Stay Connected, Stay Financed: Evidence from Global Network of Air Links and Syndicated Loans

Yan Li, The University of Hong Kong

Zigan Wang, Tsinghua University

Qie Ellie Yin, Hong Kong Baptist University *

Abstract

This paper examines how long-distance air links over the globe affect syndicated loan contracts, particularly their pricing (interest spread). We find that a city's centrality in the global air-link network facilitates financing through syndicated loans. Borrowers in this city are likely to obtain syndicated loans with lower interest spreads, fewer lead lenders, a more diversified lending structure, fewer loan amendments, more flexible covenants, and lower fees. The negative effect of air-link centrality on loan spreads is weaker with higher information transparency and a developed credit market. We employ a regression discontinuity (RD) approach based on the discontinuity of long-distance air links around 6,000 miles to identify causality. We conduct placebo tests using cargo flights and find no significant impact on syndicated loans, which suggests that the effect of air links on syndicated loans is through easy transportation of people rather than products.

Keywords: Syndicated loan, loan spread, air-link network, long-distance direct flight

JEL: F21, F23, G30, G32, O18, O19, R12, R40

*Corresponding author: Zigan Wang (wangzg@sem.tsinghua.edu.cn), Associate Professor of Finance, School of Economics and Management, Tsinghua Univeristy. Yan Li (yanlifbe@connect.hku.hk), PhD student, HKU Business School, The University of Hong Kong; Qie Ellie Yin (qieyin@hkbu.edu.hk), Assistant Professor of Finance, School of Business, Hong Kong Baptist University. We are grateful for the helpful comments from Huaizhou Li (discussant), Ronald Masulis, Kentaro Asai, Antje Berndt, Ding Ding, Chao Gao, Bruce Grundy, Nhan Le, Kun Li, Xin (Kelly) Liu, Steve Sault, Alexander Vadilyev, Takeshi Yamada, Le Zhang, Xianming Zhou, Yichao Zhu, Linxiang Ma, Michael Wang, Thomas Maurer, Hong Zou, Jian Feng, Zhiwen Zhuang, and the audience at the Australian National University, The University of Hong Kong, Vietnam National University - International University and the participants at the 35th UNSW AFBC. All remaining errors are ours.

1. Introduction

The market of syndicated loans provides a critical source of corporate debt financing. According to the Global Syndicated Loans Review by Refinitiv, the total proceeds of new syndicated loans amounted to US$4.6 trillion over the globe in 2019, representing 8.25% of total outstanding debt for publicly listed firms;[1] Annual proceeds from new syndicated loans were over 20 times higher than the US$198 billion proceeds from all IPO cases around the world in the same year. International syndicated loans are of particular importance for linking capital from rich countries to underutilized resources in underdeveloped regions. Based on the data from Reuters Loan Pricing Corporation's (LPC) DealScan, 3,756 syndicated loans were borrowed from non-domestic lenders in 2019, which was six times higher than 530 loans in 1989.

When signing contracts of syndicated loans, one key factor under consideration for both lenders and borrowers is interest spread. A cross-country study by Claessens, Coleman, and Donnelly (2018) shows that a 1% interest rate drop leads to an eight-basis-point reduction in a bank's net interest margin. Chen and King (2014) estimate that a 1% increase in interest spread is associated with about 2% lower Tobin's Q for US firms. Literature has discussed many determinants of interest spread and other terms of syndicated loans, including syndicate structure (Dennis and Mullineaux (2000); Champagne and Coggins (2012)), information asymmetry between borrowers and lenders (Sufi (2007); Armstrong, Guay, and Weber (2010)), legal and institutional environment (Qian and Strahan (2007)), and expected liquidity of loans in the secondary market (Gupta, Singh, and Zebedee (2008)). However, an often-considered factor has been understudied in the literature on syndicated loans: The distance between international borrowers and lenders.

The borrower-lender distance is not only about travel time but more about psychology. Longer distances lower communication frequency (Tillema, Dijst, and Schwanen (2010)), reduce mutual trust (Dainton and Aylor (2001)), and raise transaction costs (Ragozzino (2009)). In syndicated loan markets, distance inhibits efficient information transmission and lender monitoring (Sufi (2007)), resulting in more restrictive contracts and higher interest rates (Agarwal and Hauswald (2010); Knyazeva and Knyazeva

[1] Total outstanding debt of publicly listed firms is the sum of Total Debt (ITEM3255) in US dollars from the Worldscope database. We obtain data of new syndicated loans over the globe in 2019 from https://thesource.refinitiv.com/TheSource/getfile/download/cb9a456d-8fcc-4c57-a080-2c2b8b37b7d4.

(2012); Hollander and Verriest (2016)). The fast development of transportation then reduces travel costs and hence facilitates economic activities and the establishment of business links (e.g., Campante and Yanagizawa-Drott (2018); Bernard, Moxnes, and Saito (2019); Feyrer (2019)). In the US, the size of small business loans increases after the introduction of new domestic direct flights from a bank's headquarters to its branches (Levine et al. (2020)) while the pricing (interest spread) is not significantly impacted.

Because small business loans merely represent a small portion of all bank loans, it is straightforward to question whether domestic direct flights affect syndicated loans, which play a greater role in the debt market. As a result of investigation, we find no significant impact of direct flights on US syndicated loans using the same setting as in Levine et al. (2020). This result is understandable because given the large amount of syndicated loans compared to small business loans, the marginally increased travel time in domestic transfers is a relatively insignificant cost to borrowers and lenders. However, it may not be the case for international travelers. Compared to direct flights, international transfers often involve much longer travel distance and time, more visa problems, more flight delays, and more jet lag, which may bring negative impacts on travelers' health and psychological conditions (DeHart (2003)).

Since fast technological advancement has fostered the design of aircraft for long-haul flights and facilitated face-to-face interactions of people across countries, international long-distance direct flights may have impacts on cross-country syndicated loans. The availability of international direct flights may lead to lower economic and psychological costs for travelers, such as bank managers who seek investment opportunities in developing countries.

Two possibilities exist for the impact of international direct flights on cross-country syndicated loans. First, in-person interactions that benefit from direct flights may promote more transfer of capital from lender syndicates to borrowers. In syndicated loan markets, if a borrower locates in a city with many direct flights to other major cities over the globe, potential lenders in these connected cities can easily fly to the borrowers' location and conduct efficient due diligence by on-site visits, lowering information asymmetry. Therefore, the borrowers may obtain more favorable loan contracts, such as lower interest rates and more flexible loan structures. Because lead lenders can monitor the borrower's behaviors more efficiently, they may also be able to attract more participants in a loan syndicate.

The other possibility is that distance no longer matters when firms borrow from non-local lenders, such as from foreign lenders. If there is no easy alternative other than long-distance air transportation, lenders may still find it costly to do on-site visits. As an alternative to on-site visits, these lenders may always require restrictive loan covenants and high interest rates for their foreign borrowers from a far-away country.

Our paper makes empirical tests of the impact of distance on syndicated loan terms. We obtain data on syndicated loans from Reuters Loan Pricing Corporation's (LPC) DealScan database. We focus on borrowers and lenders that are at least 1,000 miles away. We obtain information on air links between major international airports from the International Civil Aviation Organization (ICAO). For a city with a borrower's headquarters, we measure its centrality in the global network of air links based on the availability and number of direct flight connections with other major international airports. If distance matters for syndicated loan contracts, a city's centrality is likely to generate contracts that are more favorable to borrowers. We examine whether this is the case using city-, firm-, and loan facility-level analyses. Our final sample includes 4,887 loans and 1,867 borrowing firms in 263 cities in 59 countries from 1989 to 2014.

We find that when a city has higher centrality in the global network of air links, syndicated loans borrowed by firms in this city tend to have lower interest spreads on average; the number of syndicated loans, such as revolver loans and bank term loans, borrowed by firms in this city is higher. In loan facility-level regressions, when a borrower locates in a city with higher centrality, the loan spread also tends to be lower. These findings suggest that the availability of direct air links shortens the geographical and psychological distance between borrowers and lenders that would be geographically distant, which then reduces borrowing costs.

In addition to loan spread, we further examine other properties of syndicated loans. We find that air-link centrality tends to be associated with fewer lead lenders, a more diversified composition of lenders, fewer loan amendments, more flexible loan covenants, and lower fees. These findings have several implications. First, when there are more air links, borrowers only need to negotiate with a smaller group of lead lenders rather than a larger number of lead lenders. Second, the smaller group of lead lenders can efficiently monitor borrowers' behaviors through more frequent face-to-face interactions by direct flights, which mitigates the moral hazard problem. Therefore, the need for ex-post loan amendments is lower; participants are also willing to contribute more, resulting in a more diversified lending structure. Third, higher air-link centrality results in a more flexible loan structure for borrowers.

One concern of these results is the potential endogeneity of a city's air-link centrality. There may be a reverse causality problem. Lower borrowing costs facilitate more business connections, which then fosters the development of air links in a city. Meanwhile, perhaps both syndicated loan contracts and air-link centrality are affected by some common factors. For example, if a borrower locates in a large city with good economic conditions, it is more likely to obtain low-cost syndicated loans from distant lenders, and the city is more likely to have more flight connections with other places over the globe.

To rule out this concern, we use a regression discontinuity (RD) approach as in Campante and Yanagizawa-Drott (2018): Long-distance air links exhibit a clear discontinuity around 6,000 miles because of substantially higher operating costs beyond this distance. One implicit assumption of the RD setting is that, for a given borrower, the lenders just below 6,000 miles away do not systematically differ from those located above 6,000 miles away; therefore, this 6,000-mile discontinuity of air links is exogenous to syndicated loan contracts. Relying on this RD setting, we find that when the distance between borrowers and lenders is just above 6,000 miles, the loan spread is significantly higher. This result further supports the argument that air-link centrality reduces information asymmetry between borrowers and lenders, which then fosters easier capital flows through syndicated loan contracts.

We further confirm our main finding with a set of robustness checks and additional cross-sectional analyses. We show that using thresholds other than 6,000 miles does not generate significant variation in loan spread, which implies that the impact of the 6,000-mile discontinuity on loan spread is not by chance. We find that air-link centrality measured by cargo flights does not affect syndicated loan contracts; this result suggests that the facilitating effect of air links on capital flows is through interactions of people rather than through the transportation of goods and products. We also show that the negative relationship between air-link centrality and loan spread is weaker with higher information transparency and lower technological advantage.

The remainder of this paper is as follows. Section 2 discusses the background of air-link development, contributions to related literature, and our hypotheses. Section 3 describes our data, sample, and variable construction. Section 4 presents empirical results. Section 5 concludes.

2. Air Links and Economic Activities

2.1. Background and Contributions to Related Literature

Vigorous economic activities are fostered by frequent interactions of people and easy transfer of capital. Convenient movement of people and capital over long distances is achieved through the development of air travel, especially from the late 1980s when aircraft designed for long-haul flights started to appear. These aircraft models include Boeing 747-400 and 777, Airbus A330 and A340, etc., which could fly longer than 4,000 miles. Since the introduction of these models, global air links between distant cities in different countries or continents have exploded. For example, the number of direct flights between Shanghai and Sydney (around 4,897 miles) increased from 138 to 1,080 after the late 1980s.

Although ultra-long-haul flights have become feasible thanks to technological advancements, flights over 12 hours (i.e., around 6,000 miles) still face some practical obstacles that substantially increase operating costs. For instance, according to the requirement by the US Federal Aviation Authority, flights above 12 hours should have additional pilots and crew members, as well as enough sleeping spaces. Higher personnel costs then lead to a significant drop in the number of flights over 12 hours. Therefore, long-distance air links exhibit a clear discontinuity around 6,000 miles. Campante and Yanagizawa-Drott (2018) prove this discontinuity and show that the improvement of an airport's position in the network of air links fosters local economic activity, measured by night light density, and cross-border business links, measured by the number of foreign-owned firms.

