Direct flights, trade and specialization*

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Abstract

We leverage geographic discontinuities in international air travel to show that regular direct connections between countries enable them to trade, especially in specialized products. Back-of-the-envelope calculations suggest that the effect of direct flights at this margin could account for up to 1.6% of world trade. While direct flights do not affect transportation expenses, they do induce bilateral business travel. Finally, we show that countries with stronger air connections tend to specialize away from each other's comparative advantages. These findings underscore the enduring importance of face-to-face interactions in initiating and sustaining commercial partnerships.

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Introduction

Nearby countries tend to trade more with each other.[1] The most common explanation behind this pattern is that distance imposes higher costs of moving goods between trading partners (Baier et al., 2018). Geographic factors, however, can also prevent the establishment of international trade linkages. For instance, distance may make it harder for potential trading partners to interact in person to start and sustain a commercial relationship. Identifying these channels from each other is challenging, as both marginal and fixed costs of trade may increase with the distance between potential partners.

In this paper, we show that geographic discontinuities in air travel costs first identified in Campante and Yanagizawa-Drott (2018) can erode international trade. We find that countries just within a distance of 6,000 miles from each other are not only more likely to be connected via direct flights, but they also trade more amongst themselves than with countries just outside that threshold.[2] This discontinuity, which originates in regulatory factors that should only become technologically and economically binding after the 1990s, started eroding bilateral trade only after 2010. The estimated effects are between 20-35% of observed trade values between countries at distances close but below the direct flight threshold. Back-of-the-envelope calculations suggest that the erosion of trade between countries at distances close but above the direct flight threshold could add up to 1.6% of global trade.

As the lion's share of long-distance trade is shipped, the effects of direct flight prevalence on trade are unlikely to travel through the costs of moving goods across international borders. We test this question directly with data on the differences in CIF and FOB trade values between countries. We find no evidence that trade costs associated with product insurance and freight grow at the direct-flight discontinuity. Moreover, effects are greatest for differentiated, relationship-dependent products (Rauch, 1999; Nunn, 2007), suggesting that air travel costs erode trade by

[1] Indeed, the idea that two countries are "near" to each other transcends geographic proximity. A long literature on "gravity" trade models has shown that cultural and historical differences between countries can add to geographic distance in explaining bilateral trade intensity through added transaction costs (Zhou, 2010).

[2] Results are robust to considering different representative geolocations for each country when calculating bilateral distances.

preventing the development of in-person commercial relationships. We further explore how these discontinuities affect business dynamics: While we find no robust evidence that direct flights affect tourism trips, we find that the discontinuity strongly affects bilateral expenses in business travel, as well as decision to engage in direct investments. These results affirm the view that direct flights enable international commercial linkages through in-person interactions between trade partners.

Finally, we expand our analysis of the effects of direct flights on trade and business by evaluating how this margin affects patterns of export specialization with regard to other countries' comparative advantages. If air connectivity induces trade integration, it should also induce specialization away from activities in which connected partners had a comparative advantage before geographic discontinuities became economically binding. We find that this is the case: Whenever a country's potential trading partners at a distance close to but below the discontinuity show baseline competitiveness in a given product, that country becomes less likely to become competitive in that product today. Taken together, these results indicate that despite broad access to telecommunication technologies for international business, in-person interactions are of continuing importance for developing and sustaining commercial relationships. We provide evidence that air connectivity can affect countries' trade and specialization prospects, not by affecting transportation costs, but by enabling in-person business relationships.

Our paper corresponds with the broad literature on the economic effects of access to transportation and communication networks (Blonigen and Cristea, 2015; Donaldson and Hornbeck, 2016; Donaldson, 2018; Campante and Yanagizawa-Drott, 2018; Cristea, 2023). One motive behind such effects is the possibility of accessing technologies and productive know-how available elsewhere. Indeed, reduced connection costs seem to enable investment and innovation (Andersen and Dalgaard, 2011; Hovhannisyan and Keller, 2015; Fageda, 2017; Bahar et al., 2023). Another way in which connectivity may affect the economy is by enabling trade, and a subset of this literature has paid attention to the effects of communication networks through this commercial channel (Baier and Bergstrand, 2001; Hummels, 2007; Feyrer, 2019, 2021; Bailey et al., 2021).

While a large share of this literature has emphasized the role of connectivity on transportation costs, this mechanism has been deemed insufficient to explain the large and persistent negative effects of distance in "gravity" models of trade (Coe et al., 2007; Head and Mayer, 2013). This has moved attention towards how transportation networks may affect trade by disrupting the possibility of face-to-face commercial transactions, especially given the growing importance of business travel in the World economy (Coscia et al., 2020). Focusing on the link between in-person connections and trade, Cristea (2011) shows a positive correlation between business travel and international trade in the US. At a micro level, Startz (2016) shows that Nigerian firms able to develop in-person connections with commercial partners are able to overcome institutional constraints and engage in international trade of differentiated products.

This paper studies the effects of country-to-country direct air connections on international trade via the possibility of engaging in face-to-face commercial relationships. Söderlund (2023) considers the opening of the Soviet airspace as a case of discrete changes in bilateral air connectivity between specific country pairs and provides difference-in-difference evidence of trade expansions between countries with improved connections. Wang et al. (2021) consider a similar question and develop an instrumental variable strategy to identify exogenous variation in bilateral air connectivity, also finding effects on international trade. By assuming that enhanced bilateral air connectivity does not affect transportation costs, both papers conclude that the possibility of in-person business connections drives the observed effects.

Our paper provides credible causal evidence from a tractable regression discontinuity framework building on a well-known feature of the aviation sector - that the probability of direct flights between airports drops discretely at the ULH threshold of 6,000 miles. Indeed, we confirm that this conclusion extends to the probability of regular direct passenger flights between country pairs. Our reduced form results show negative and large effects of direct flights on international trade. The fact that the probability of regular cargo flights between countries does not seem to be affected at the ULH threshold lends credence to the identifying assumptions of Söderlund (2023) and Wang et al. (2021). Nevertheless, we go a step further and directly test whether the ULH threshold affects observed insurance and freight costs and find no evidence that it does. Moreover, our paper expands the study of the role of face-to-face commercial relationships for trade by showing direct evidence that the 6,000 discontinuity affects bilateral business travel expenditures but does not affect tourism travel[3]. The importance of face-to-face commercial relationships is confirmed by the fact that the effects of the ULH threshold on trade are stronger for differentiated and downstream products. Finally, given how air travel affects investment, technology flows, and trade, it is uncertain whether connectivity would induce diversification or specialization. We test this question directly and provide unique evidence that countries that became more likely to connect via direct flights tended to specialize away from each other's baseline comparative advantages. This finding suggests that trade specialization dynamics dominate in the effects of connectivity on the development of domestic productive capabilities.

The paper continues as follows: First, we introduce the regulatory, technological, and economic factors behind the discontinuities in air travel. Second, we introduce our methodological framework and data sources. Third, we show the main results of our paper, providing credibly identified evidence of the effects of geographic constraints on direct flights on international trade. Fourth, we provide evidence in favor of fixed business travel costs as the main mechanism behind our main results. Fifth, we show how air connectivity affects patterns of trade specialization. Sixth, we provide conclusions of our analyses.

1 Discontinuities in direct flights between countries

To empirically assess the influence of direct flights on international trade, we leverage a distinctive characteristic of the aviation sector: Airports separated by less than 6,000 miles tend to offer nonstop services more frequently than those exceeding this distance. This pattern is attributed to regulatory, technological, and economic factors that increase operational expenses associated with

[3]In a concurrent paper, Ho et al. (2024) show that direct flights affect travel spending from Chinese cities to other countries. Our bilateral business and tourism travel results broaden these findings by considering a larger set of potential traveler origins and separating business and non-business travel motives. While commercial relationships need to be developed and sustained in time by individual firms, individual tourists typically travel to specific destinations just once. Our expectation that the added costs of air travel should make a meaningful difference for business travel but not as much for tourism travel is confirmed by our findings.

servicing routes beyond 6,000 miles[4]. The critical 6,000-mile threshold aligns with a 12-hour flight duration at standard cruising speeds, with flights surpassing this duration and distance classified as Ultra-long Haul (ULH) flights (McKenney et al., 2000).

ULH flights are subject to stringent staffing regulations, including the necessity for additional flight crew members and suitable sleeping facilities onboard for flights exceeding 12 hours, as mandated by regulators in the US, Europe, and other countries. These stipulations significantly elevate the operational costs for ULH flights, with crew expenses constituting approximately 36% of non-fuel costs (Federal Aviation Administration, 2016). Indeed, fatigue risk management policies establish a threshold of 12 hours for the evaluation of staffing adequacy and the relocation of additional crew members to departure city bases to ensure that "sufficient reserve crews are available to support ULH flight schedules" (Matschnigg et al., 2011).

