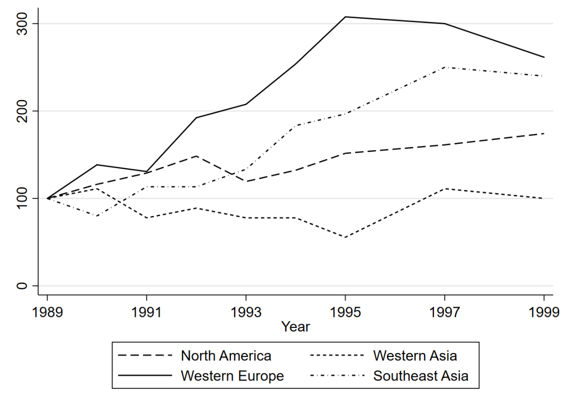
(b) Non-stop passenger traffic between East Asia and the Rest of the World



(c) Non-stop routes between Western Europe and the rest of the world

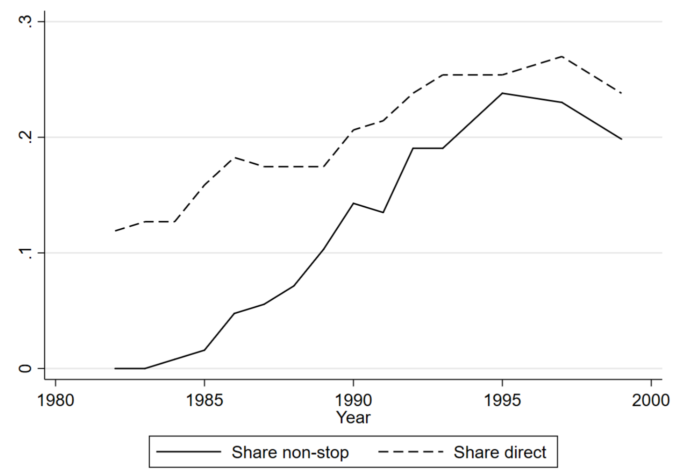


(d) Non-stop routes between East Asia and the rest of the world



A route is defined as a city pair with at least 20,000 annual non-stop passengers. For East Asia, Africa, South America, and Oceania are excluded due to negligible levels of air traffic.

Figure A.4: Share of treated country pairs with direct and non-stop connections



A non-stop connection is defined as a city pair with at least 20,000 annual non-stop passengers.

Figure A.5: Number treated country pairs with at least a weekly non-stop connection

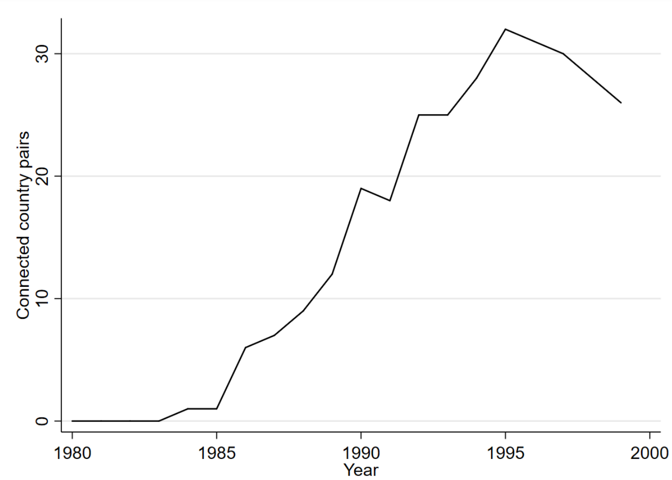
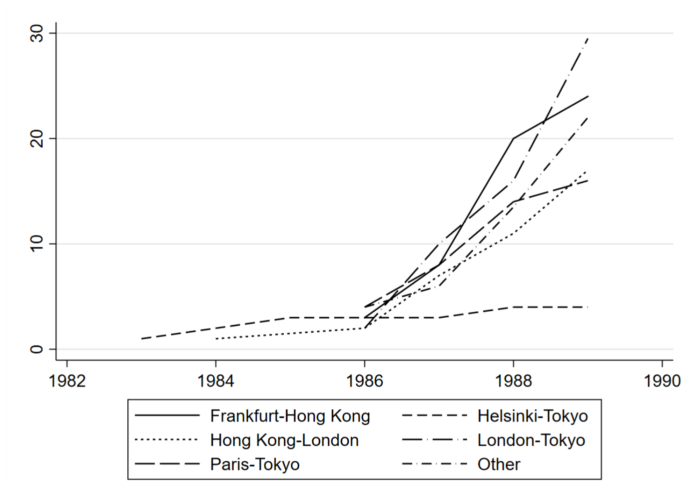