Several other studies have also documented the impact of transportation or proximity on business activities, such as innovation, firm performance, trade, investment, and ownership structure. Specifically, Chu, Tian, and Wang (2019) find that geographical proximity between suppliers and customers fosters supplier innovation. Bernard, Moxnes, and Saito (2019) exploit the opening of a high-speed train line in Japan and document that lower traveling cost helps to build better supplier-customer links and improves firm performance. Donaldson (2018) builds and tests a model to show that a vast railroad network in India reduces trade costs and increases real income. In addition to railroads, some studies examine air travel. Cristea (2011) and Feyrer (2019) both argue that the ease of cross-border air travel fosters international trade. Giroud (2013) regards the initiation of new airline routes as a proxy for change in proximity and documents that headquarters' proximity to plants improves monitoring and information transmission, which then fosters plant-level productivity and investment. Zhang, Kandilov, and Walker (2021) show that newly introduced direct flights between China and the US allow for faster travel and lower cost to acquire information, which then facilitates cross-border mergers & acquisitions between these two countries. Da et al. (2021) use the introduction of flight links through newly opened air hubs to show that air travel broadens firms' investor base and reduces their cost of equity.

We differ from these studies in several aspects. Our identification strategy relies on an RD setting based on a global sample of firms from 59 countries rather than exogenous shocks based on one or two countries (e.g., Bernard, Moxnes, and Saito (2019); Giroud (2013); Zhang, Kandilov, and Walker (2021)). Our RD setting follows Campante and Yanagizawa-Drott (2018) that uses the 6,000-mile discontinuity of air links, but we examine another important question. Unlike Campante and Yanagizawa-Drott (2018) who document a positive relationship between global air inks and foreign ownership, we focus on how global air links affect the borrower-lender relationship in the market of syndicated loans.

Our study is also related to a set of studies on the determinants of syndicate loans. For instance, Dennis and Mullineaux (2000) find that a loan is more likely to be syndicated when the managing agent of the syndicate is more reputable and when the borrower becomes more transparent. Sufi (2007) also shows that when information asymmetry between borrowers and lenders is severe, loan syndicates are inclined to be more concentrated. Champagne and Coggins (2012) find that loan spread is significantly related to syndicate structure, such as syndicate quality, share concentration, lead arrangers' characteristics, etc. Qian and Strahan (2007) show that loan spread tends to be lower in an environment with stronger credit protection. Gupta, Singh, and Zebedee (2008) show that loan spread is lower if this loan has higher expected liquidity in secondary markets.

We contribute to this stream of literature by investigating the impact of borrower-lender proximity to syndicate loan contracts. Considering the fact that air links may reshape the distance between borrowers and lenders, we proxy "proximity" using the availability of direct flights between borrowers and lenders and using a city's centrality in the global network of air links. We examine loan structure from different angles, including loan spread, loan type, loan size, lender structure, and contract flexibility.

Our setting uses the discontinuity of direct flights around 6,000 miles to examine the causal effect of proximity on loan structure. This discontinuity results from a regulatory convention in the airline industry; it is exogenous to local economic conditions (Campante and Yanagizawa-Drott (2018)) and is not driven by changes in financing activities, so there is minimal problem of unobserved factors or reverse causality. This setting offers a better identification of variation in proximity than using the initiation of new airline routes, which may be endogenous to regional economic development.

Although we use a similar discontinuity setting as in Campante and Yanagizawa-Drott (2018), our study substantially extends their city-level analyses by introducing firm-level, loan facility-level, and package-level analyses of micro-data. We present a firm-level analysis of how capital flow varies when long-distance travel becomes easier. In addition, we provide direct evidence on how loan contract details and lender monitoring incentives change with air links.

Moreover, because the cost of long-distance travel may be too expensive for small borrowers to afford, participants in the market of syndicated loans are usually large firms and large financial institutions whose managers are more likely to travel abroad and work on cross-border deals. Therefore, examining the relationship between long-distance air links and syndicated loans is of more importance.

2.2. Hypotheses on the Impact of Long-distance Air Links on Syndicated Loans

Information asymmetry between borrowers and lenders leads to a high cost of external financing (Myers and Majluf (1984)). When the distance between borrowers and lenders increases, it becomes more difficult for lenders to monitor or acquire information from borrowers; therefore, these loans tend to have higher spreads (Agarwal and Hauswald (2010); Knyazeva and Knyazeva (2012)) and more restrictive covenants (Hollander and Verriest (2016)). However, the development of airline routes in distant locations may mitigate the obstacle of lender monitoring and information acquisition; this is because borrowers and lenders could have more face-to-face interactions via flights, which fosters more information disclosure. For the market of syndicated loans, if a borrower locates in a city whose position in the network of international air links is more important (i.e., with more direct flights with other major airports over the globe), this borrower may be more likely to obtain cheap syndicated loans from lenders in those connected cities. We state this inference as follows:

Hypothesis 1. *When a borrower's headquarters is located in a city with higher centrality in the global network of air links, interest spreads of its syndicated loans arranged by lead lenders in those flight-connected cities are lower.*

In the market of syndicated loans, it is usually the lead arrangers who are responsible for doing due diligence and actively monitoring borrowers. If lead arrangers hold a lower fraction of a syndicated loan, their incentive of active monitoring is likely to be lower (Sufi (2007)). Similarly, if a syndicated loan is held by a large group of lead arrangers and syndicate participants, it is more difficult for lead arrangers to do efficient monitoring. Therefore, we expect that, as the possibility of active monitoring increases with the growth of long-distance air links between borrowers and lenders, a loan syndicate tends to have a smaller size.

However, when long-distance direct flights between borrowers and lead arrangers become available, potential syndicate participants believe that lead arrangers will monitor borrowers' behaviors more efficiently and actively; they may worry less about the moral hazard problem and be likely to lend out more money. If this scenario holds, the loan syndicate may be more diversified, and the share of lead arrangers may be lower. Therefore, we obtain the following hypothesis:

Hypothesis 2. *When a borrower's headquarters is located in a city with higher centrality in the global network of air links, its syndicated loans arranged by lead lenders in those flight-connected cities have smaller but more diversified lending syndicates.*

One major consequence of the information asymmetry between borrowers and lender syndicates is the moral hazard problem: Lenders can not efficiently monitor borrowers' behaviors. To mitigate this problem, syndicated loans require either more restrictive ex-ante covenants or more ex-post monitoring from lead arrangers in the syndicate. For borrowers and lenders that are distant from each other, if direct air links are not available, efficient monitoring from lenders may not be realistic, and thus they must rely on restrictive loan covenants. In contrast, if long-distance direct flights between borrowers and lenders are introduced, lenders can have more frequent on-site visits and have active monitoring of borrowers' behaviors; in this case, the syndicated loans may have fewer covenants, or those covenants may exhibit higher flexibility. We summarize these discussions as follows:

Hypothesis 3. *When a borrower's headquarters is located in a city with higher centrality in the global network of air links, its syndicated loans arranged by lead lenders in those flight-connected cities have fewer and more flexible covenants.*

Although interest spread is the most important measure of the cost of debt, there are other costs and fees associated with syndicated loans, such as commitment fees, standby fees, and annual fees. According to Berg, Saunders, and Steffen (2016), these different types of fees account for a substantial portion of borrowing costs and should not be ignored. Following this intuition, we predict that accompanying the drop in borrowing cost, different types of fees associated with syndicated loans also decline as the growth of long-distance air links between borrowers and lenders. This prediction leads to the following hypothesis:

Hypothesis 4. *When a borrower's headquarters is located in a city with higher centrality in the global network of air links, lead arrangers in those flight-connected cities ask for lower fees associated with granted syndicated loans.*

3. Sample Description and Variables Definition

The data on syndicated loans are from Reuters Loan Pricing Corporation's (LPC) DealScan database. Based on the headquarters of borrowers and lead lenders in DealScan, we obtain information on the number of direct flights between these cities and major international airports from the International Civil Aviation Organization (ICAO). In cases where firms are headquartered in cities without an international airport, we assign them to the nearest major international city within a 50-mile distance. For instance, if a firm is headquartered in Wilmington, Delaware, we assign it to Philadelphia International Airport, which is located 20 miles away. We then merge this data with borrowers' financial information from Worldscope databases through a fuzzy name-matching algorithm following Beyhaghi et al. (2021) and WRDS.[2]

Because we are interested in the long-distant borrower-lender relationship, we keep the loan facilities that the flight distance between borrowers and lead lenders is at least 1,000 miles.[3] We exclude loan

[2]https://wrds-www.wharton.upenn.edu/pages/wrds-research/database-linking-matrix/linking-thomson-refinitiv-with-thomson-refinitiv/

[3]We clean our sample using the following criteria to make sure the borrower-lender distance truly reflects the distance between the operating entity that borrows money and the entity that provides money. First, we define a lead lender's location as

facilities with amounts less than 100 million USD and US domestic loans in which both borrowers and lenders are in the US, as the pricing of US domestic loans is less likely to be affected by direct flights according to our tests (Levine et al. (2020)).

3.1. Syndicated Loan Variables

Our analyses use not only city-level and package-level data but also facility-level data. We evaluate syndicated loans using four sets of variables. The first one is the all-in-drawn loan spread, which is defined as the loan interest rate above the London Interbank Offered Rate (LIBOR) in basis points, including fees paid to the lender group. This variable is the most commonly used measure of borrowing cost (e.g., Hollander and Verriest (2016); Houston et al. (2014); Lin et al. (2013)).

The second set of variables is related to loan types and financial covenants. We count the numbers of all types of loans, revolver loans, and bank term loans at the city level. As the financial covenants are usually defined at package level, we construct three variables related to covenants in a package (Demiroglu and James (2010)): 1) the total number of covenants; 2) financial covenant tightness, defined as the difference between the initial covenant of maximum debt to EBITDA ratio and a borrowing firm's actual debt to EBITDA ratio; 3) normalized tightness, defined as the previous variable normalized by the standard deviation of a borrowing firm's actual debt to EBITDA ratio over previous twelve quarters.

The third set of variables describes the concentration level of lenders (Sufi (2007)). For each loan facility, we count the number of lead arrangers and the number of participants. We calculate the percentage of loan shares held by all lead arrangers. We also calculate the HH Index of lenders' shares following Rhoades (1993). In addition, according to Chu, Tian, and Wang (2019) arguing that concentrated lenders may facilitate loan renegotiations that require unanimous lender consent, we count the number of loan renegotiations or amendments.

The fourth set of variables measures different fees paid to lenders. As argued by Berg, Saunders, and Steffen (2016), the majority of syndicated loans contain different fees that affect how borrowers draw down credit lines and utilize term loans. Following that paper, we consider three types of fees, including annual fee, commitment fee, and upfront fee. [4]

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its branch that signs the loan contract with a borrower. Second, we manually check the names of all borrowers in our sample; if a borrower is an offshore financial or investment shell company, we use its parent company to calculate the distance.

[4] We do not investigate the other types of fee because of the limited number of available observations.

3.2. Air-link Network Centrality

Our main independent variable of interest should describe the prevalence of air links in a borrower's headquarters with the headquarters of potential lenders. In each year t, we construct the graph G_t to represent the global flight network, with each node representing a city. Following Campante and Yanagizawa-Drott (2018), we connect city i and j if there is a weekly direct flight forth and back. We first construct a dummy to identify whether there is a weekly direct flight between city i and city j.