The technological advancements of the 1990s further exacerbated this cost disparity, as the introduction of long-range aircraft models from both Boeing and Airbus improved fuel efficiency for long-haul flights, underscoring the critical nature of minimizing non-fuel expenditures, such as crew costs. As companies started competing at these margins in the 2000s, the ULH regulatory threshold started to bind on the probability of direct connections between airport pairs. Indeed, Campante and Yanagizawa-Drott (2018) shows that while the ULH threshold did not affect the probability of direct flights in 1995, it significantly reduced such connections by 2014.

While the fact that the ULH threshold affects direct connections between airports has been established, it is unclear whether such a threshold affects nonstop flights between countries. A chief concern in establishing this relationship is selecting a representative geolocation point for each country. Given the spatial dispersion of countries' territories, populations, and economic activities, any geolocation choice is bound to induce some degree of measurement error.

[4] Campante and Yanagizawa-Drott (2018) introduced this fact in studying the effect of cities' connectivity on local economic growth. Bahar et al. (2023) leveraged the discontinuity to assess the effect of direct flight connections on patenting citations and collaborations.

2 Empirical Strategy

This section describes the measures of the different variables used in the study and the econometric estimations performed to assess the effect of the ULH discontinuity on trade. Table A.1 shows key summary statistics for all the variables used in our analyses.

Measuring the distance between country pairs

As discussed above, there exists a discontinuity in the probability of direct flights between airports at the 6,000-mile threshold for ULH flights. In this paper, we aim to leverage this same threshold to assess the effects of air connectivity on bilateral trade. However, as trade data is collected at the country-country level, the first relevant question is how to define the representative geolocation of a country with which to calculate bilateral distances. Opposite to analyses looking at the distances between airports, any choice of geolocation for a country will involve some measurement error. These errors should be relatively meaningful for territorially large countries, which represent an important share of international trade.

To address this concern, we will show that our results are robust in alternative definitions of countries' representative geolocations. Our main specifications are based on the geodesic distances between countries' population-weighted centroids[5]. We also calculate the geodesic distances between countries' geographic centroids, their capital cities, and between their main cities and main airports. Distances between these points are either collected or calculated based on data from CEPII (Conte et al., 2022) and OAG, a private firm tracking operations in the aviation sector. To further evaluate the relevance of the ULH threshold in direct travel and trade between countries, we perform placebo analyses showing that negative and precise effects are specific to the ULH threshold. Cumulatively, the evidence shows significant effects at the correct discontinuity despite the possibility of attenuation due to mismeasurement in our treatment variable.

[5]Population-weighted centroids come from Morales-Arilla and Gadgin Matha (2023).

Measuring direct flights between countries

We observe the number of flights between each country pair using OAG's flight data. Importantly, we capture the number of passenger and cargo flights between two countries in 2015. We create a binary measure of passenger and cargo "connectedness" based on whether the number of bilateral flights is above one daily flight on average.

Measuring bilateral trade

Aggregate and product-specific bilateral trade data between country pairs for each year between 1995 and 2020 is collected from Harvard's Atlas of Economic Complexity. At the intensive margin, the trade comparison across countries needs to deal with each country's overall scale. For this reason, most of our analysis uses a modified revealed comparative advantage (RCA) measure, which is used extensively in the international trade literature:

$$RCA_{o,d} = \frac{x_{o,d}/\sum_d x_{o,d}}{\sum_o x_{o,d}/\sum_o \sum_d x_{o,d}} = \frac{x_{o,d}/x_o}{x_d/x_w}. \tag{1}$$

were $x_{o,d}$ is the amount exported from origin country o to destination country d. The fraction in the numerator represents the share that each destination has on the overall export basket of a given country, while the fraction in the denominator is the share of the importer over total world trade. An RCA of one implies that a trade partner has a weight in a country's export equivalent to its relative size in world trade. Since the distribution of RCA could be significantly skewed but takes a value of 0 often, we focus its Inverse Hyperbolic Sine transformation (Bellemare and Wichman, 2020) and on two binary measures based on the RCA value. We say that there is "high" trade between two countries o and d if $RCA_{o,d} \geq 1$, as such values imply that countries have bilateral trade above their "fair" share given the scale of the destination market. Moreover, we say that there is "some" trade between two countries o and d if $RCA_{o,d} \geq 0.2$. We use an analog formula for calculating the RCA in the export of each specific product according to the SITC 1992 4-digits product classification[6].

Measuring bilateral transportation costs

UNCOMTRADE published data on the FOB and CIF value of imports and exports by a sample of 22 countries with 229 countries in the world in 2019.[7]. As the difference between FOB and CIF values of trade capture the costs of insurance and freight, we use the difference between them to proxy for bilateral transportation costs between countries. For this sample of destination countries, we produce the following measures of transportation costs:

$$TC_{o,d} = \frac{CIF_{o,d} - FOB_{o,d}}{FOB_{o,d}} \quad (2)$$

$CIF_{o,d}$ and $FOB_{o,d}$ are the CIF and FOB aggregate traded values between origin country o and destination country d. The average "price" of insurance and freight in bilateral trade is 8.4%, and the median is 5.5%. This measure will allow us to directly evaluate whether discontinuities in air travel affect observed transportation costs in bilateral trade.

Measuring bilateral business travel, tourism trips and Foreign Direct Investmnet

We take 2016 data on bilateral business travel spending from Mastercard used in Coscia et al. (2020)[8]. Moreover, we take 2015 bilateral tourism trip data from the World Tourism Organization (2021). Finally, we take 2015-2019 bilateral FDI data harmonized by the World Bank (Steenbergen et al., 2022). Similar to our calculations for trade, we produce analog measures of bilateral RCA, "high" and "some" travel based on business spending amounts and tourism trip counts, as well as

[6] The specific formula for product-specific RCAs is: $RCA^p_{o,d} = \frac{x^p_{o,d}/\sum_o x^p_{o,d}}{\sum_d x^p_{o,d}/\sum_o \sum_d x^p_{o,d}}$

[7] In our exploration of the COMTRADE data, of the last ten years 2019 is the year with the largest number of countries reporting FOC and CIF import and export values. The number of observations in the data is 4,260, so on average, each reporting country reports CIF and FOB values imported from 193 trading partners

[8] We thank Muhammed Yildirim for his help in identifying specific countries in bilateral business travel spending values.

for FDI.

Regression discontinuity specification

Our empirical strategy relies on discrete increases in air travel costs at the 6,000-mile ULH threshold. We follow a regression-discontinuity strategy to assess the effect of this threshold on the prevalence of direct flights between country pairs to then evaluate its effects on bilateral trade, transportation costs, and business-tourism travel. For each of these outcomes, we perform the following specification:

$$Y_{o,d} = \beta_0 + \beta_1 T_{o,d} + \beta_2 D_{o,d} + \beta_3 T_{o,d} * D_{o,d} + \epsilon_{o,d} \tag{3}$$

where $Y_{o,d}$ is a particular outcome of interest between countries o and d, $T_{o,d}$ is a binary marker for whether countries o and d are at a distance above 6,000 miles, $D_{o,d}$ is the distance between both countries and $\epsilon_{o,d}$ is the error term. While our main specifications use the optimal bandwidth proposed by Calonico et al. (2020), we show results for arbitrary bandwidths of 1,500 miles and 500 miles around the discontinuity. Moreover, we also show our main results are robust to quadratic controls for the distance between countries at both sides of the discontinuity.

As with all regression-discontinuity designs, our study relies on the identification assumption that all relevant factors other than air connectivity change continuously at the ULH distance threshold. Table A.2 shows that important economic, demographic, geographic, and cultural characteristics of and relationships between importers and exporters are balanced at the discontinuity. Moreover, Figure A.1 shows balance in the data density at both sides of the discontinuity, providing evidence against the possibility of manipulation of the running variable. Taken together, this evidence favors the plausibility of our study's identification assumption.

Relationship specificity

To assess whether the effects of direct flights on trade are driven by how they enable the development and sustaining of trading relationships, we evaluate whether the main regression-discontinuity results are strongest for relationship-dependent products. We take data from Rauch (1999), which classifies different products as either customized or homogeneous. Customized products are considered to rely on specific supply relationships with providers that can tailor and service specific needs. Accordingly, these products have also been characterized as "contract intensive" (Nunn, 2007). Moreover, we build a binary transformation of a measure of the "upstreamness" of a product in global value chains proposed by Antràs and Chor (2013) and based on US Input-Output data.

To assess whether the effect of the ULH threshold is greater for these products, we perform the following regression specification:

$$\begin{aligned} Y_{p,o,d} =& \beta_0 + \beta_1 T_{o,d} + \beta_2 D_{o,d} + \beta_3 T_{o,d} * D_{o,d} + \\ & \gamma_1 T_{o,d} * R_p + \gamma_2 D_{o,d} * R_p + \gamma_3 T_{o,d} * D_{o,d} * R_p + \epsilon_{p,o,d} \end{aligned} \tag{4}$$

where $Y_{p,o,d}$ captures the exports of product p from origin country o to destination country d, and R_p is a binary marker for whether product p is either customized or upstream. While direct flight discontinuities should also matter for the development of trading relationships in non-customized or upstream products, we expect the effect to be greatest for customized and downstream products if the key driver of this effect is the added costs of establishing sustainable and nuanced trading relationships that rely on face-to-face interactions.