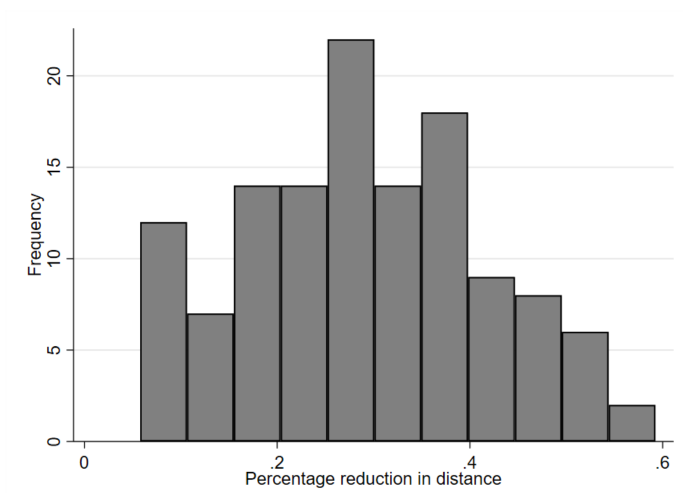
Figure A.6: Number of weekly non-stop departures on busiest routes between Western Europe and East Asia



Other city pairs include Amsterdam-Tokyo, Copenhagen-Tokyo, Frankfurt-Tokyo, Rome-Hong Kong, Milan-Tokyo, and Zurich-Tokyo.

A.5 Distribution of the Continuous Treatment Variable

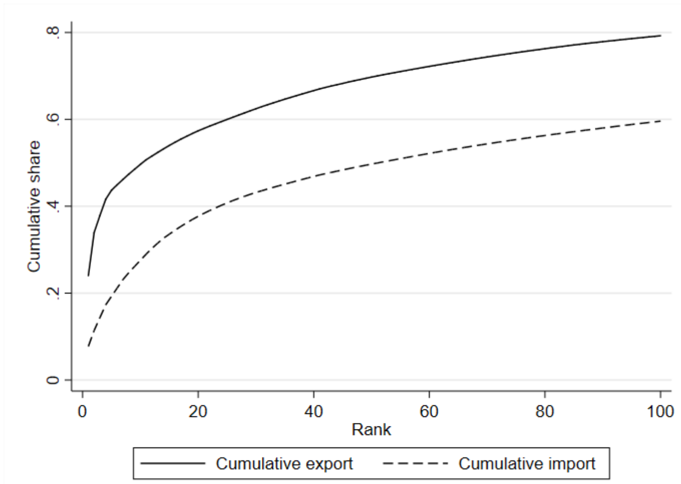
Figure A.7: Percentage reduction in distance between treated country pairs



The figure illustrates the distribution of the percentage reduction in flight distance between all 126 treated country pairs.

A.6 Firm Concentration of Trade

Figure A.8: Cumulative share of trade between Sweden and East Asia by Sweden's 100 largest importers and exporters in 1997



The figure show that the 10 largest exporters of goods from Sweden to East Asia account for approximately 50% of total exports. The 10 largest importers account for about 30% of total imports. In total, there are 7510 firms that imports goods from East Asia and there are 5382 firms exporting goods to East Asia.