In addition to the direct flight measure between two cities, we also construct four centrality variables commonly used in the social and economic network literature to measure the relative importance of a city in the global air-link network (Fracassi (2017)). The four centrality variables are calculated as follows:

- *Betweenness Centrality*: the sum of the fraction of all-pairs shortest paths that pass through the city in the flight network. Specifically, the betweenness centrality of city c in year t is calculated as follows:

$$BetweennessCentrality_{c,t} = \sum_{i,j \in V} \frac{\sigma(i,j|c)}{\sigma(i,j)}$$

  where V is the set of cities in the network G_t, $\sigma(i,j)$ is the number of the shortest path between city i and j, and $\sigma(i,j|c)$ is the number of those paths passing through city c.

- *Closeness Centrality*: the inverse of the average distance between a city and every other city in the global flight network G_t, where the distance is the shortest path connecting a city and another city in the global air network. Specifically, the closeness centrality of city c in year t is calculated as follows:

$$ClosenessCentrality_{c,t} = \frac{m}{\sum_{i=0}^{m} d(m,c)}$$

  where m is the number of cities reachable from city c and $d(m,c)$ is the shortest-path distance between city m and c.

- *Degree Centrality*: the number of cities the city is connected to, divided by the total number of cities in the network. Specifically, the degree centrality of city c in year t is calculated as follows:

$$DegreeCentrality_{c,t} = \sum_{i=0, i \neq c}^{n} \frac{\mathbb{1}(c,i)}{n}$$

where $\mathbb{1}(\cdot)$ is an indicator function that equals one if city c and i are connected by weekly direct flight, and n is the number of cities in the network.

- *Eigenvector Centrality*: Eigenvector centrality for a city based on the centrality of its neighbors connected in the flight network, following the algorithm introduced by Bonacich (1987). Specifically, the eigenvector centrality of the city c in year t is calculated as the c-th element of the vector x defined by the equation:

$$EigenvectorCentrality_{c,t} = x_c, \text{ such that } Ax = \lambda x$$

where A is the adjacency matrix of the network G_t with eigenvalue λ.

Passengers in a city with high centrality are more easily to fly to another city. Furthermore, we construct weighted centrality measures that take into account passenger volume, as the significance of a direct flight should be greater when it serves a larger number of passengers. We use the passenger volume weighted centrality measures as robustness checks, addressing concerns arising from overweighting small cities.

3.3. Control Variables

Following Lin et al. (2013), we control 1) loan characteristics, including loan maturity and loan size, 2) borrower-lender relationship defined as the total loan size obtained in the past five years between the particular borrower-lender pair, 3) industry-year characteristics, including the Herfindahl-Hirschman Index (HHI) and sales growth rate, and 4) firm-year characteristics, including the natural logarithm of total assets, market-to-book ratio, profitability, leverage, cash flow volatility, and tangibility for loan-level analyses. For package-level analyses, we use averages of loan characteristics for a given package as controls. For city-level analyses, we use average loan characteristics for a given city as controls. Definitions of all variables are in Table A1. We present summary statistics of major variables in Table 1.

4. Empirical Results

4.1. The Discontinuity Setting

Our identification relies on the 6,000-mile discontinuity of air links documented by Campante and Yanagizawa-Drott (2018): Because of the regulation by the United States and European Union, cities exhibit a disproportionate likelihood of being connected by direct flights when the distance between their airports is below 6,000 miles compared to the distance above 6,000 miles, where "connected" is defined as having at least one direct flight forth and back every week. We would like to examine whether long-distance flight connections between borrowers and lead lenders affect syndicated loan contracts over the globe.

To make the identification valid, the assumption is that a city with an airport just under 6,000 miles away from other airports does not systematically differ from a city with an airport just above 6,000 miles away from other airports. In other words, for a city with an airport, the locations of other potential airports, regardless of direct connections, are randomly distributed around the 6,000-mile distance; therefore, the proportion of potential borrower-lender city pairs around the 6,000-mile distance is not determined by city-level economic or geographic conditions. Based on this assumption, for borrowers and lead lenders that are around 6,000 miles away by flight, any distinction in the syndicated loans signed by them comes from a change in the likelihood of being linked by air, rather than any other channels.

To check whether the air-link discontinuity matters for our sample of syndicated loans, Panel A of Figure 1 plots the frequency of all possible borrower-lender city pairs in the Dealscan database by distance, regardless of direct flight connections; Panel B of Figure 1 plots the frequency of city pairs by distance for borrowers and their lead lenders that initiate syndicated loans between 1989 and 2014.[5] As shown, there is no discontinuity at 6,000 miles for all potential borrower-lender city pairs included in the Dealscan database, indicating that the results are unlikely driven by the geographical distribution of potential borrowers and lenders; however, the frequency of city pairs between borrowers and lenders exhibits a sharp drop around the 6,000-mile distance, which is exactly the threshold for the discontinuity of air links. This figure provides preliminary evidence of a positive relationship between long-distance

[5]The 6,000-mile discontinuity starts disappearing after regulatory changes in 2014.

air links and the frequency of syndicated loans in connected cities.

We further examine the effect of the air-link discontinuity at 6,000 miles on syndicated loan spread. We first focus on the range of 5,500 to 6,500 miles and syndicated loans with exactly one lead lender to accurately measure the borrower-lender distance.

We exclude the loans with multiple lead lenders to eliminate the concern that the nearest lead lender is responsible for negotiating and monitoring the loan contract.

We then calculate the average loan spread with a distance falling in each bin, where the optimal bin width is determined by the mimicking variance evenly-spaced estimator by Calonico, Cattaneo, and Titiunik (2015). We plot the average loan spread and 90% confidence interval of each bin in Figure 2. Regardless of using a linear polynomial, quadratic polynomial, or cubic polynomial, when the distance between borrowers and lead lenders increases from just below to just above 6,000 miles, there is a sharp increase in the average loan spread. The confidence intervals to the right side of the 6,000-mile threshold are wider because of fewer observations. The results remain robust if we present the global RDD plots in Figure 3. We also consider a margin of 1,000 miles around the 6,000-mile cut-off as a robustness check and present the results in Figure A1. These findings are consistent with our Hypothesis 1 that long-distance air links promote information transmission, lower borrowing costs, and increase the likelihood of obtaining syndicated financing from connected cities.

Table 2 presents the regression results that are comparable with Figure 2. To be specific, we establish the following city-pair regression model:

$$Y_{kj} = \alpha + \beta \cdot \mathbf{1}(Distance_{kj} > 6,000 Miles) + g(Distance_{kj}) + \epsilon_{kj} \quad (1)$$

where Y_{kj} denotes the average loan spread of syndicated loans between borrowers at city k and lead lenders at city j. The indicator variable, $\mathbf{1}(Distance_{kj} > 6,000 Miles)$, equals one if the flight distance between city k and city j is above 6,000 miles and zero otherwise. The function $g(Distance_{kj})$ denotes higher-order polynomials of $Distance_{kj}$ to consider potential non-linearity. In columns (1) to (3), we use linear polynomials, quadratic polynomials, and cubic polynomials. Similar to He, Wang, and Zhang (2020), we consider three different kernel weighting methods, including the uniform, triangular, and Epanechnikov kernel methods, and our results are robust throughout Panels A, B, and C in Table 2. We use a margin of 1,000 miles as the robustness check and present the results in Table A2.

As shown in Panels A, B, and C in Table 2, when the borrower-lender distance measured by direct flights is above 6,000 miles, the average loan spread significantly increases. These results further confirm the RDD plots in Figure 2 and thus support our Hypothesis 2.

We also conduct placebo tests to ensure that the significant results in Panel A of Table 2 only hold for the 6,000-mile threshold. To do so, we randomly select distances between 4,500 and 7,500 miles as pseudo thresholds for the air-link discontinuity and re-estimate Equation (1) using these pseudo thresholds. We repeat the procedure 1,000 times and Figure 4 plots the distribution of pseudo coefficients corresponding to column (1) in Panel A of Table 2. As shown, the actual coefficient based on the 6,000-mile threshold lies on the right of the pseudo distribution. We obtain similar results for other columns in Panel A of Table 2. These placebo tests further imply that the significant impact on loan spread of the air-link discontinuity around 6,000 miles is not driven by coincidence.

Another concern is that syndicated loans between borrowers and lenders above 6,000 miles are different in every aspect, which results in a significantly higher loan spread. To alleviate this concern, we present a balance test of borrower characteristics for city pairs with a distance from 5,000 miles to 7,000 miles in Panel D of Table 2. Comparing city pairs below and above 6,000 miles, we do not find significant differences in borrower firm characteristics, including industry HH index, industry average sales growth, assets, profitability, leverage, market-to-book ratio, cash flow volatility, and tangibility. Therefore, the difference in loan spread documented in Table 2 is not driven by different borrowing firms' characteristics, further validating our discontinuity setting.

4.2. Effects of Long-distance Air Links on Loan Spread

4.2.1. City-year regressions

Our main analysis starts from city-year regressions of average loan spread on a city's centrality in the network of long-distance air links. We establish the following regression model:

$$Y_{c,t+1} = \alpha + \beta \cdot Centrality_{c,t} + \mathbf{X}_{c,t} + \Phi + \epsilon_{c,t} \tag{2}$$

where $Y_{c,t+1}$ is the average loan spread of all long-distant loans obtained in year $t + 1$ for borrowers with headquarters in city c. The main independent variable of interest is $Centrality_{c,t}$ that measures city c's importance in the global air-link network in year t. As described in Section 3.2, we use four centrality measures based on the global passenger air network: Closeness Centrality, Degree Centrality, Between Centrality, and Eigenvector Centrality. $\mathbf{X}_{c,t}$ denotes the control variables. We control for the 10 nearest cities' average centrality to rule out any spillover effect. We control for average loan characteristics, such as average maturity and average loan size that may also determine loan spread. Φ denotes a set of fixed effects. We include country-year and city-fixed effects to control for unobservable factors that may affect loan contracts. We cluster standard errors at the city level.

Panel A of Table 3 presents the regression results. No matter how we measure a city's centrality in the global network of air links, as the centrality level increases, the average loan spread in the city significantly declines (Columns 1 through 4). These results suggest that, when a city has more long-distance connections with other major cities over the globe, firms in this city tend to obtain cheaper syndicated loans. In terms of economic significance, a one-standard-deviation increase in the Eigenvector Centrality (Column 4), for instance, leads to a 38.29 basis points drop in average loan spread.[6]. In Table A3, we present the results using the weighted centrality which considers the number of passengers of each airline, and our results are robust.

Someone may argue that the facilitating effect on capital flows is not through more convenient transportation of *people* through direct air links; instead, this effect may be driven by the ease of transportation of *goods and products*. To test whether this argument is valid, we conduct a placebo test using cargo flights. The only difference here is that we replace $Centrality_{c,t}$ in Equation (2) with their comparable variables measured based on cargo flights and repeat our analyses in Panel A of Table 3. The data on cargo flight connections are also obtained from ICAO. [7]

Panel B of Table 3 then presents the results using cargo flights. As shown, when we measure city centrality based on cargo flight connections, none of these coefficients are statistically significant. Therefore, capital flow from lenders to borrowers is not driven by the easy transmission of products.

Overall, the above city-year regressions support our Hypothesis 1 that, when a city becomes more

[6] $38.29 = 5.40(\text{standard deviation}) * 7.09(\text{coefficient})$

[7] We cannot construct weighted cargo flight centrality due to the absence of data on the value or volume of each cargo flight.

important in the global network of long-distance air links, firms in this city face lower borrowing costs, as indicated by lower loan spread.