Effects of connectivity on patterns of specialization

As specialization patterns are determined at the country-product level, we need to measure the degree of exposure of every country to connected trade partners that were competitive in a particular product before the ULH discontinuity became economically binding. We focus on long-distance partners (above 4,500 miles) at distances within the ULH threshold of a given country (below 6,000 miles). As a placebo exercise, we evaluate the relative importance of competitive partners at a symmetric bandwidth outside the ULH threshold. We focus on a sample country-product combinations for which the country showed no baseline competitiveness ("absent"), and our outcome is a binary measure of whether the country became competitive in that product (became "present", or "appeared").

We follow two separate methodologies to define whether a country is competitive in a given product or not. First, we follow Kehoe and Ruhl (2013), who sort products by ascending export size for each country to produce country-specific cummulative export shares. Products are classified as "absent" if they fall below the 5th percentile, and they are classified as "present" if they fall above the 10th percentile. Second, we follow Hausmann et al. (2022) who leverage standard RCA measures.[9] Products are classified as "absent" if the value of their RCA falls below 0.05, and they are classified as "present" if their RCA falls above 1.

For the set of "absent" country-product combinations in 2015, we perform the following linear probability model of country-product appearance:

$$Y_{o,p}^{2020} = \beta_0 + \beta_1 S_{o,p}^{IN} + \beta_2 S_{o,p}^{OUT} + \beta_3 Y_{o,p}^{1995} + \psi_o + \psi_p + \epsilon_{o,p} \tag{6}$$

where $Y_{o,p}^{2020}$ is a binary marker for whether country o is competitive in product p in 2020, $S_{o,p}^{IN}$ is the share of partners at distances between 4,500 and 6,000 miles from country o that were competitive on product p in 1995, $S_{o,p}^{OUT}$ is the share of partners at distances between 6,000 and 7,500 miles from country o that were competitive on product p in 1995, and $RCA_{o,p}^{1995}$ is the baseline

[9] We measure countries' patterns of specialization with the standard Balassa's measure of Revealed Comparative Advantage of a given country for a particular product:

$$RCA_{o,p} = \frac{x_{o,p}/\sum_o x_{o,p}}{\sum_p x_{o,p}/\sum_o \sum_p x_{o,p}} = \frac{x_{o,p}/x_p}{x_o/x_w} \tag{5}$$

where $x_{o,p}$ are the exports of country o of product p. The fraction in the numerator captures the importance of country o for the world market of product p, while the fraction in the denominator captures the importance of country o for World trade. When $RCA_{o,p}$ has a value of 1, the importance of a country in a given product is proportional to its importance for World trade.

RCA of country o in product p in 1995. ψ_o and ψ_p stand for country and product fixed-effects. Standard errors are calculated allowing for within country and within product error correlation. If air connectivity is inducing trade specialization, we should expect to estimate a negative β_2, while β_3 should take be smaller in magnitude or even zero statistically.

3 Main results

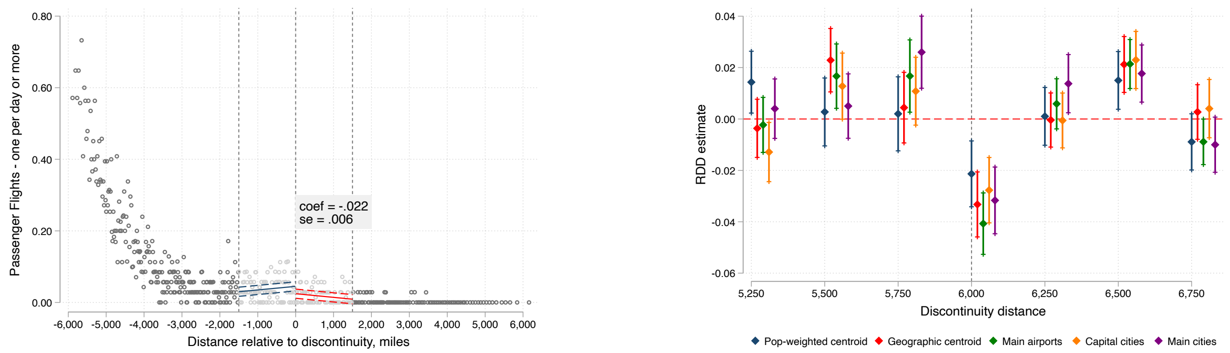
In this section, we present the main empirical findings of our study. We start by providing regression discontinuity evidence about the effect of the ULH distance threshold on bilateral passenger and cargo flight connections. We then present reduced form evidence of the effect of the ULH threshold on bilateral trade. We continue providing evidence on the effects of the ULH threshold on bilateral costs of transportation and freight, business travel spending, and tourism trips. Finally, we present results on how connected partners' baseline comparative advantages affect current patterns of trade specialization.

Discontinuities in direct flights between countries

Do added air travel costs at the ULH threshold affect the probability that countries are connected via direct flights? Figure 1 provides regression discontinuity evidence that it does. Panel A shows a binscatter plot of the probability that two countries had a daily passenger flight on average in 2015, showing how that probability decreases as the distance between countries' population centriods increases. Importantly, focusing on a 1,500 mile bandwidth, our linear regression discontinuity specification suggests that the ULH threshold reduces the probability of direct passenger connections from about 4% to about 2%. Panel B shows the effect of the ULH discontinuity on the probability of direct flights for the different definitions of bilateral distances, along with placebo cut-offs at lower and higher bilateral distances. The figure shows that negative and precisely estimated effects are only detected at the ULH threshold. Figure A.2 provides similar visualizations focusing on the probability of regular cargo flights between country pairs, showing that the ULH threshold does not seem to affect the prevalence of direct flights with freight purposes.

Figure 1: Direct passenger connections between countries at the ULH threshold

(a) Passenger connection (b) Placebo thresholds for passenger connections



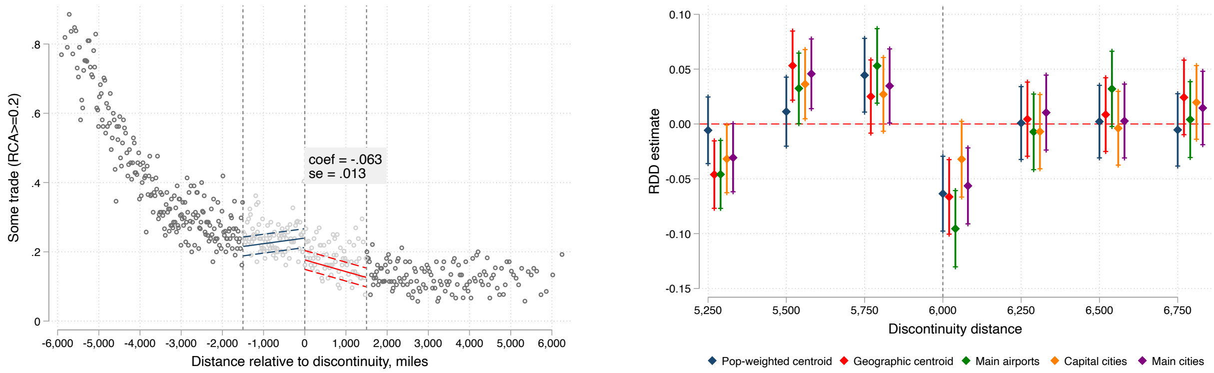
Note: Country pairs are defined as connected by whether they had more than 365 bilateral passenger flights in 2015. The effect of the ULH discontinuity on direct flight connections is estimated following the specification in Equation 3. Panel A shows the effect of the ULH discontinuity according to distances between countries' population-weighted centroids. Panel B provides estimated effects of the ULH and placebo cut-offs according to different country-representative geolocations.

Effects on bilateral trade

We now focus on the effects of the ULH threshold on bilateral trade. Figure 2 shows the main results. Panel A provides a binscatter plot of the probability of "some" trade between countries in 2020. Overall, the probability of some trade between countries becomes lower at higher distances between countries' population-weighted centroids. Focusing on country pairs at 1,500 miles around the ULH threshold, our linear regression discontinuity specification shows a negative and significant effect of 6.3 percentage points. This effect is about one third of the share of countries with some trade at distances between 4,500 and 6,000. Panel B shows estimates for specifications at placebo cut-offs around the ULH threshold for distances based on different country-representative geolocations. As with international passenger connections, estimates are negative and precise at the 6,000-mile discontinuity.