A.7 The Time Change Treatment Variable

I use the geoprocessing software ArcGIS to compute shortest routes between Western Europe and East Asia to construct the treatment variable that captures the change in flight time between all treated country pairs. The biggest difference between the time change treatment variable and the distance change treatment variable, used in the baseline regression, is that the former takes into account that certain countries received non-stop connection while others did not. The time change variable also takes into account that parts if the Chinese airspace was still not available after the liberalization of the Soviet airspace.

To compute the shortest routes I create two networks of routes that connect countries in Western Europe with countries in East Asia. The first network captures the period before the liberalization and contains routes that avoid Soviet airspace. The second network reflects the period after the liberalization and contains routes that cross Soviet airspace but still avoids the parts of the Chinese airspace that were still prohibited.[39] Both networks consist of points that represent the city in each country in Western Europe and East Asia with the most departing passengers in 1985.

First, I have to determine which countries have airports with intercontinental air traffic between Western Europe and East Asia. I am not able to use the actual hubs that channeled passenger between Western Europe and East Asia as that is endogenous. Instead I choose the two cities with the most departing passengers during the 1980s in Western Europe and East Asia. The busiest cities turned out to be London, Paris, Tokyo, and Hong Kong. I refer to London, Paris, Tokyo and Hong Kong as hubs, while the remaining points are referred to as spokes.

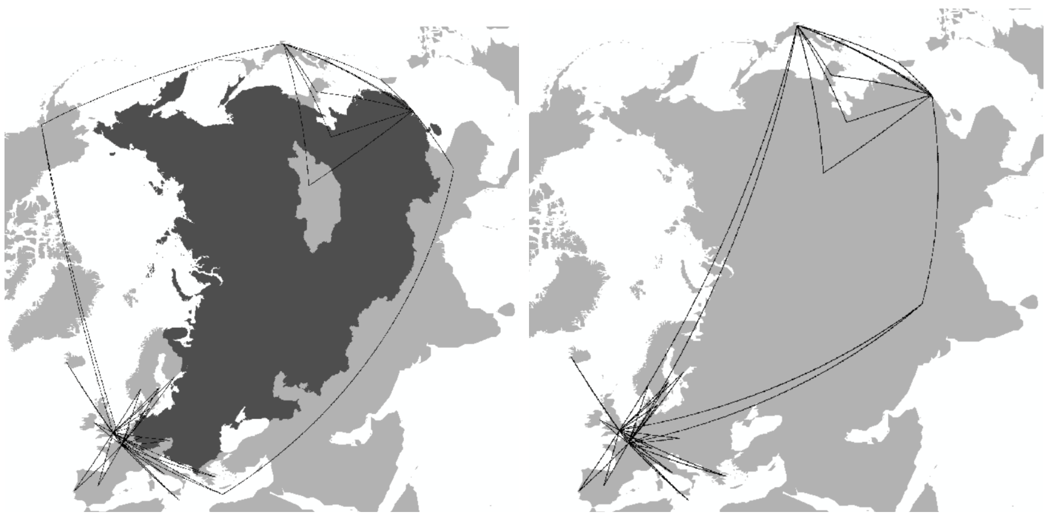
The network are then set up in the following way: Each spoke receives a non-stop connection to both hubs in its respective region. For instance, Copenhagen is the city with most departing passengers in Denmark in 1985. Hence, Copenhagen receives a non-stop connection to both Paris and London. Then, each hub receives an intercontinental connection to hubs in the other region. Hence, London and Paris

[39] The reason why parts of the Chinese airspace was prohibited is explained in Section 3.

each receives connections to Tokyo and Hong Kong.

The difference between the networks that I create is that intercontinental routes between the hubs prior to the liberalization completely avoid Soviet airspace. The intercontinental routes that avoid Soviet airspace are routed both over the Middle East and Anchorage, Alaska.[40] The intercontinental routes in the network after the liberalization represent the shortest routes between the hubs that still avoided the parts of the Chinese airspace that were not available. Using these networks I compute the shortest distance between all country pairs before and after the liberalization of the Soviet airspace. The networks are illustrated in Figure A.9.