4.2.2. Loan facility-level regressions

Because city-year regressions do not incorporate the borrower characteristics and the determinants of loan spread from the lender side, we conduct loan-level (i.e., facility-level) regressions in this subsection as follows:

$$Y_{k,i,c,t+1} = \alpha + \beta \cdot Centrality_{c,t} + \mathbf{X}_k + \mathbf{X}_{ind,i,t} + \mathbf{X}_{i,t} + \mathbf{\Phi} + \epsilon_k \tag{3}$$

where $Y_{k,i,c,t+1}$ denotes the loan spread of a facility k for a borrower i in city c and placed in year $t+1$. The main independent variable of interest is the $Centrality_{c,t}$, which measures the importance of a borrower's city c in the global air-link network in year t. We consider four centrality measures as described in Section 3.2. The vector $\mathbf{X}_k$ includes loan characteristics (maturity, loan size, dummies of loan type, and dummies of loan purpose) and borrower-lender relationship (the total loan size obtained in the past five years between the particular borrower-lender pair); the vector $\mathbf{X}_{ind,i,t}$ includes the industry characteristics of a borrowing firm (Herfindahl-Hirschman index, and sales growth rate); the vector $\mathbf{X}_{i,t}$ includes borrowing firms' characteristics (assets, market-to-book ratio, profitability, leverage, cash flow volatility, and tangibility). The vector $\mathbf{\Phi}$ denotes fixed effects at different levels: country-year, lender-year, and borrower fixed effects of loan facility k. We do not need the lender characteristics because they are absorbed by the lender-year fixed effects. We cluster standard errors at the borrower city level.

Panel A of Table 4 presents the corresponding results. As shown, if the borrower of a loan facility locates in a city with higher centrality, regardless of the measures, the loan facility tends to have a significantly lower spread. The effect is economically meaningful, as a one-standard-deviation increase in the Eigenvector Centrality (Column 4) leads to a 77.17 basis points drop in loan spread, accounting for 40.98% of the average borrowing cost.[8] Panel B of Table 4 further shows the facility-level placebo test using cargo flights at the facility level. We do not find any significant impact of cargo-based centrality on loan spread, which is similar to Panel B of Table 3. These results further substantiate that the reduction in borrowing costs stems from the ease of transportation of people rather than goods and products.

[8] $77.17 = 7.71(\text{standard deviation}) * 10.01(\text{coefficient})$. $40.98\% = 77.17/188.32(\text{sample mean}) * 100\%$.

The negative effects of borrower cities' centrality on loan spread are robust if we replace the industry-year control with industry-year fixed effects or use the weighted centrality measures. We present the corresponding results in Table A4 and Table A5, respectively.

Our findings at the facility level are consistent with the results in Table 2 to Table 3 and provide direct evidence for our Hypothesis 1: air-links between borrowers and lead lenders reduce borrowers' borrowing cost, as measured by loan spread.

4.3. Cross-sectional Heterogeneity

In this section, we further examine any cross-sectional heterogeneity. We investigate whether the negative relationship between long-distance air links and the cost of syndicated loans is affected by *ex-ante* information transparency and credit market development.

4.3.1. Information transparency

First, we use the number of analysts that cover a borrower as a measure of information transparency. If a borrower is covered by more analysts, it suggests that the public has more information about the borrower's quality, reducing the required loan spread (Hallman, Howe, and Wang (2022)). Therefore, lenders can partially rely on analyst research to assess the risk of the covered borrowers; in this case, the facilitating effect of direct flights between them on syndicated loan contracts may be weaker. To test this prediction, we obtain the number of analysts for all borrowers in our sample from the I/B/E/S database and interact this variable $Analyst_{i,t}$ with $Centrality_{c,t}$ in Equation (3). Specifically, we run the following regression:

$$\begin{aligned} Y_{k,i,c,t+1} = \alpha + \beta \cdot Centrality_{c,t} \times Analyst_{i,t} + Centrality_{c,t} + Analyst_{i,t} \\ + \mathbf{X}_k + \mathbf{X}_{ind,i,t} + \mathbf{X}_{i,t} + \mathbf{\Phi} + \epsilon_k \end{aligned} \tag{4}$$

Panel A of Table 5 then shows the corresponding results. Consistent with our prediction, the coefficient on the interaction term between the number of analysts and a measure of $Centrality_{c,t}$ is significantly positive, which is different from the negative baseline coefficient on a measure of $Centrality_{c,t}$. These results imply that the lowering effect of long-distance direct flights on borrowing costs is weaker if borrowers exhibit higher ex-ante transparency.

Second, we obtain the foreign revenue of the borrowing firm from the FactSet Revere database. As documented by Houston, Itzkowitz, and Naranjo (2017), foreign assets alleviate information barriers for distant lenders and help firms obtain better loan contracts. We consequently predict that the presence of foreign assets enhances information acquisition for foreign lenders and weakens the impact of direct flights between borrowers and lenders. To test our hypothesis, we interact foreign sales $ForeignSales_{i,t}$ with $Centrality_{c,t}$ in Equation (3) and conduct the subsequent analysis as follows:

$$\begin{aligned} Y_{k,i,c,t+1} = \alpha + \beta \cdot Centrality_{c,t} \times ForeignSales_{i,t} + Centrality_{c,t} + ForeignSales_{i,t} \\ + \mathbf{X}_k + \mathbf{X}_{ind,i,t} + \mathbf{X}_{i,t} + \mathbf{\Phi} + \epsilon_k \end{aligned} \tag{5}$$

Panel B of Table 5 presents the results by interacting foreign sales with centrality measures. The coefficient on the interaction term is significantly positive, which is consistent with our prediction. These findings indicate that firm foreign assets enhance the collection of soft information, reducing benefits from long-distance direct flights.

4.3.2. Credit market development

As foreign banks from developed markets usually operate more efficiently than domestic banks in developing markets, foreign lenders may have incentives to enter small or less developed markets due to their technological advantages over domestic lenders in those markets (Bonin, Hasan, and Wachtel (2005)). Claessens, Demirgüç-Kunt, and Huizinga (2001) document that the presence of foreign banks reduces the profit margin for domestic banks and the effects are driven by the entry of foreign banks rather than substantial market share gains. Based on this logic, we anticipate that borrowing firms in developing markets experience more benefits if they have increased direct flights connecting them to lenders in developed markets. Following Rajan and Zingales (1998), we employ the ratio of domestic credit provided by the banking sector over GDP as the proxy for local credit market development. We define technological advantage $TechAdvantage_{i,j,t}$ as the difference between lender j and borrower i's local credit market development in year t. A higher value of this variable implies that borrowers obtain loan contracts from lenders in relatively developed markets. We interact technological advantage

$TechAdvantage_{i,j,t}$ with $Centrality_{c,t}$ in Equation (3) and estimate the following model:

$$Y_{k,i,c,t+1} = \alpha + \beta \cdot Centrality_{c,t} \times TechAdvantage_{i,j,t} + Centrality_{c,t} + TechAdvantage_{i,j,t} + \mathbf{X}_k + \mathbf{X}_{ind,i,t} + \mathbf{X}_{i,t} + \mathbf{\Phi} + \epsilon_k \tag{6}$$

Table 6 presents the results of the above model. The coefficient on the interaction terms is significantly negative, amplifying the impact of air network centrality. These findings reveal that direct flights effectively decrease the costs associated with search and demand for borrowing firms operating in developing markets, allowing them to have easier access to potential lenders in developed markets that more efficiently access the risk and charge for fewer loan spreads.

4.4. Effects of Long-distance Air Links on Other Loan Characteristics

4.4.1. Number of loans

According to Hypothesis 1, if a city has higher centrality in the network of air links, information asymmetry between borrowers in this city and lenders from a long distance tends to be lower. This lower information asymmetry tends to reduce the cost of borrowing (i.e., interest spreads), which motivates borrowers to borrow more frequently; the ease of travel may also attract more lenders, which then motivates lenders to lend out more frequently. Both aspects tend to result in more loans signed in a city with higher air-link centrality.

In this subsection, we test whether this prediction holds using city-level regressions. We replace the dependent variable in Equation (2) with one of the following: 1) the total number of loans obtained by all borrowers in city c in year t; 2) the number of revolver loans obtained by all borrowers in city c in year t; 3) the number of bank term loans obtained by all borrowers in city c in year t. All other settings are identical to those in equation (2). We present the results for our four major centrality measures in Panel A of Table 7. We conduct placebo tests using cargo flights and present the results in Panel B of Table 7.

Panel A of Table 7 shows that the total number of loans and the numbers of different types of loans all significantly rise as a city has higher air-link centrality. These results are consistent with our prediction and hence provide further support for Hypothesis 1. In contrast, placebo tests in Panel B of Table 7 show that the numbers of loans or different types of loans do not change significantly if we measure air-link centrality using cargo flights. These results imply that the effect of air links on syndicated loans is not through the ease of product transportation. We obtain similar results if we use the weighted centrality measures as the independent variables in Table A6.

4.4.2. Lending syndicate composition

To test Hypothesis 2, we conduct loan facility-level regressions and replace the dependent variable in Equation (3) with one of following variables: 1) the number of amendments for a facility k; 2) the number of lead arrangers in facility k; 3) the number of non-lead participating lenders in facility k; 4) the share allocated to lead lenders in facility k; 5) share allocation HH Index for facility k. The intuition is as follows. If there are more direct air links in a borrower's city, the borrower can more easily find a lead lender from connected cities so that they do not need to approach many lead lenders. A smaller size of lead lenders makes them more efficient to monitor syndicated loans because lead lenders can spend less time coordinating with each other. With more efficient monitoring, the need to amend loan contracts ex-post tends to be lower. Moreover, participants may anticipate lower moral hazard problem and are likely to lend out more money, which may reduce both the share of lead lenders in a syndicate and the share allocation HH Index; in this case, lead lenders may also have no need to approach many participants.

Table 8 presents the corresponding results. The results are generally consistent with the above prediction. Loan facilities in cities with high centrality receive significantly fewer amendments, lead lenders, and participants. Lender shares are more diversified with significantly fewer leader shares and share allocation HH index. These findings imply a higher willingness of participants to lend out money and, hence a more diversified lending syndicate. The negative effects hold if we use the weighted centrality measures, and we present the corresponding results in Table A7. These results then support our Hypothesis 2.

4.4.3. Direct flight

In this subsection, we test the effect of direct flight between borrowers and lead lenders. We replace the independent variable in Equation (3) with the direct flight dummy. To ensure that we accurately determine which lead lender is responsible for negotiating and monitoring the loan contract, we only analyze loan facilities with precisely one lead arranger. The dependent variables in this analysis are the loan spread, number of amendments, and number of participants.

The corresponding results presented in Table 9 align with our previous analysis. We observe that borrowers with weekly direct flights to lead lenders tend to receive contracts with fewer spreads, amendments, and participants. These results support our Hypothesis 1 and Hypothesis 2.

4.4.4. Loan fees

In this subsection, we use loan facility-level regressions to test Hypothesis 4 about loan fees. We replace the dependent variable in Equation (3) with one of the following variables: 1) annual fee of facility k, defined as the fee paid on the unused amount of loan commitments; 2) commitment fee of facility k, defined as the fee paid on the entire committed amount regardless of usage; 3) upfront fee of facility k, defined as the fee paid to a lender to compensate the syndicate. Following the prediction of Hypothesis 4, we expect that all these fees become lower as a borrower's city has higher centrality in the global network of air links.

Table 10 presents the corresponding results. If a borrower's city has higher air-link centrality, different fees for this borrower significantly drop. We present the results using the weighted centrality measures in Table A8. All these results support our Hypothesis 4.

4.4.5. Loan covenants

We test Hypothesis 3 about loan covenant flexibility using package-level regressions similar to Equation (3). The reason for using package-level regressions is that covenants data are only available at the package level. We aggregate loan characteristics by package and estimate the following package-level model:

$$Y_{p,i,c,t+1} = \alpha + \beta \cdot Centrality_{c,t} + +\mathbf{X}_p + \mathbf{X}_{ind,i,t} + \mathbf{X}_{i,t} + \mathbf{\Phi} + \epsilon_p \quad (7)$$

where $Y_{p,i,c,t+1}$ is one of the loan package covenant measures as defined in Section 3.1: 1) the number of financial covenants in each package j; 2) financial tightness of package j; and 3) normalized tightness of package j. For tightness measures, a higher value of them implies a more flexible covenant. $\mathbf{X}_p$ is the package-level control, including average maturity, average loan size, and average loan size obtained from the lead arranger in the past five years. We cannot add the lender-by-year fixed effects because a package may have multiple loan facilities with different lead arrangers. All other settings are the same as in Equation (3). We cluster the standard error at the city level.