Figure 2: “Some” trade between partner countries

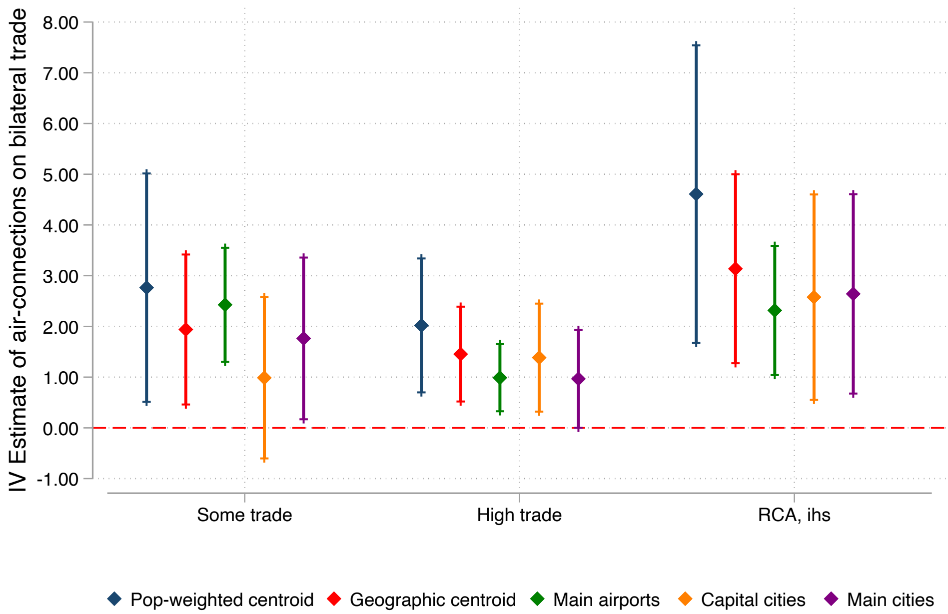
(a) Main effect (b) Placebo thresholds



Note: Panel A shows the proportion of countries engaging in at least “some” trade (RCA ≥ 0.2) at different distances from each other’s population-weighted centroids, capturing the effect of the ULH threshold within a 1,500-mile bandwidth around the discontinuity. Panel B shows the effects of placebo discontinuities around the ULH threshold for distances between countries’ population-weighted centroids.

Figures A.3 and A.4 provide similar plots for our definitions of “high” trade and for the IHS transformation of the RCA of bilateral trade, leading to similar conclusions. Table A.3 provides the main results of the effects of the ULH discontinuity on bilateral trade for the three measures, considering different bandwidths and for both lineal (Panel A) and quadratic (Panel B) controls for the distance between countries’ population-weighted centroids around the ULH discontinuity. Finally, Table A.4 provides estimates of the effect of the ULH discontinuity for the different definitions of countries’ reference geolocations. Under the exclusion assumption that only costs of air travel change discretely at the ULH discontinuity, these results provide reduced form evidence that the discrete drop in the probability of regular direct passenger flights between countries negatively affects bilateral trade prospects. We take bilateral passenger connections and trade to produce a “fuzzy” RDD specification that captures the effect of a regular direct flight on bilateral trade. Figure 3 provides these estimates for all bilateral trade measures and distances based on different representative geolocations, suggesting that the effects of direct flights on trade are both large and robust.

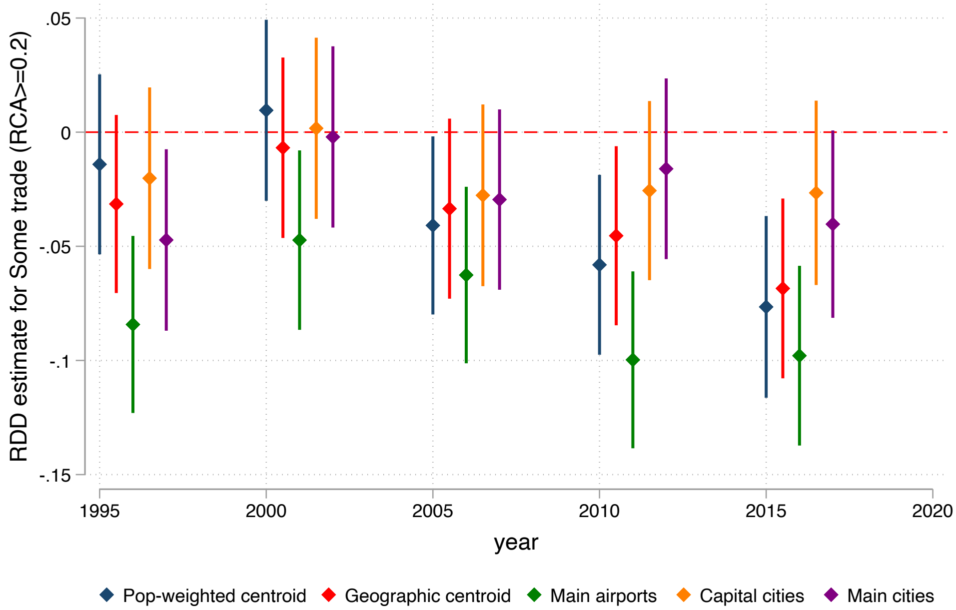
Figure 3: Fuzzy RDD estimates



Note: Figure shows "Fuzzy" RDD estimates of the effect of regular direct passenger air connections between countries on trade. Estimates and confidence intervals are separated by measures of trade and are colored according to the representative geolocation used when calculating bilateral country distances.

Focusing on reduced form estimates, we further study the timing of the effect of the ULH discontinuity for the different country representative point definitions. We produce average trade values between country pairs in each five-year block between 1995 and 2020 to then calculate the three trade measures of interest. Figure 5 shows RDD estimates of the ULH threshold on the 5-year presence of "some" trade between country pairs, finding that negative effects only become robustly negative after the late 2000s. Figure A.5 provides RDD estimates for our measures of "high" trade and on the RCA (IHS) of trade as outcomes, yielding similar dynamics. These results are consistent with the increasing relevance of long-haul flights starting in the 2000s and with the findings shown in Campante and Yanagizawa-Drott (2018), where discontinuities are only relevant for flight connections and economic outcomes when measured in the mid-2010s.

Figure 4: Dynamics of effect of ULH discontinuity on "Some" trade



Note: Figure shows the effect of the ULH threshold -based on distances between population-weighted centroids- on the probability of countries engaging in at least "some" trade (RCA ≥ 0.2) for different 5-year RCA averages: 1995-1999, 2000-2004, 2005-2009, 2010-2014, 2015-2019.

Finally, we look at how the effects concentrate according to the income levels of different trading partners. First, we separate countries as either high or low income according to their GDP per capita levels of 2020[10]. We then separate the data according to the income level of exporters and importers into four groups: Exports from low-income countries to other low-income countries, exports from high-income countries to other high-income countries, exports from low-income countries to high-income countries, and exports from high-income countries to low-income countries. Table A.5 provides linear RDD estimates of the ULH discontinuity for each of these blocks, considering the three trade measures as outcomes. Overall, we find that the largest and most precise effects are found in transactions between high-income importer and exporter countries.

[10]We take this data from the World Bank's World Development Indicators.

Assessing the relevance of estimated effects

To put the implications of our estimated effects in perspective, we propose a back-of-the-envelope calculation to gauge how much trade would increase for each country, assuming it was possible to reduce the impact of the ULH threshold.[11] For simplicity, we rely on our RDD estimates using the continuous RCA measure of trade described in Equation 1 as an outcome. We can think of a projected bilateral RCA (RCA') for country pairs at just above the ULH threshold. The difference between the projected and actual RCA values will be given by the estimated effect or the 6,000-mile discontinuity:

$$\begin{aligned} -\beta^{\text{RDD}} &= \text{RCA}' - \text{RCA} \\ &= \frac{\frac{x'_{o,d}-x_{o,d}}{x_o}}{x_d/x_w}. \end{aligned}$$

were we implicitly assume that only trade flows between an origin and destination countries would change if the effects of the ULH threshold were circumvented[12]. We can rearrange terms and arrive at an expression of the trade increase per country-pair in dollars:

$$x'_{o,d} - x_{o,d} = -\beta^{\text{RDD}} \times \frac{x_d}{x_w} \times x_o. \tag{7}$$

Finally, let us assume that for each country, the policy only affects destinations marginally disconnected - defined as those countries up to 1,500 miles above the discontinuity. Hence, the total impact of our hypothetical interventions for a country is equivalent sum of all trade increases with destinations at distances between 6,000 and 7,500 miles from that country.

Table 1 shows our back-of-envelope estimates. Panel A shows the Top 25 countries sorted by the ratio of the trade increase to the total exports of the country, while Panel B sorts countries by

[11] For instance, countries could subsidize the extra cost of ULH connections without the need to overrule the current fatigue precautions in place for ULH flights.