Figure A.9: Flight route networks before and after the liberalization



The left map depict the network before the liberalization. The dark area depict the Eastern Bloc and China. The right map depict the network after the liberalization.

To translate distances into flight time I need to make assumptions with regards to the number of stopovers on each route, stopover time, and average flight speed. I assume that a passenger need to make a stopovers whenever they pass through a hub. I also assume that every intercontinental flight prior to the liberalization need to make a stopover. For instance, a flight from Sweden to South Korea prior to the liberalization would consist of four legs. It would start in Stockholm and end end in

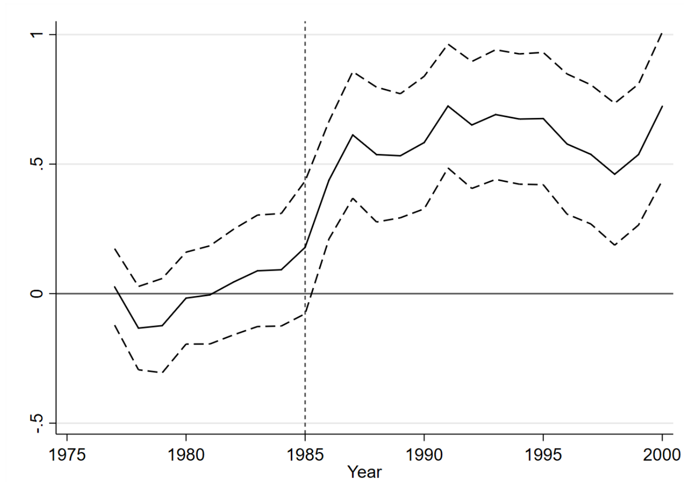
[40]These routes both represent the shortest detour routes between Western Europe and East Asia prior to 1985 depending on the point of departure and destination.

Seoul. As neither Stockholm or Seoul are hubs, the flight would be routed Stockholm-London-Anchorage-Tokyo-Seoul. The same flight after the liberalization of the Soviet airspace would be routed Stockholm-London-Tokyo-Seoul.[41] I assume that a stopover adds 1.5 hours of flight time. I also assume that the average flight speed between any two points is 900km/h, which is approximately the average cruising speed on long-haul flights. I obtain the reduction in flight time for each country pair by dividing the flight time before the liberalization by the flight time after the liberalization, subtracted by one.

[41] All routes are assumed to be symmetric, which implies that the route from Seoul to Stockholm would be routed Seoul-Tokyo-Anchorage-London-Stockholm.