We present the corresponding results in Table 11. As shown in Panel A of Table 11, the number of covenants significantly declines with the air-link centrality of a borrower's city. Combing this result with more loans shows that air-link centrality actually results in more flexible loan packages. We further confirm higher covenant flexibility using two tightness indices. We find that if a borrower locates in a city with higher air-link centrality, the values of the financial tightness index and normalized tightness index are both significantly higher, implying that the covenant threshold of maximum debt/EBITDA ratio is further above a borrower's actual debt/EBITDA ratio; in other words, financial covenants become more relaxed or flexible. We present the results using the weighted centrality in Table A9 and our findings are robust.

Therefore, all results in Table 11 and Table A9 support our Hypothesis 3: Higher air-link centrality mitigates the moral hazard problem; the need of using a restrictive loan contract should be lower.

All results in Section 4.4 show that a city with higher centrality may attract more financing, measured by the number of different loans. When a borrower locates in a city with higher centrality the borrower faces lower borrowing costs, including lower interest spread and different fees; its loan covenants become more relaxed; and the lending syndicate becomes smaller and more diversified. Together with all these findings, long-distance direct flights facilitate capital flows in the global syndicated loan market by reducing information symmetry and mitigating the moral hazard problem.

5. Conclusion

This paper examines how long-distance air links over the globe affect syndicated loan contracts. In general, we find that air links facilitate financing through syndicated loans, no matter at the loan facility or city level. Specifically, when a city has higher centrality in the global network of air links, borrowers in this city are likely to obtain more syndicated loans with lower interest spreads. Similarly, when there are direct flights between borrowers and lead lenders, the loan spread tends to be lower. Therefore, air links shorten the geographic distance between borrowers and lenders and hence reduce information asymmetry as well as borrowing costs.

Moreover, when a syndicated loan is for a borrower in a city with higher air-link centrality, it tends to have fewer lead lenders, a more diversified lending composition, fewer loan amendments, more flexible loan covenants, and lower fees. These results imply that air links facilitate efficient negotiations between borrowers and lead lenders, which then attract participants to contribute more capital and result in a more flexible loan structure.

To identify a causal relationship, we employ a regression discontinuity (RD) approach based on the discontinuity of long-distance air links around 6,000 miles because of substantially higher operating costs beyond this distance (Campante and Yanagizawa-Drott (2018)). We find that when the distances between borrowers and lenders are above 6,000 miles, the loan spread is significantly higher.

In addition, we conduct a set of robustness checks and cross-sectional analyses. We conduct placebo tests to show that the impact of the 6,000-mile discontinuity on loan spread is not by chance. We analyze cargo flights to show that the effect of air links on syndicated loans is through easy transportation of people rather than products. Our cross-sectional analyses show that the negative effect of air-link centrality on syndicated loan spread is weaker with higher information transparency and lower technological advantage.

Overall, our study shows distance matters for syndicated loans when borrowers and lenders can be very far away from each other or even from different countries. Direct long-distance air links could shorten the geographic distance and lead to more favorable loan contracts for borrowers. Therefore, the development of transportation not only fosters trade, innovation, firm investment, and ownership structure but also facilitates the flow of capital through syndicated loans.

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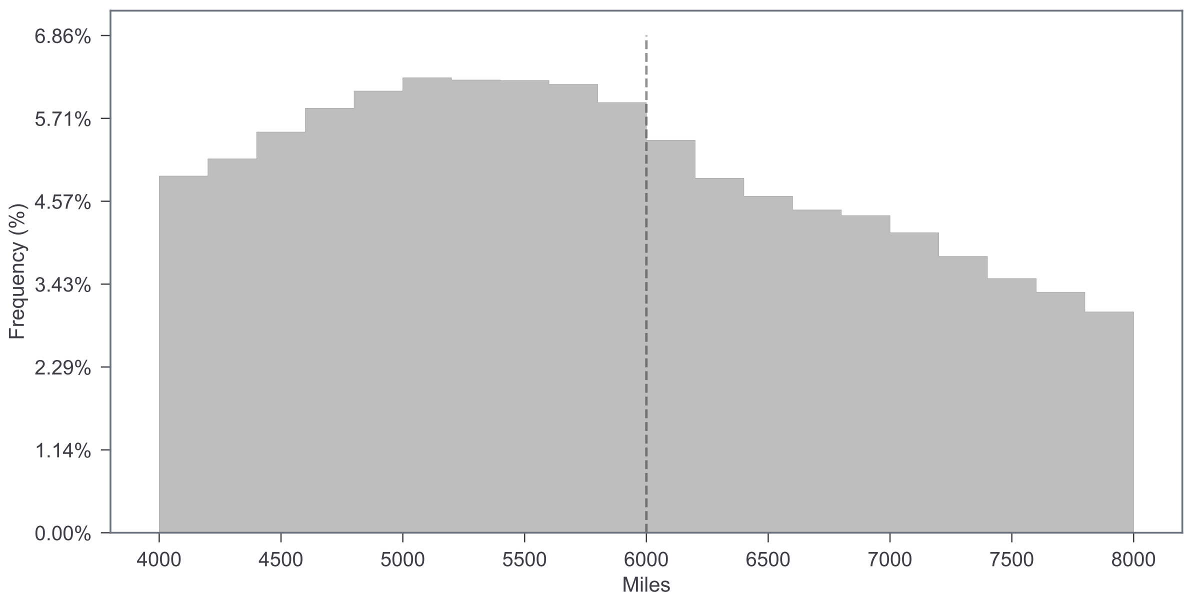
Tables and Figures

Figure 1. City Pairs Histogram

This figure plots the distribution of borrower-lender city pairs across flight distances from 4,000 to 8,000 miles with 20 equally spaced bins. Panel A displays all potential combinations of borrower and lender cities obtained from the Dealscan database. Panel B plots the borrower-lender city pairs with at least one syndicated loan deal from 1989 to 2014.

Panel A. All Possible City Pairs



Panel B. City Pairs with Syndicated Loan (1989 - 2014)

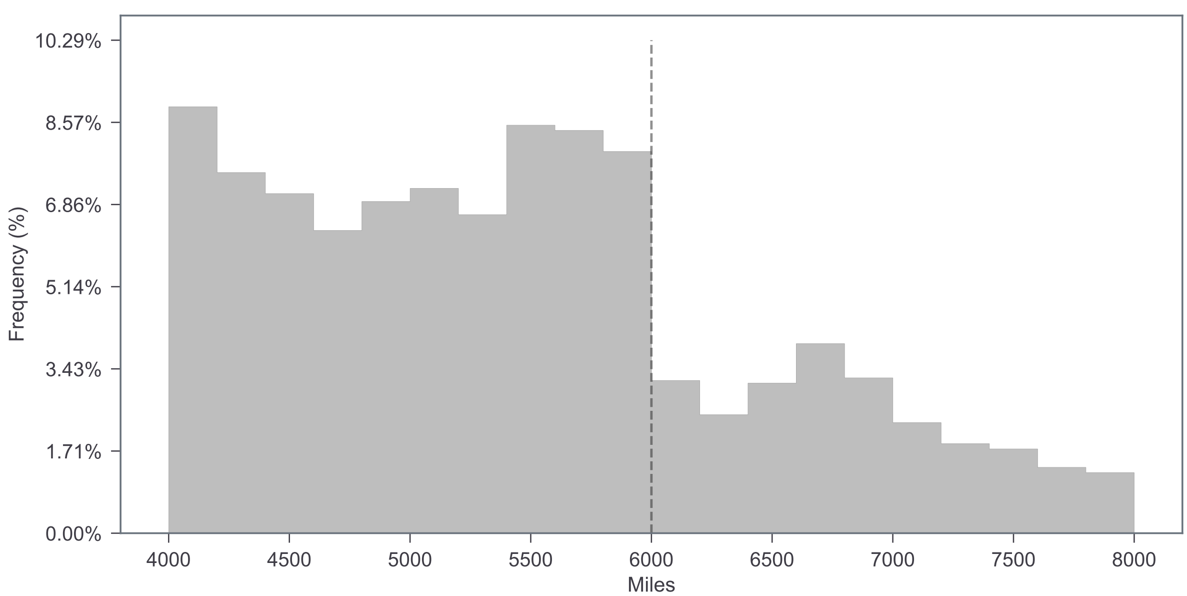
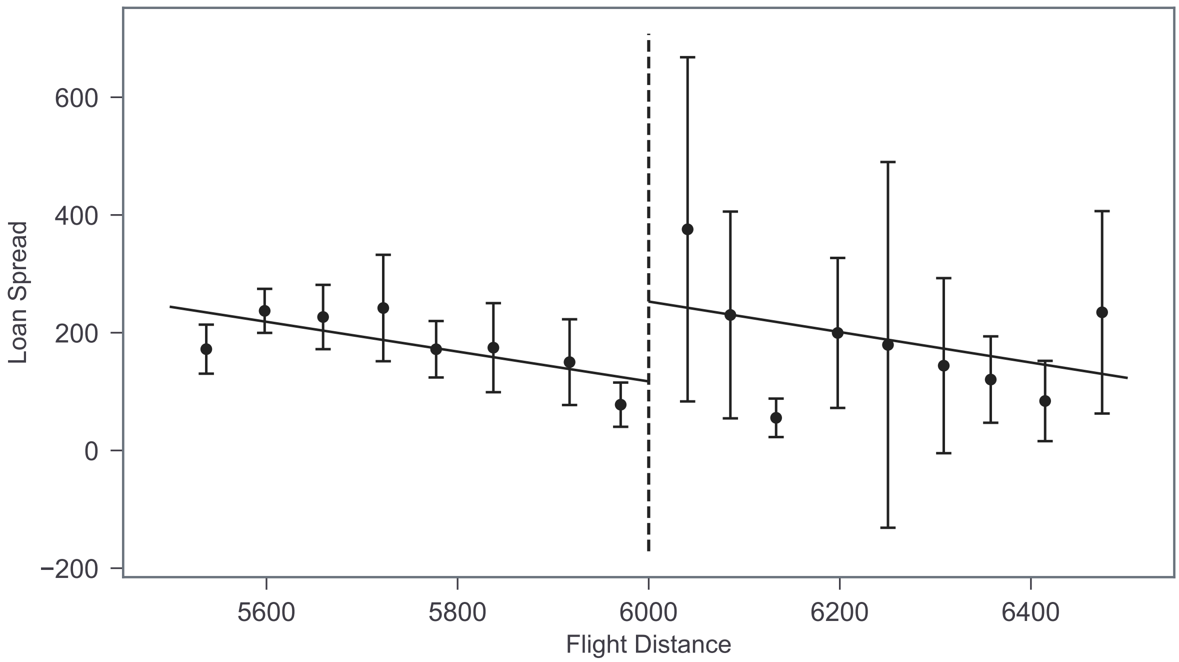
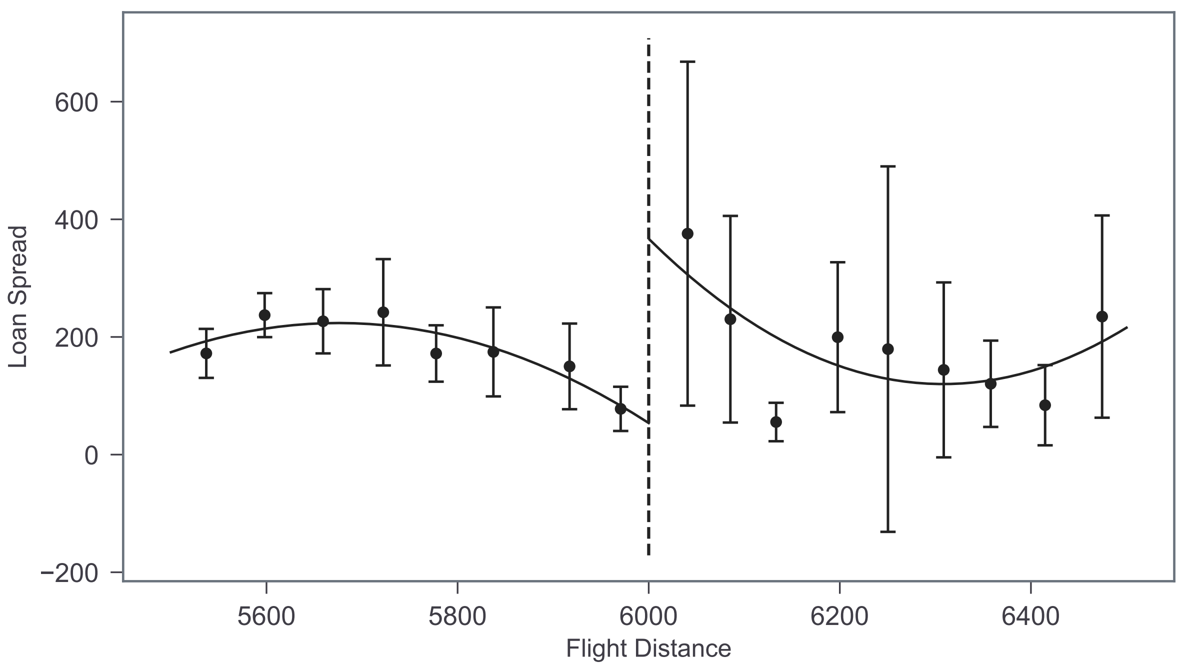
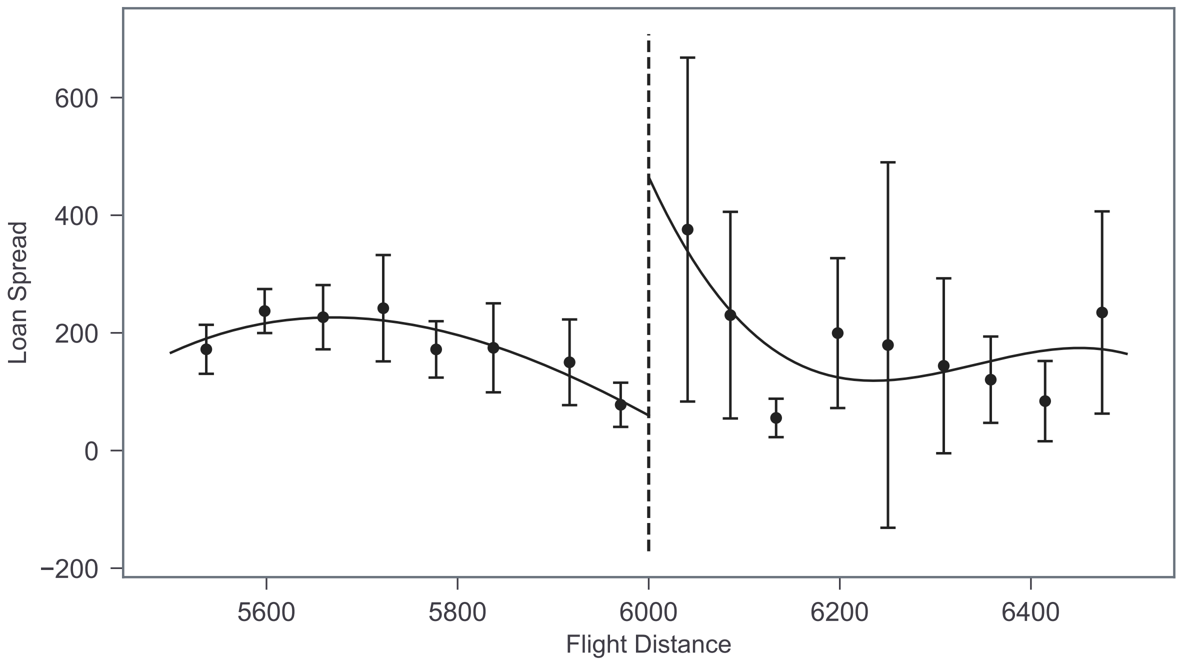