[12] In the calculation we neglect general equilibrium effects, such as those that would involve trade diversion, and assume that it is only valid if implemented independently by one country at a time. Finally, since we are not taking into account subsidization costs, our calculation does not equate to a proper cost-benefit analysis.

the dollar value of the trade increase[13]. Relative to current exports (Panel A), Nigeria is the country that would benefit the most, with an increase in exports of US$ 2.4 billion, equivalent to 4.2% of their current exports. Panel B suggests that China, the United States, and Japan are the countries that would increase exports by a larger amount. Interestingly, in unreported results, we find that the relative and absolute values shown in Table 1 do not correlate with common notions of countries' market access (Redding and Venables, 2004). Most importantly, if we aggregate estimated trade increases across the globe, and abstracting from general equilibrium effects, these would add up to $300 billion, or about 1.6% of World trade.

4 Transportation versus relationship-development costs

As we mentioned in the introduction, it is unlikely that the observed effects of the ULH threshold on international trade are driven by an increase in transportation costs. For the most part, goods traded internationally at distances around 6,000 miles tend to be shipped by sea. While some international trade does occur by air freight, Figure 1 shows no discrete effects of the ULH discontinuity on the prevalence of regular cargo flights between countries. We expand on the question of whether direct flight connections affect transportation costs. Table **??** provides linear RDD estimates of the effect of the ULH threshold on the difference between CIF and FOB trade amounts between the sample of countries that report those values and other countries in the World. Overall, we find no evidence that the prevalence of direct flights affects transportation costs at the 6,000 discontinuity. Taken together, these results oppose the view that direct flight connections enable trade by decreasing transportation costs.

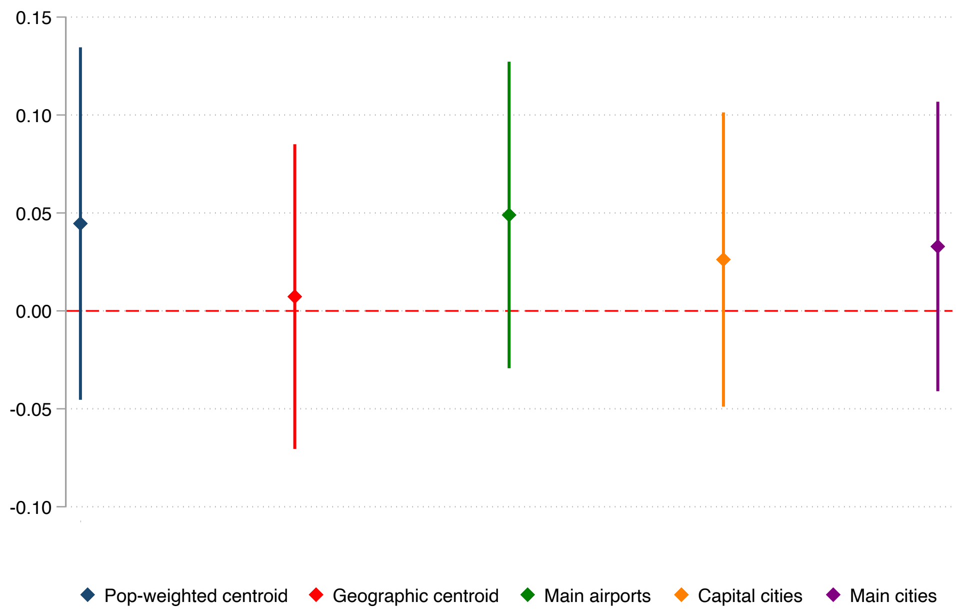
[13] We have restricted the rankings to countries that account for more than 0.1% of world trade.

Table 1: Back-of-the-envelope estimates of potential trade increases

Panel A: Sorted by % change of current exports				Panel B: Sorted by trade value increase			
Rank	Country	Trade increase (US$ millions)	% of current exports	Rank	Country	Trade increase (US$ millions)	% of current exports
1	NGA	2,425	4.24	1	CHN	55,035	2.18
2	PHL	3,046	3.68	2	USA	35,059	2.13
3	PER	1,724	3.65	3	JPN	22,893	3.05
4	IDN	6,448	3.53	4	KOR	13,943	2.37
5	ARG	2,148	3.39	5	SGP	10,755	3.37
6	SGP	10,755	3.37	6	CAN	10,707	2.39
7	DZA	1,232	3.33	7	MEX	9,811	2.10
8	MYS	8,879	3.16	8	ESP	9,529	2.96
9	JPN	22,893	3.05	9	FRA	9,457	1.67
10	ECU	677	2.98	10	MYS	8,879	3.16
11	ESP	9,529	2.96	11	TWN	8,610	2.23
12	PRT	1,913	2.89	12	DEU	8,566	0.57
13	MAR	879	2.86	13	ITA	7,676	1.43
14	AGO	992	2.52	14	IDN	6,448	3.53
15	CAN	10,707	2.39	15	GBR	5,966	1.29
16	KOR	13,943	2.37	16	VNM	3,571	1.27
17	TWN	8,610	2.23	17	TUR	3,486	1.93
18	ZAF	2,227	2.21	18	BRA	3,239	1.40
19	CHN	55,035	2.18	19	NLD	3,115	0.57
20	USA	35,059	2.13	20	IRL	3,050	1.70
21	MEX	9,811	2.10	21	PHL	3,046	3.68
22	NZL	828	2.09	22	BEL	2,514	0.78
23	CHL	1,464	2.02	23	NGA	2,425	4.24
24	EGY	626	1.96	24	CHE	2,357	0.76
25	TUR	3,486	1.93	25	ZAF	2,227	2.21
		Total	Percent			Total	Percent
	Top 25	215,336	2.77		Top 25	252,364	2.12
	All countries	299,543	1.59		All countries	299,543	1.59

Note: Calculations based on Equation 7 and RDD estimates shown in Table A.3.

Figure 5: Effects on transportation costs



Note: The figure shows the effect of the ULH threshold on the CIF to FOB ratio for the year 2019 using bilateral distances based on different representative country geolocations.

The alternative view is that direct flights enable trade by easing the development of in-person relationships between clients and suppliers across international borders. If this was the case, we would expect the effects of the ULH threshold to have disproportionate effects for differentiated products that rely on developing and sustaining relationships with specific suppliers. To test this hypothesis empirically, we perform regression discontinuity specifications at the product-country pair level following Equation 4, capturing the heterogeneity of the 6,000-mile discontinuity between countries for homogenous vs. differentiated products. Indeed, Table 2 shows that the effects of the discontinuity are strongest for differentiated products and downstream products for two of our three trade intensity definitions at the product level. This finding lends further credence to the relationship-building channel.

Table 2: Effects on relationship-intensive products

Dep. variable	Interaction	Discontinuity β	se		Discontinuity interaction γ	se	
"Some" (RCA≥0.2)							
	Custom product	-0.310	0.027	***	-0.280	0.039	***
	Upstream product	-0.467	0.020	***	0.096	0.019	***
"High" (RCA≥1.0)							
	Custom product	-0.140	0.019	***	-0.025	0.026	
	Upstream product	-0.152	0.013	***	0.003	0.013	
RCA, ihs							
	Custom product	-0.312	0.028	***	-0.229	0.039	***
	Upstream product	-0.437	0.020	***	0.070	0.019	***

Note: Table shows effects of the ULH threshold -based on distances between population-weighted centroids- on product-specific bilateral trade for products non-customized vs. customized products (Rauch, 1999) and for downstream vs. upstream products. Effects are estimated following Equation 4. β estimates capture the effect of the ULH discontinuity on non-customized (downstream) products, and γ estimates capture the difference between these and customized (upstream) products. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Moreover, if the costs of sustaining in-person commercial relationships across long distances are the dominating channel, then the ULH threshold should affect the intensity of business travel across national borders, while having smaller effects for travel motives that do not rely on sustained in-person relationships between individual clients and suppliers (e.g. tourism). Table 3 provides linear regression discontinuity estimates of the effect of the ULH threshold on bilateral business travel spending and tourism trips, showing large, significant, and robust effects only for the former. Moreover, Figure A.6 shows that negative and precisely estimated effects on business travel spending are specific to the 6,000 discontinuity that characterizes the ULH direct flights threshold.

Table 3: Effects on business and tourism travel

Panel A: Business travel expenditure

Outcome	β	se		BW	Mean
"Some" (RCA $\geq$ 0.2)	-0.140	0.027	***	2,388	0.316
"High" (RCA$\geq$ 1.0)	-0.032	0.012	***	1,720	0.069
RCA, ihs	-0.062	0.022	***	1,559	0.211

Panel B: Tourism trips

Outcome	β	se		BW	Mean
"Some" (RCA $\geq$ 0.2)	-0.031	0.014	**	2,228	0.159
"High" (RCA $\geq$ 1.0)	-0.005	0.007		2,303	0.044
RCA, ihs	-0.008	0.013		1,763	0.133

Note: The table shows the effects of the ULH threshold -based on distances between population-weighted centroids- on bilateral business travel spending (Panel A) and bilateral tourism trips (Panel B). Effects are estimated following Equation 3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Cumulatively, these results suggest that direct flights between countries at the margin of the ULH threshold enable international trade not by attenuating transportation costs but by easing the possibility of developing and sustaining in-person client-supplier relationships over long distances, confirming the continuing importance of personal links for business development despite widespread access to telecommunication technologies.