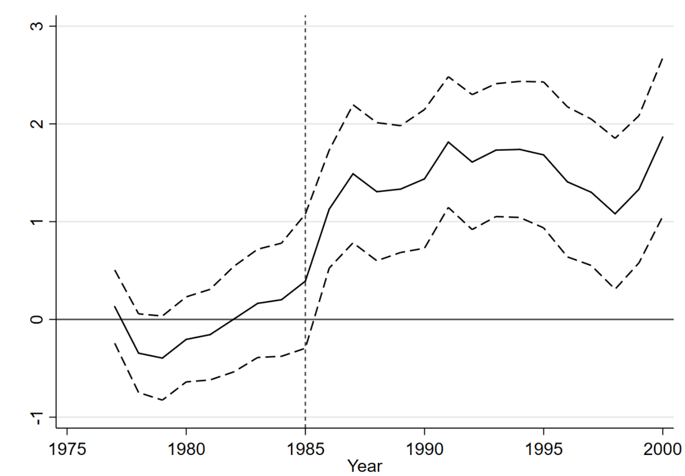
A.8 Robustness Results

Figure A.10: Binary treatment



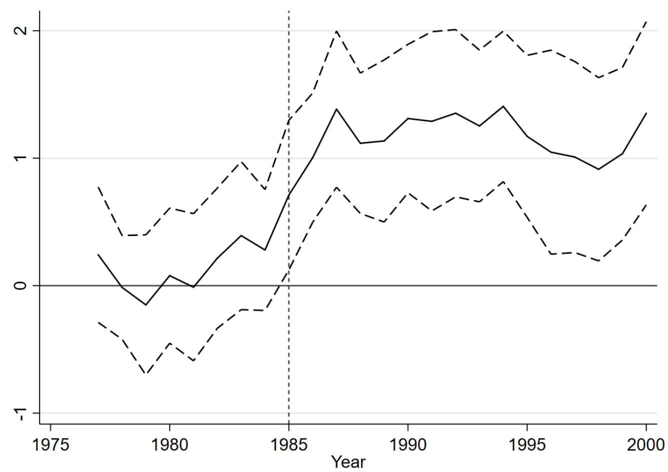
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year.

Figure A.11: Time change



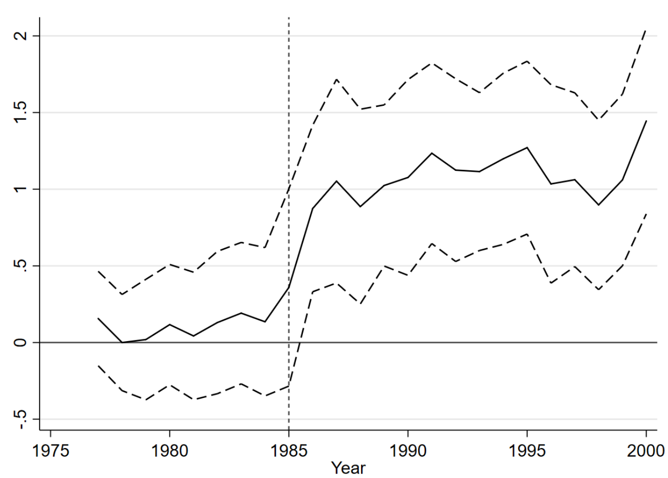
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year.

Figure A.12: Goods not typically transported by air



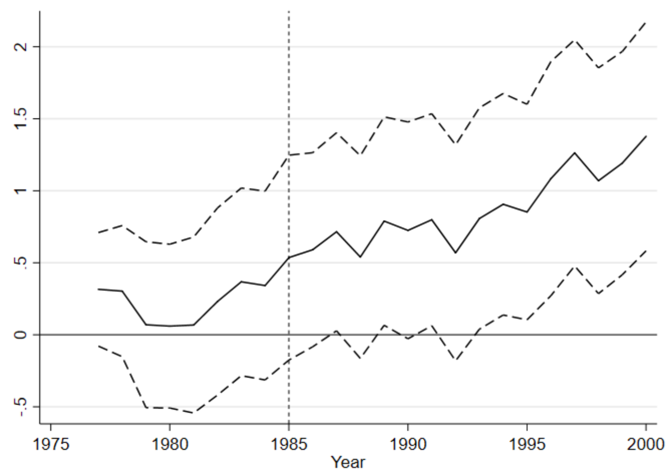
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year. A good is defined not typically transported by air if less than 20 percent of the value of trade of that good between the EU and East Asia crosses the EU border by air.

Figure A.13: Gravity controls



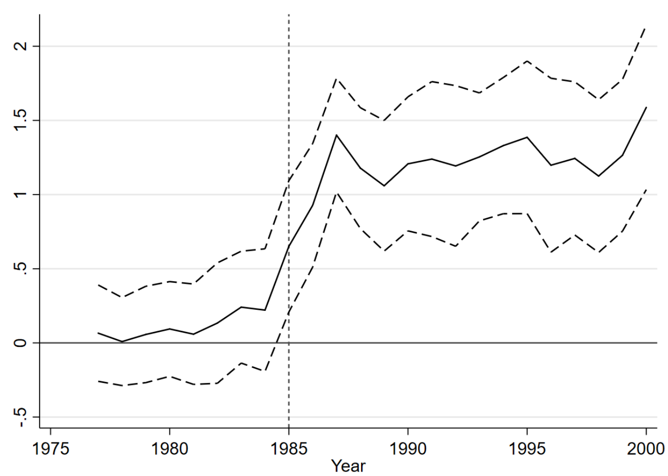
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year. Gravity controls include GDP, GDP per capita and free trade agreement status.