Figure 2. Regression Discontinuity Design

This figure plots the fitted linear, quadratic, and cubic estimates with 90% confidence intervals within a bin of distance. The x-axis is the flight distance between the borrower and lead arranger cities, and the y-axis is the spread of loan facilities in basis points. The optimal bin width is determined by the mimicking variance evenly-spaced estimator proposed by Calonico, Cattaneo, and Titiunik (2015). Each dot on the plot represents the average loan spread within equally spaced bins, with a margin of 500 miles around the 6,000-mile cut-off.



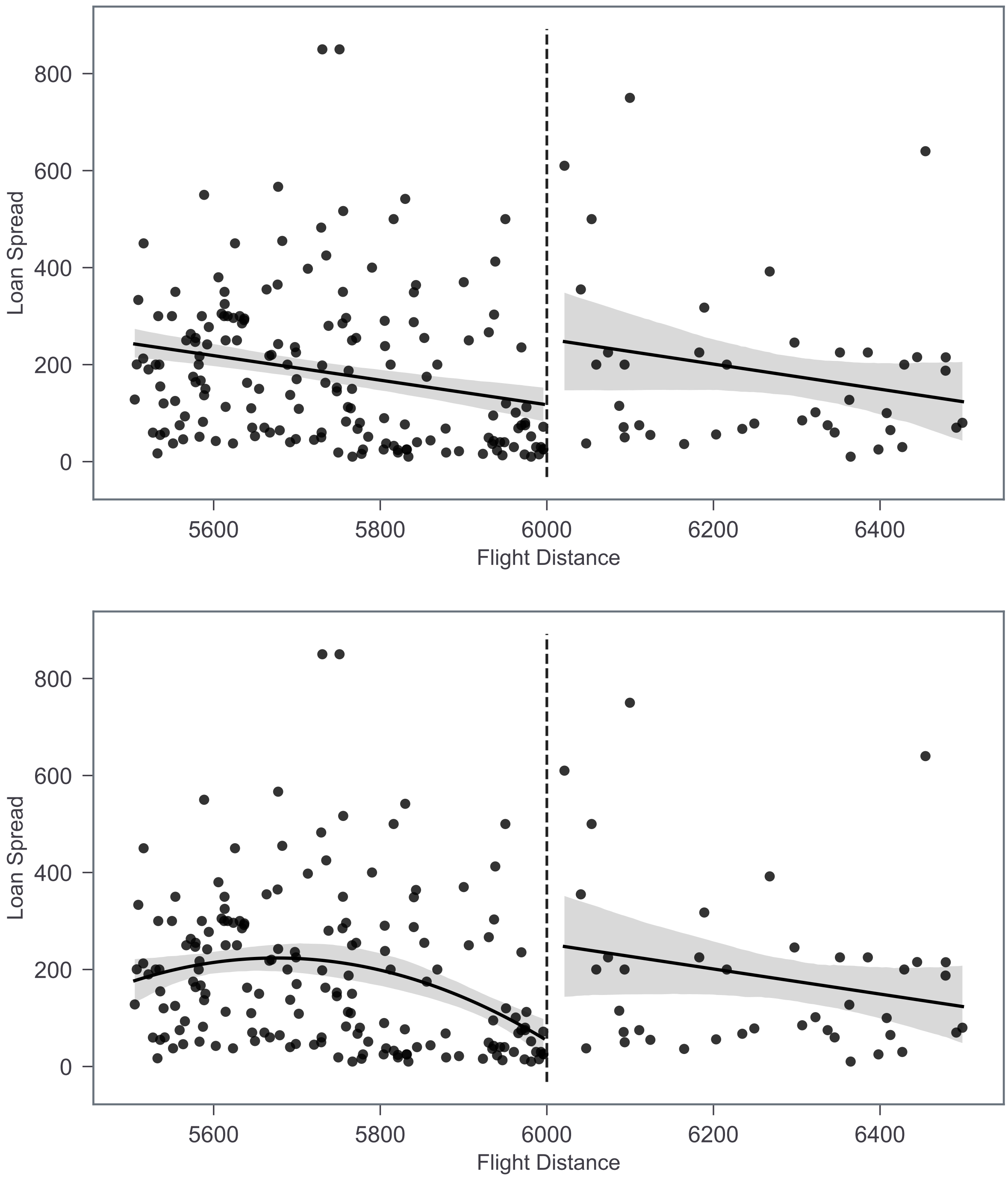


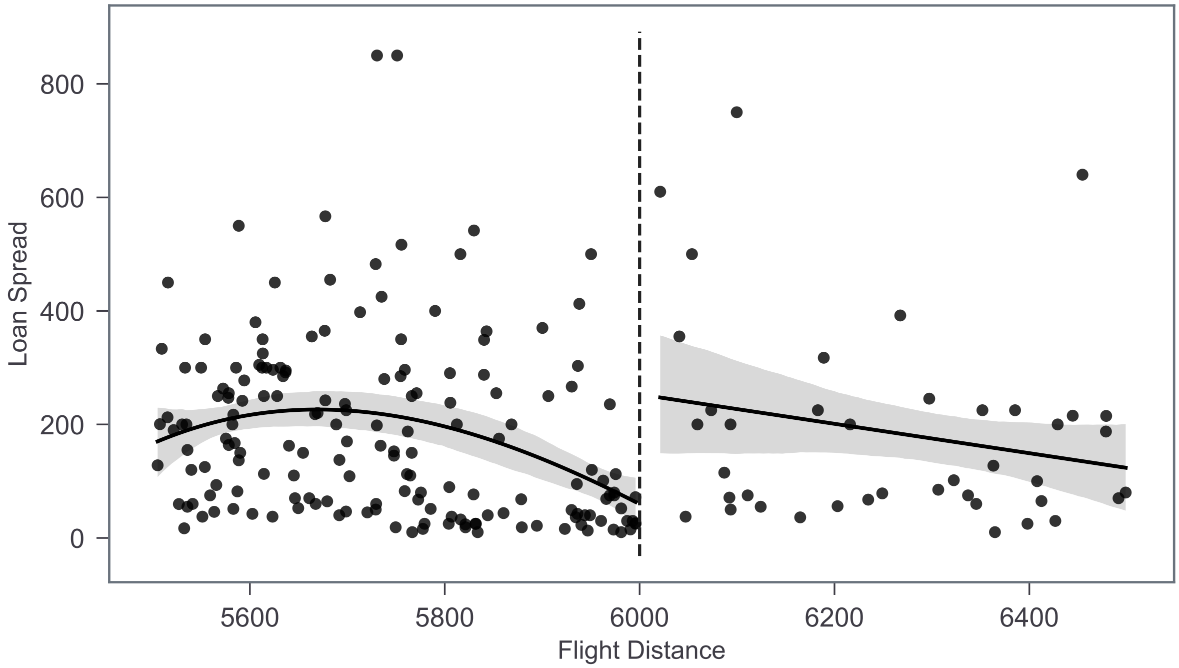


600
400
200
0
−200
Loan Spread
5600
5800
6000
6200
6400
Flight Distance

Figure 3. Regression Discontinuity Design - Global

This figure plots the fitted linear, quadratic, and cubic estimates with 90% confidence intervals around the fitted value. The x-axis is the flight distance between borrower and lender cities, and the y-axis is the spread of loan facilities in basis points. The dots depict the average loan spread of each borrower-lender city pair with a margin of 500 miles around the 6,000 miles cut-off.