5 Direct flights and trade specialization

So far, we have provided evidence that, by increasing relationship-development costs, the ULH discontinuity affected bilateral international trade starting in the 2010s. How did patterns of trade specialization respond? If direct flights enable bilateral trade, then integration with partners with strong comparative advantages in specific products could prevent the development of domestic capabilities in that product. Nevertheless, enhanced business travel between countries has also been shown to enable bilateral investments (Campante and Yanagizawa-Drott, 2018) and knowledge diffusion (Bahar et al., 2023).[14] These channels could affect patterns of specialization in the opposite direction, as access to partners' capital, technologies, and know-how may boost domestic productivity in activities in which partners held comparative advantages at baseline.

Following the specification described in Equation 6, Table 4 provides estimates of the effect of having distant partners within and beyond the ULH threshold with baseline comparative advantages in a given product on countries' development of new capabilities in those products. For a given "absent" product in a country, a higher share of partners just below the ULH discontinuity that were competitive in a given product in 1995 associates with a lower chance that the country becomes competitive in that product. We find no evidence that the same measure for partners just above the ULH threshold is associated with product "appearances" in a given country. Figure 6 shows that these effects have been building up in time. Consistent with our evidence above, effects only become large and significant starting in the late-2000s. These findings suggest that, while also inducing bilateral investments and knowledge diffusion, direct flights' effects on countries' patterns of specialization are in line with a trade integration channel.

[14] Indeed, Table A.6 shows that the ULH discontinuity also affects the intensity of bilateral direct investment between countries.

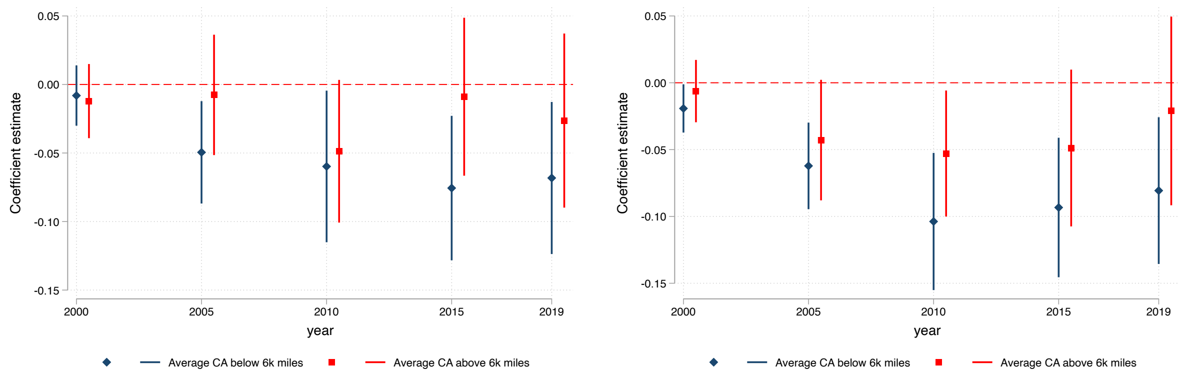
Table 4: Effects on patterns of specialization

	Appeared (Cum. share $\geq$ 0.1)			Appeared (RCA$\geq$1)		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
S^{IN}_{1995}	-0.066**		-0.068**	-0.079***		-0.081***
	(0.028)		(0.028)	(0.027)		(0.028)
S^{OUT}_{1995}		-0.018	-0.026		-0.011	-0.021
		(0.033)	(0.032)		(0.035)	(0.036)
RCA_{1995}, ihs	0.017***	0.017***	0.017***	0.682***	0.683***	0.682***
	(0.002)	(0.003)	(0.002)	(0.069)	(0.069)	(0.069)
Observations	176,168	176,168	176,168	116,418	116,418	116,418
R-squared	0.089	0.089	0.089	0.059	0.059	0.059

Note: Table shows effects of the share of distant partners within and beyond the ULH Threshold with baseline "presence" in a product on the probability of "appearance" of a product in a given country. Effects are estimated following Equation 6. "absence" and "presence" of country-product combinations are defined following either Kehoe and Ruhl (2013) or Hausmann et al. (2022). All specifications include country-fixed effects and product-fixed effects. Robust standard errors clustered by exporter and product are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure 6: Effects on patterns of specialization over time

(a) Appeared (Cum. share ≥ 0.1) (b) Appeared (RCA ≥ 1)



Note: Figure shows effects of the share of distant partners within and beyond the ULH Threshold with baseline “presence” in a product on the probability of “appearance” of that product in a given country at different moments. Effects are estimated following Equation 6. “Absence” and “presence” of country-product combinations are defined following either Kehoe and Ruhl (2013) (Panel A) or Hausmann et al. (2022) (Panel B).

Conclusion

This paper has investigated how geographic discontinuities, determined by regulatory and technological factors, affect the prevalence of direct passenger flights between countries and, in turn, shape the landscape of international trade. By focusing on the Ultra-long haul regulatory threshold of 6,000 miles, our research underscores how direct flights enable international trade by easing the development and sustaining of in-person commercial relationships. These findings affirm the continuing relevance of face-to-face interactions in fostering robust trade partnerships despite broad access to telecommunication technologies.

Moreover, our research extends beyond the immediate implications for trade volumes and studies how direct flights may influence the export specialization of national economies. Our evidence suggests that countries are more likely to diversify away from products for which distant but connected partners possessed competitive advantages at baseline. This shift underscores the capacity of air travel enhancements to not only facilitate trade, but to integrate markets and reshape their comparative advantages by inducing trade specialization.

The findings of this paper contribute to a nuanced understanding of gravity trade models. While most attention has been placed on the effects of the distance between trading partners on bilateral transportation costs, they may also determine the fixed costs of developing and sustaining commercial links. Indeed, in a setting in which distance discretely affects air connectivity, we identified very large effects that can only be explained by a relationship-development channel. Finally, by highlighting the critical role of in-person interactions for trade, especially in the context of differentiated and relationship-dependent products, our study underscores the need for policymakers to consider air accessibility as a key factor in trade and economic strategy formulation.

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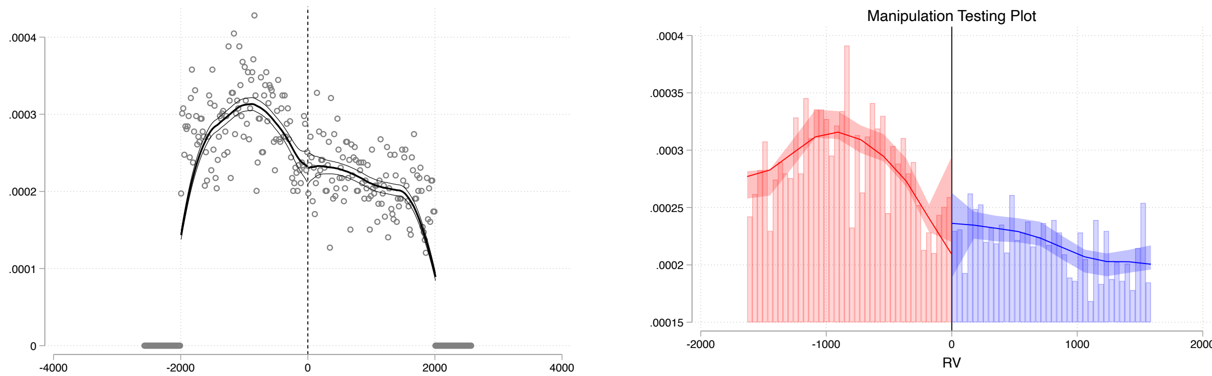
Appendix

Figure A.1: Manipulation tests



(a) McCrary test

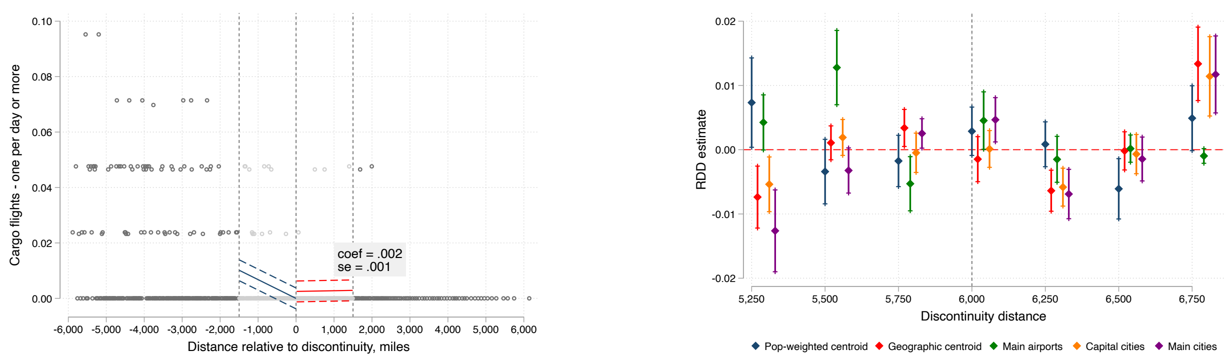
(b) RD Density test

Note: Figures provide threshold manipulation visualizations following McCrary (2008) (Panel A) and Cattaneo et al. (2018) (Panel B).