Figure A.14: Country-time fixed effects



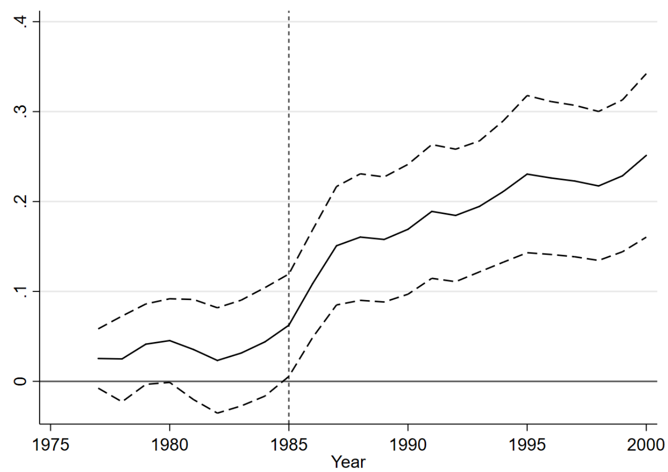
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year.

Figure A.15: Minor trade flows are dropped



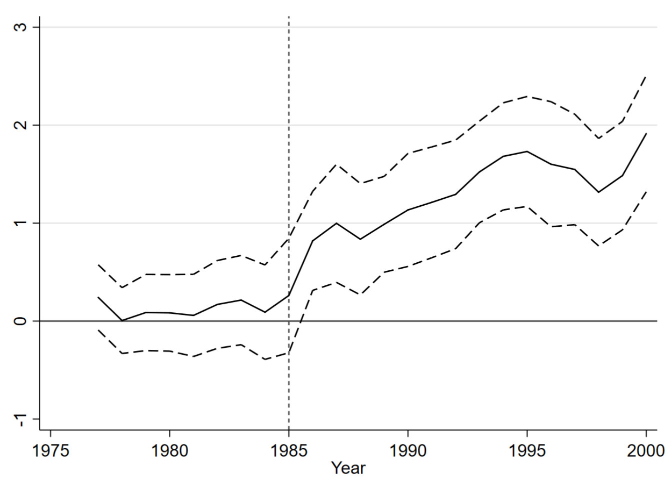
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year. Minor trade flows are defined as the 10th smallest percentile of bilateral trade flows.

Figure A.16: Importance weights



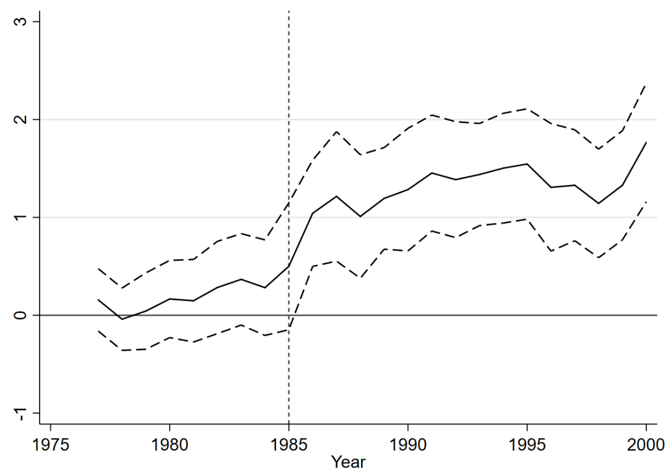
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year. Importance weights are based on country pairs' share of world trade in 1985.