800
600
400
200
0
Loan Spread
5600
5800
6000
6200
6400
Flight Distance

Figure 4. Regression Discontinuity Design - Placebo Test

This figure plots the histogram (and kernel approximation) for regression discontinuity estimates using pseudo cut-off randomly selected between 4,500 miles and 7,500 miles for 1,000 times. Specifications use linear polynomial, optimal bandwidth, uniform kernel, and a margin of 500 miles. The optimal bandwidth is determined by the mean square error (MSE) optimal bandwidth selector. The dashed curve is the kernel density estimate, and the vertical line depicts the estimate using the 6000-mile as the cut-off.

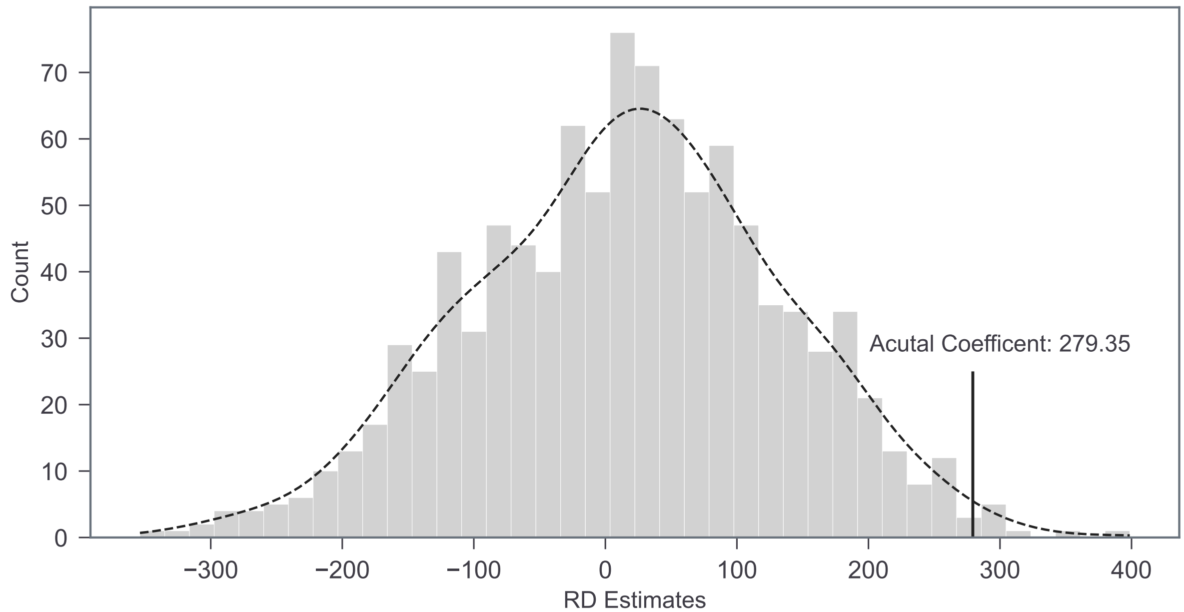


Table 1. Summary Statistics

Variable	**Obs**	**Mean**	**Std**	**25%**	**Median**	**75%**
			Panel A. City-Level			
Dependent Variable						
Average LoanSpread	2,516	203.58	139.73	88.09	195.21	287.19
Number of Loans	2,516	8.25	13.80	1.00	3.00	9.00
Number of Revolver Loans	2,516	3.36	6.92	0.00	1.00	3.00
Number of Bank Term Loans	2,516	0.44	1.31	0.00	0.00	0.00
Independent Variable						
Betweenness Centrality	2,516	10.94	27.54	0.02	1.22	9.25
Closeness Centrality	2,516	3.71	0.59	3.35	3.73	4.10
Degree Centrality	2,516	3.59	4.42	0.66	2.08	4.85
Eigenvector Centrality	2,516	5.12	5.40	1.16	3.16	7.53
Betweenness Centrality (Weighted)	2,516	11.02	37.28	0.00	0.02	6.29
Closeness Centrality (Weighted)	2,516	4.06	0.71	3.64	4.09	4.52
Degree Centrality (Weighted)	2,516	22.24	28.18	3.80	12.23	29.64
Eigenvector Centrality (Weighted)	2,516	5.12	5.56	1.05	3.01	7.57
Betweenness Centrality (Cargo)	1,651	8.18	17.35	0.01	0.76	8.58
Closeness Centrality (Cargo)	1,651	3.99	0.56	3.65	4.00	4.40
Degree Centrality (Cargo)	1,651	4.53	4.89	0.97	2.95	6.53
Eigenvector Centrality (Cargo)	1,651	5.46	4.91	1.39	4.06	8.13
10 Nearest Cities' Average Centrality						
Betweenness Centrality	2,516	4.54	12.36	0.01	0.30	2.90
Closeness Centrality	2,516	3.34	0.49	3.09	3.36	3.60
Degree Centrality	2,516	1.67	2.19	0.40	0.93	2.05
Eigenvector Centrality	2,516	2.43	2.79	0.62	1.63	3.01
Betweenness Centrality (Weighted)	2,516	5.26	17.27	0.00	0.00	1.71
Closeness Centrality (Weighted)	2,516	3.59	0.58	3.28	3.61	3.89
Degree Centrality (Weighted)	2,516	10.43	14.47	2.10	5.40	12.97
Eigenvector Centrality (Weighted)	2,516	2.38	2.88	0.57	1.51	2.90
Control Variable						
Average LoanSize	2,516	19.16	1.30	18.42	19.18	19.95
Average Maturity	2,516	52.54	28.04	36.00	50.77	60.81

Panel B. Facility-Level

Dependent Variable						
LoanSpread	4,955	188.32	155.34	75.00	150.00	255.00
NumAmendment	4,955	0.08	0.67	0.00	0.00	0.00
NumLeaders	4,955	5.51	6.82	1.00	3.00	6.00

Continued on next page

Table 1. Summary Statistics - Continued

NumParticipants	4,955	6.11	8.09	0.00	3.00	8.00
LeaderShare	1,688	0.70	0.34	0.36	0.87	1.00
ShareHHI	1,688	0.46	0.42	0.09	0.22	1.00
AnnualFee	377	18.81	16.47	9.00	12.50	22.00
CommitmentFee	1,432	39.42	40.28	15.75	30.00	50.00
UpfrontFee	1,567	71.39	94.46	20.00	50.00	100.00
Independent Variable						
Betweenness Centrality	4,955	37.87	63.53	2.09	10.89	39.73
Closeness Centrality	4,955	4.19	0.63	3.79	4.16	4.54
Degree Centrality	4,955	7.72	7.83	2.44	4.66	10.52
Eigenvector Centrality	4,955	8.88	7.71	3.24	6.48	12.97
Betweenness Centrality (Weighted)	4,955	50.58	105.86	0.05	6.58	47.96
Closeness Centrality (Weighted)	4,955	4.66	0.73	4.21	4.64	5.09
Degree Centrality (Weighted)	4,955	60.12	66.38	16.01	34.13	73.15
Eigenvector Centrality (Weighted)	4,955	9.20	8.20	3.23	6.58	13.30
Betweenness Centrality (Cargo)	4,521	34.94	60.35	1.12	7.44	33.48
Closeness Centrality (Cargo)	4,521	4.46	0.66	4.04	4.41	4.84
Degree Centrality (Cargo)	4,521	10.05	10.17	3.02	5.71	14.56
Eigenvector Centrality (Cargo)	4,521	9.79	7.40	4.07	7.41	15.15
Analyst Number	3,542	3.58	1.11	2.94	3.81	4.37
TechAdvantage	3,737	0.20	0.62	-0.25	0.27	0.67
Foreign Sales	2,075	47.76	34.72	16.13	39.53	80.39
Control Variable						
LoanSize	4,955	19.27	1.65	18.42	19.43	20.40
Maturity	4,955	47.24	26.29	24.00	50.00	60.00
LoanSizePast5Y	4,955	10.65	10.44	0.00	17.44	20.88
SalesHHI	4,955	0.04	0.04	0.02	0.03	0.05
SalesGrowth	4,955	11.18	11.40	5.18	9.50	16.61
Assets	4,955	22.16	1.98	20.77	22.18	23.57
Profitability	4,955	0.10	0.10	0.04	0.10	0.15
Leverage	4,955	0.33	0.20	0.20	0.30	0.45
MarketBookRatio	4,955	2.40	4.15	1.09	1.81	2.97
CashFlowVolatility	4,955	0.04	0.03	0.01	0.02	0.04
Tangibility	4,955	0.35	0.29	0.07	0.29	0.59

Panel C. Package-Level

Dependent Variable						
Number of Covenants	381	2.08	0.75	2.00	2.00	2.00
Initial Covenant	381	4.14	1.54	3.25	3.75	4.75

Continued on next page

Table 1. Summary Statistics - Continued

Tightness	381	3.72	8.51	0.05	1.11	4.14
Independent Variable						
Betweenness Centrality	441	32.75	54.88	1.12	12.94	44.20
Closeness Centrality	441	4.13	0.61	3.73	4.15	4.41
Degree Centrality	441	7.07	7.19	2.00	5.36	9.94
Eigenvector Centrality	441	7.66	6.99	2.32	5.62	10.76
Betweenness Centrality (Weighted)	441	44.49	94.01	0.01	7.35	53.85
Closeness Centrality (Weighted)	441	4.60	0.73	4.16	4.65	4.98
Degree Centrality (Weighted)	441	57.75	68.21	15.00	37.28	65.89
Eigenvector Centrality (Weighted)	441	7.94	7.45	2.36	5.64	10.59
Control Variable						
Average LoanSize	441	19.46	1.34	18.62	19.52	20.25
Average Maturity	441	52.33	18.08	36.00	60.00	60.00
Average LoanSizePast5Y	441	12.51	10.11	0.00	19.21	21.09
SalesHHI	441	0.05	0.06	0.02	0.04	0.06
SalesGrowth	441	10.52	10.56	4.47	8.79	14.95
Assets	441	21.46	1.59	20.41	21.37	22.43
Profitability	441	0.12	0.10	0.08	0.12	0.16
Leverage	441	0.36	0.21	0.22	0.34	0.49
MarketBookRatio	441	2.91	5.24	1.26	2.22	3.88
CashFlowVolatility	441	0.04	0.04	0.02	0.03	0.05
Tangibility	441	0.37	0.28	0.13	0.33	0.60

Table 2. Loan Spread – Regression Discontinuity Design

This table presents the RD regression results on the relationship between loan spread and distance between borrower and lender. The Definitions of all variables are in the Table A1. The optimal bandwidth is determined by the mean square error (MSE) optimal bandwidth selector with a 500-mile margin around the 6,000-mile cut-off. Panel A, B, and C present the results using the Uniform, Triangular, and Epanech kernel methods, respectively. Panel D presents the result of the balance test. Standard errors are clustered by borrowers' city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Panel A. Uniform Kernel

	(1)	(2)	(3)
		Loan Spread	
Flight Distance > 6,000 Miles	279.35**	562.87***	614.91***
	(2.29)	(3.17)	(3.31)
Polynomial	1	2	3
Cluster by Borrower City	Yes	Yes	Yes
Borrower Lender City-Pairs	210	210	210

Panel B. Triangular Kernel

	(1)	(2)	(3)
		Loan Spread	
Flight Distance > 6,000 Miles	583.73***	666.94***	888.92***
	(4.11)	(3.73)	(5.07)
Polynomial	1	2	3
Cluster by Borrower City	Yes	Yes	Yes
Borrower Lender City-Pairs	210	210	210