Figure A.2: Direct cargo connections between countries at the ULH threshold

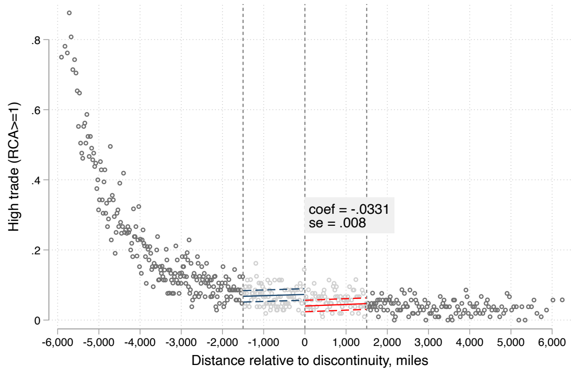
(a) Passenger connection

(b) Placebo thresholds for passenger connections

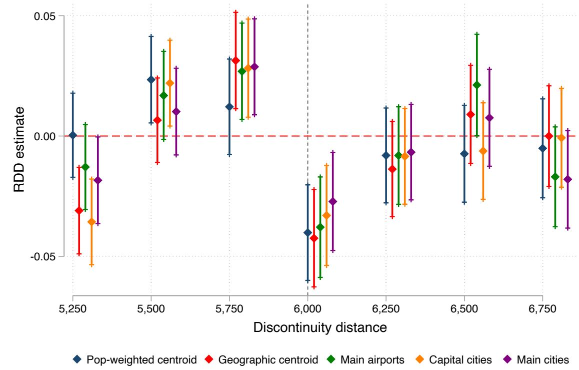


Note: Country pairs are defined as connected by whether they had more than 365 bilateral cargo flights in 2015. The effect of the ULH discontinuity on direct flight connections is estimated following the specification in Equation 3. Panel A shows the effect of the ULH discontinuity according to distances between countries' population-weighted centroids. Panel B provides estimated effects of the ULH and placebo cut-offs according to different country-representative geolocations.

Figure A.3: “High” trade between partner countries



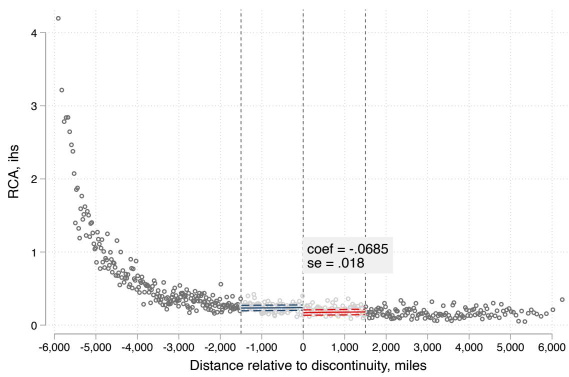
(a) Main effect



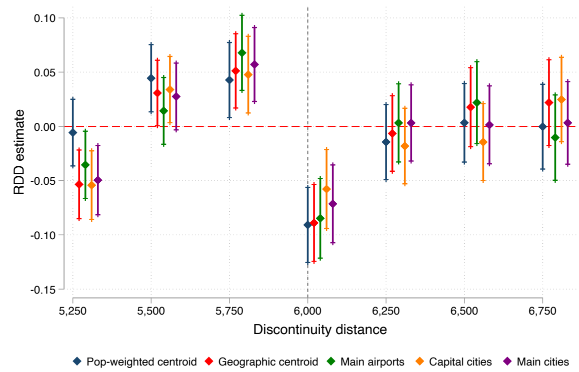
(b) Placebo thresholds

Note: Panel A shows the proportion of countries engaging in “high” trade (RCA ≥ 1) at different distances from each other’s population-weighted centroids, capturing the effect of the ULH threshold within a 1,500-mile bandwidth around the discontinuity. Panel B shows the effects of placebo discontinuities around the ULH threshold for distances between countries’ population-weighted centroids.

Figure A.4: RCA of trade (IHS transformation) between partner countries



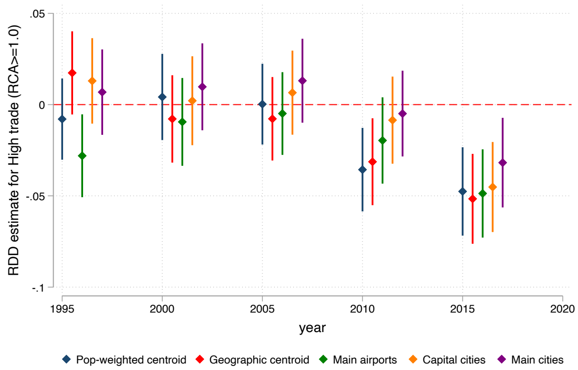
(a) Main effect



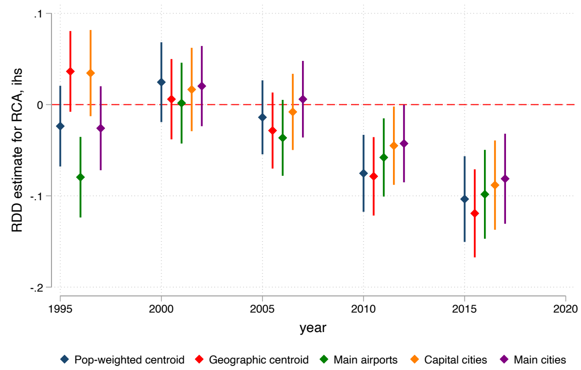
(b) Placebo thresholds

Note: Panel A shows the value of the RCA (Inverse hyperbolic sine transformation) of bilateral trade at different distances between countries’ population-weighted centroids, capturing the effect of the ULH threshold within a 1,500-mile bandwidth around the discontinuity. Panel B shows the effects of placebo discontinuities around the ULH threshold for distances between countries’ population-weighted centroids.

Figure A.5: Dynamics of effects of ULH discontinuity



(a) "High" trade between partners

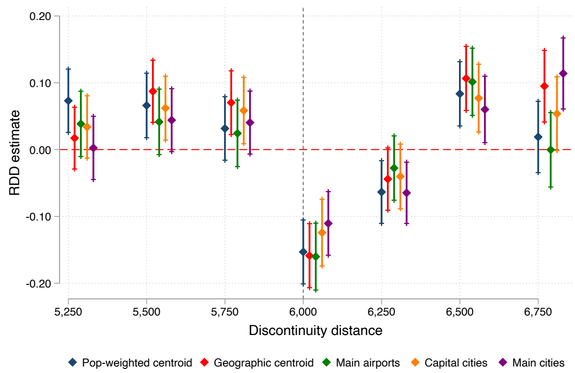


(b) RCA (IHS) of trade between partners

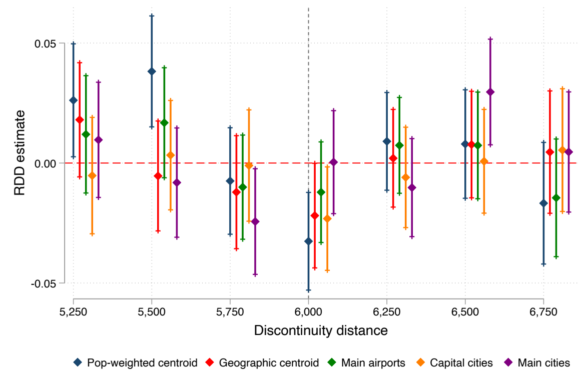
Note: Figure shows the effect of the ULH threshold -based on distances between population-weighted centroids- on the probability of countries engaging in "high" trade (Panel A) and for the IHS transformation of RCA (Panel B) for different 5-year RCA averages: 1995-1999, 2000-2004, 2005-2009, 2010-2014, 2015-2019.