Figure A.17: Treatment group extended to Southeast Asian countries



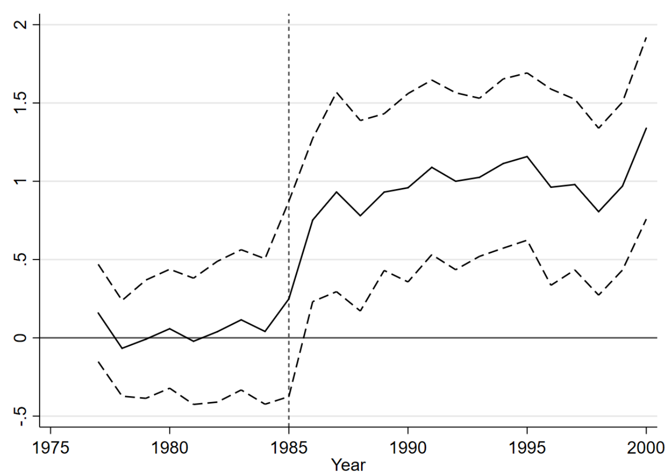
Effect with 95% confidence interval. SE clustered at country pair level. Fixed effects at country pair and year level. 1976 = base year.

Figure A.18: Dropping routes that cross or pass close to the Eastern Bloc



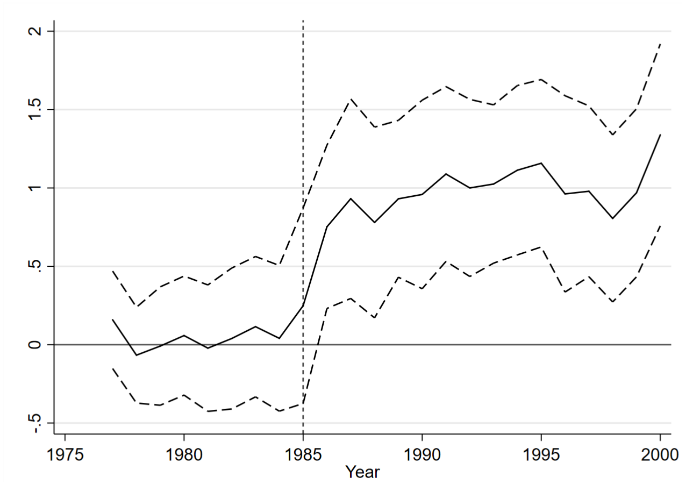
Effect with 95% confidence interval. SE clustered at country pair level.
Fixed effects at country pair and year level. 1976 = base year.

Figure A.19: Dropping the Eastern Bloc



Effect with 95% confidence interval. SE clustered at country pair level.
Fixed effects at country pair and year level. 1976 = base year.

Figure A.20: Only trade between country pairs where at least one country belong to East Asia or Western Europe



Effect with 95% confidence interval. SE clustered at country pair level.
Fixed effects at country pair and year level. 1976 = base year.

A.9 Routes Potentially Crossing the Eastern Bloc or China

As I lack information about the exact flight routes of airlines during the 1980s and 1990s I do robustness checks where I exclude a large set of country pairs that could have been connected by flights that were routed over or close to the Eastern Bloc or China. I group all countries into nine regions and exclude region pairs that contain country pairs that could have been connected by a flight that potentially would have crossed the airspace over the Eastern Bloc or China. Regions are shown in Figure A.2. The list of excluded region pairs are listed below.

Table 4: Routes Potentially Crossing the Eastern Bloc or China

East Asia	Western Asia
Southeast Asia	Western Asia
Africa	East Asia
Africa	Southeast Asia
Western Europe	Western Europe
Africa	Western Europe
Western Asia	Western Europe
East Asia	North America
North America	Western Asia
North America	Southeast Asia
Southeast Asia	Western Europe

These region pairs contain 2,646 country pairs which is approximately a fifth of the total number of country pairs in the data.

A.10 Trade between US/Canada and East Asia

Figure A.21: Trade between Treatment Group vs. US/Canada and East Asia