Figure A.6: Bilateral business travel spending

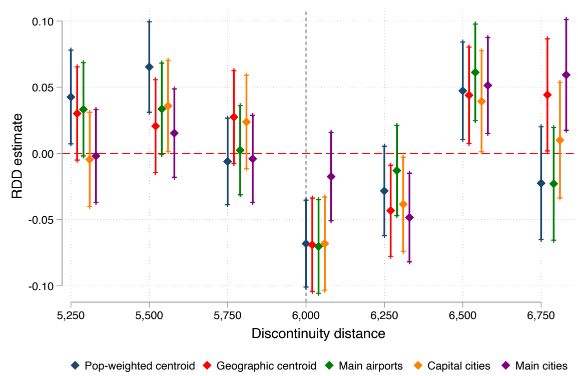
(a) "Some" (RCA≥0.2)



(b) "High" (RCA≥1.0)



(c) RCA (IHS)



Note: Figure shows the effects of placebo discontinuities around the ULH threshold for distances between countries' population-weighted centroids on business travel spending. Panel A shows result for our binary measure of "some" business travel. Panel B shows results for our binary measure of "high" business travel. Panel C shows results for the Inverse Hyperbolic Sine transformation of the RCA measure.

Table A.1: Summary Statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Bilateral trade					
Some trade, 1995	30,396	0.39	0.49	0.00	1.00
Some trade, 2000	30,396	0.40	0.49	0.00	1.00
Some trade, 2005	30,396	0.41	0.49	0.00	1.00
Some trade, 2010	30,396	0.41	0.49	0.00	1.00
Some trade, 2015	30,396	0.42	0.49	0.00	1.00
High trade, 1995	30,396	0.17	0.38	0.00	1.00
High trade, 2000	30,396	0.18	0.39	0.00	1.00
High trade, 2005	30,396	0.18	0.38	0.00	1.00
High trade, 2010	30,396	0.18	0.38	0.00	1.00
High trade, 2015	30,396	0.18	0.38	0.00	1.00
RCA, 1995	30,396	0.82	1.79	0.00	7.95
RCA, 2000	30,396	0.90	1.99	0.00	9.14
RCA, 2005	30,396	0.91	2.13	0.00	10.39
RCA, 2010	30,396	0.81	1.80	0.00	8.34
RCA, 2015	30,396	0.78	1.64	0.00	7.13
Business Travel					
"Some" (RCA$\geq$0.2)	14,477	0.38	0.49	0.00	1.00
"High" (RCA$\geq$1.0)	14,477	0.17	0.38	0.00	1.00
RCA	14,477	0.64	1.31	0.00	5.00
Tourism Trips					
"Some" (RCA$\geq$0.2)	35,802	0.21	0.41	0.00	1.00
"High" (RCA$\geq$1.0	35,802	0.10	0.31	0.00	1.00
RCA	35,802	0.65	2.20	0.00	12.19
Bilateral FDI					
"Some" (RCA$\geq$0.2)	23,799	0.02	0.12	0.00	1.00
"High" (RCA$\geq$1.0	23,799	0.01	0.10	0.00	1.00
RCA	23,799	0.14	0.65	0.00	4.00
Bilateral Distance					
Pop-weighted centroid	30,396	4,871	2,795	41	12,402
Geographic centroid	30,396	4,870	2,788	37	12,466
Main airports	30,228	4,854	2,780	16	12,375
Capital cities	30,396	4,866	2,788	6	12,466
Main cities	30,396	4,878	2,791	6	12,463

Note: The table provides summary statistics for the main variables used in the paper to assess the effects of the ULH discontinuity on trade.

Table A.2: Balance tests

Dep variable	β	se	Nobs
GDP per capita - exporter, log	-0.027	0.064	35,341
GDP per capita - importer, log	0.009	0.065	33,924
Difference in GDP per capita - imp/exp	0.015	0.074	29,891
Total exports, log	-0.061	0.091	39,055
Total imports, log	0.045	0.091	38,544
Population - exporter, log	-0.123	0.102	39,055
population - importer, log	-0.108	0.105	38,544
Difference in population imp/exp	-0.009	0.168	37,545
Area - exporter, log	-0.011	0.130	39,055
Area - importer, log	0.010	0.127	38,544
Common language	0.000	0.004	40,090
Common colonizer	0.000	0.000	40,090
Latitud - exporter	1.232	1.165	40,015
Longitud - exporter	-2.420	2.817	40,015
Latitud - importer	1.033	1.088	40,015
Longitud - importer	-4.103	3.190	40,015

Note: Table provides RDD estimates of the effect of the ULH threshold -according to the distance between countries' population-weighted centroids- on a number of baseline covariates of exporter, importer, or bilateral characteristics. Estimates are produced following Equation 3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: effect of the ULH discontinuity on trade

Panel A: Linear controls

	Optimal BW			BW =1,500		Mean outcome (left of discontinuity)	
Outcome	β		BW	β		Optimal	BW=1,500
“Some” trade	-0.076	***	2,139	-0.085	***	0.271	0.265
	(0.017)			(0.015)			
“High” trade	-0.023	**	1,750	-0.025	***	0.077	0.075
	(0.011)			(0.009)			
RCA, ihs	-0.044	*	1,591	-0.046	**	0.253	0.251
	(0.026)			(0.021)			

Panel B: Quadratic controls

	Optimal BW			BW =1,500		Mean outcome (left of discontinuity)	
Outcome	β		BW	β		Optimal	BW=1,500
“Some” trade	-0.077	***	3,743	-0.104	***	0.298	0.265
	(0.017)			(0.023)			
“High” trade	-0.021	*	2,897	-0.028	**	0.090	0.075
	(0.011)			(0.014)			
RCA, ihs	-0.042		2,519	-0.059	*	0.272	0.252
	(0.027)			(0.031)			

Note: Table provides RDD estimates of the effect of the ULH threshold -according to the distance between countries' population-weighted centroids- on our three different trade outcomes. Panel A shows estimates based on RDD specifications with linear controls around the discontinuity, following Equation 3. Panel B shows estimates based on RDD specifications with quadratic controls around the discontinuity. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Alternative definitions of countries' representative geolocation

	Optimal Bandwith						BW fixed to 1500 miles					
Distance variable	RCA≥0.2		RCA≥1.0		RCA, ihs		RCA≥0.2		RCA≥1.0		RCA, ihs	
Pop-weighted centroid	-0.053	***	-0.034	***	-0.069	***	-0.063	***	-0.033	***	-0.068	***
	0.014		0.011		0.026		0.014		0.008		0.019	
Geographic centroid	-0.049	***	-0.024	**	-0.050	*	-0.051	***	-0.025	***	-0.047	***
	0.016		0.011		0.026		0.014		0.009		0.020	
Main airports	-0.059	***	-0.026	***	-0.062	***	-0.051	***	-0.025	***	-0.060	***
	0.016		0.010		0.025		0.014		0.008		0.020	
Capital cities	-0.032	**	-0.021	*	-0.037		-0.029	**	-0.022	***	-0.037	*
	0.015		0.011		0.025		0.014		0.009		0.020	
Main cities	-0.050	***	-0.021	*	-0.045	*	-0.052	***	-0.022	***	-0.045	**
	0.016		0.011		0.025		0.014		0.009		0.020	

Note: The table provides RDD estimates of the effect of the ULH threshold on our three different trade outcomes, iterating over different definitions of countries' representative geolocations. Estimates are based on specifications that follow Equation 3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Effects across low and high income trading partners

Dep. variable	Sample	β	se		Nobs	Mean	BW
"Some" trade (RCA≥0.2)							
	Full	-0.049	0.019	***	29,925	0.445	2,691
	Low → Low	0.008	0.027		7,483	0.365	
	High → High	-0.131	0.031	***	7,310	0.579	
	Low → High	-0.059	0.028	**	7,482	0.381	
	High → Low	-0.008	0.029		7,480	0.448	
"High" trade (RCA≥1.0)							
	Full	-0.043	0.015	***	29,925	0.205	1,661
	Low → Low	0.022	0.027		7,483	0.221	
	High → High	-0.101	0.021	***	7,310	0.260	
	Low → High	-0.028	0.017	*	7,482	0.153	
	High → Low	-0.056	0.021	***	7,480	0.182	
RCA, ihs							
	Full	-0.050	0.025	**	29,925	0.551	1,656
	Low → Low	0.098	0.054	*	7,483	0.604	
	High → High	-0.200	0.036	***	7,310	0.659	
	Low → High	-0.035	0.029		7,482	0.434	
	High → Low	-0.052	0.039		7,480	0.501	

Note: The table provides RDD estimates of the effect of the ULH threshold on our three different trade outcomes, iterating over different combinations of country pairs according to the income levels of exporters and importers. Countries above the median income in 2020 are categorized as "high" income, and those below that value are classified as "low" income. Estimates are based on specifications that follow Equation 3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: Effects on bilateral FDI

Outcome	β	se		Nobs	BW	Mean
"Some" (RCA $\geq$ 0.2)	-0.023	0.007	***	23,799	1,914	0.015
"High" (RCA $\geq$ 1.0)	-0.010	0.005	**	23,799	1,985	0.006
RCA, ihs	-0.025	0.013	**	23,799	2,492	0.051

Note: The table shows the effects of the ULH threshold -based on distances between population-weighted centroids- on bilateral FDI. Effects are estimated following Equation 3. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$