Panel C. Epanech Kernel

	(1)	(2)	(3)
		Loan Spread	
Flight Distance > 6,000 Miles	594.20***	639.62***	764.50***
	(4.38)	(3.25)	(4.12)
Polynomial	1	2	3
Cluster by Borrower City	Yes	Yes	Yes
Borrower Lender City-Pairs	210	210	210

Panel D. Balance Test

	Flight Distance < 6,000 Miles Observations = 377		Flight Distance > 6,000 Miles Observations = 112			
Firm Characteristic	Mean	Std	Mean	Std	Diff	T-stat
HHI (Industry)	0.04	0.04	0.05	0.05	-0.01	-1.25
SaleGrowth (Industry)	11.36	12.81	12.18	10.37	-0.82	-0.69
Assets	21.86	1.82	22.09	1.64	-0.23	-1.25
Profitability	0.11	0.07	0.11	0.07	-0.00	-0.60
Leverage	0.28	0.16	0.30	0.16	-0.02	-1.05
MarketBookRatio	2.11	1.39	2.08	1.29	0.03	0.25
CashFlowVolatility	0.03	0.03	0.04	0.03	-0.00	-0.93
Tangibility	0.34	0.27	0.38	0.27	-0.03	-1.07

Table 3. Loan Spread - City-level Analysis

This table presents the OLS regression results on the relationship between loan spread and global air network centrality. The dependent variable is the *Average Loan Spread* in the next year ($t+1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality*. City-year controls, including the *10 Nearest Cities' Centrality*, *Average Maturity* and *Average Loan Size*; country × year fixed effects; and city fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Panel A presents the results using the passenger air network. Panel B presents the results using the cargo air network. Standard errors are clustered by city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Panel A. Flight Centrality

	(1)	(2)	(3)	(4)
	Average Loan Spread			
Betweenness Centrality	-0.69**			
	(-2.41)			
Closeness Centrality		-36.33*		
		(-1.87)		
Degree Centrality			-8.18***	
			(-3.07)	
Eigenvector Centrality				-7.09**
				(-2.22)
10 Nearest Cities' Centrality	-0.45	3.23	-2.76	-2.49
	(-0.72)	(0.29)	(-0.99)	(-1.16)
Average Maturity	0.42*	0.41*	0.40	0.41*
	(1.70)	(1.67)	(1.61)	(1.67)
Average LoanSize	-29.92***	-29.72***	-30.00***	-29.90***
	(-5.96)	(-5.91)	(-6.03)	(-5.98)
Constant	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	2,516	2,516	2,516	2,516
R-squared	0.82	0.82	0.82	0.82

Panel B. Cargo Centrality

	(1)	(2)	(3)	(4)
	Average Loan Spread			
Betweenness Centrality (Cargo)	-0.18			
	(-0.25)			
Closeness Centrality (Cargo)		-4.19		
		(-0.18)		
Degree Centrality (Cargo)			-2.09	
			(-0.79)	
Eigenvector Centrality (Cargo)				-3.32
				(-0.86)
Average Maturity	0.25	0.25	0.24	0.23
	(0.47)	(0.47)	(0.44)	(0.44)
Average LoanSize	-27.38***	-27.34***	-27.41***	-27.47***
	(-3.38)	(-3.37)	(-3.39)	(-3.40)
Constant	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	1,651	1,651	1,651	1,651
R-squared	0.85	0.85	0.85	0.85

Table 4. Loan Spread - Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan spread and global air network centrality. The dependent variable is the *Loan Spread* in the next year ($t+1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Panel A presents the results using the passenger air network. Panel B presents the results using the cargo air network. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Panel A. Flight Centrality

	(1)	(2)	(3)	(4)
	Loan Spread			
Betweenness Centrality	-1.36***			
	(-2.95)			
Closeness Centrality		-86.81**		
		(-2.41)		
Degree Centrality			-18.18***	
			(-3.03)	
Eigenvector Centrality				-10.01***
				(-2.84)
Constant	Yes	Yes	Yes	Yes
Facility Control	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	4,955	4,955	4,955	4,955
R-squared	0.93	0.93	0.93	0.93

Panel B. Cargo Centrality

	(1)	(2)	(3)	(4)
		Loan Spread		
Betweenness Centrality (Cargo)	-0.56			
	(-0.73)			
Closeness Centrality (Cargo)		32.92		
		(0.47)		
Degree Centrality (Cargo)			6.73	
			(0.70)	
Eigenvector Centrality (Cargo)				6.85
				(0.72)
Constant	Yes	Yes	Yes	Yes
Facility Control	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	4,521	4,521	4,521	4,521
R-squared	0.93	0.93	0.93	0.93

Table 5. Loan Spread Cross-sectional Test: Information Transparency – Loan Facility-level Analysis

This table presents the OLS regression results to test the information transparency mechanism. The dependent variable is the *Loan Spread* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality* and their interactions with *Analyst Number*, *Earnings Management* and *Foreign Sales*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Panel A, B, and C present the results of *Analyst Number*, *Earnings Management*, and *Foreign Sales*, respectively. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Panel A. Analyst Following

	(1)	(2)	(3)	(4)
		Loan Spread		
Betweenness Centrality × Analysts Number	0.36***			
	(2.74)			
Closeness Centrality × Analysts Number		32.32***		
		(3.44)		
Degree Centrality × Analysts Number			2.98***	
			(3.57)	
Eigenvector Centrality × Analysts Number				1.98***
				(3.06)
Centrality	-3.06***	-211.36***	-29.84***	-14.39***
	(-4.42)	(-4.79)	(-4.46)	(-3.20)
Analysts Number	-40.66***	-158.68***	-51.01***	-43.27***
	(-3.30)	(-4.57)	(-3.82)	(-3.65)
Facility Control	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	3,542	3,542	3,542	3,542
R-squared	0.94	0.94	0.94	0.94

Panel B. Foreign Sales

	(1)	(2)	(3)	(4)
	Loan Spread			
Betweenness Centrality × Foreign Sales	0.02***			
	(3.65)			
Closeness Centrality × Foreign Sales		2.40***		
		(3.10)		
Degree Centrality × Foreign Sales			0.14***	
			(4.14)	
Eigenvector Centrality × Foreign Sales				0.14***
				(3.13)
Centrality	-1.84***	-237.81***	-22.61***	-14.44**
	(-2.86)	(-2.93)	(-2.70)	(-2.48)
Foreign Sales	-1.94***	-11.64***	-2.42***	-2.52***
	(-4.48)	(-3.61)	(-5.93)	(-5.71)
Facility Control	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	3,052	3,052	3,052	3,052
R-squared	0.93	0.93	0.93	0.93

Table 6. Loan Spread Cross-sectional Test: Technological Advantage – Loan Facility-level Analysis

This table presents the OLS regression results to test the technological advantage mechanism. The dependent variable is the *Loan Spread* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality* and their interactions with *TechAdvantage*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Panel A, B, and C present the results of *Analyst Number*, *Earnings Management*, and *Foreign Sales*, respectively. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)
	Loan Spread			
Betweenness Centrality × TechAdvantage	-0.37**			
	(-2.25)			
Closeness Centrality × TechAdvantage		-19.47**		
		(-2.24)		
Degree Centrality × TechAdvantage			-2.34**	
			(-2.27)	
Eigenvector Centrality × TechAdvantage				-2.62***
				(-3.25)
Centrality	-1.65***	-103.03**	-20.07***	-13.69**
	(-3.43	(-2.31)	(-3.01)	(-2.57)
TechAdvantage	-82.65*	-25.77	-90.12*	-86.77*
	(-1.69)	(-0.48)	(-1.80)	(-1.74)
Facility Control	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	3,737	3,737	3,737	3,737
R-squared	0.96	0.96	0.96	0.96

Table 7. Number of Syndicated Loans – City-level Analysis

This table presents the OLS regression results on the relationship between loan spread and global air network centrality. The dependent variables are the *Number of Loans*, *Number of Revolver Loans*, and *Number of Bank Term Loans* in the next year ($t + 1$). The independent variables of interest are *Closeness Centrality*, *Degree Centrality*, *Betweenness Centrality* and *Eigenvector Centrality*. City-year controls, including the *10 Nearest Cities' Centrality*, *Average Loan Spread*, *Average Maturity* and *Average Loan Size*; country × year fixed effects; and city fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Panel A presents the results using the passenger air network. Panel B presents the results using the cargo air network. Standard errors are clustered by city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Panel A. Flight Centrality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Loans				Number of Revolver Loans				Number of Bank Term Loans			
Betweenness Centrality	0.21***				0.08*				0.02*			
	(2.73)				(1.81)				(1.94)			
Closeness Centrality		4.96**				2.77**				0.80**		
		(2.19)				(2.17)				(2.10)		
Degree Centrality			1.82**				0.78**				0.18**	
			(2.41)				(2.20)				(2.26)	
Eigenvector Centrality				1.72**				0.69**				0.14**
				(2.49)				(2.30)				(2.20)
10 Nearest Cities' Centrality	0.10	-0.02	0.64	0.41	0.04	0.02	0.30	0.21	0.01	-0.04	-0.03	-0.03
	(0.73)	(-0.01)	(1.08)	(0.79)	(0.70)	(0.05)	(1.30)	(1.09)	(0.09)	(-0.23)	(-0.34)	(-0.34)
Average LoanSpread	0.01**	0.01**	0.01**	0.01**	0.01	0.01	0.01	0.01	0.01*	0.01*	0.01*	0.01*
	(2.35)	(2.34)	(2.36)	(2.47)	(1.34)	(1.41)	(1.54)	(1.58)	(1.75)	(1.93)	(1.81)	(1.90)
Average Maturity	0.03	0.02	0.07	0.05	0.15	0.14	0.17	0.15	-0.07**	-0.08**	-0.06**	-0.07**
	(0.12)	(0.08)	(0.34)	(0.22)	(1.43)	(1.38)	(1.62)	(1.52)	(-2.45)	(-2.57)	(-2.23)	(-2.48)
Average LoanSize	-0.01	-0.01	0.01	0.01	-0.01	-0.01	-0.01	-0.01	0.01	0.01	0.01	0.01
	(-0.04)	(-0.06)	(0.23)	(0.03)	(-1.25)	(-1.17)	(-1.00)	(-1.22)	(0.80)	(0.80)	(0.93)	(0.76)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516
R-squared	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.58	0.58	0.58	0.58

Panel B. Cargo Centrality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Loans				Number of Revolver Loans				Number of Bank Term Loans			
Betweenness Centrality (Cargo)	0.03				0.04				-0.01			
	(0.49)				(1.11)				(-0.06)			
Closeness Centrality (Cargo)		1.28				1.04				0.27		
		(0.47)				(0.91)				(0.64)		
Degree Centrality (Cargo)			0.04				0.15				0.01	
			(0.11)				(0.71)				(0.19)	
Eigenvector Centrality (Cargo)				0.02				0.05				0.02
				(0.03)				(0.19)				(0.24)
Average LoanSpread	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	(1.19)	(1.19)	(1.18)	(1.17)	(1.11)	(1.11)	(1.11)	(1.10)	(1.22)	(1.23)	(1.21)	(1.22)
Average Maturity	-0.13	-0.13	-0.13	-0.13	0.04	0.03	0.04	0.04	-0.06	-0.06	-0.06	-0.05
	(-0.48)	(-0.51)	(-0.50)	(-0.51)	(0.31)	(0.25)	(0.30)	(0.27)	(-1.21)	(-1.19)	(-1.19)	(-1.18)
Average LoanSize	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
	(-0.06)	(-0.05)	(-0.07)	(-0.08)	(-0.89)	(-0.91)	(-0.84)	(-1.00)	(-0.41)	(-0.34)	(-0.38)	(-0.36)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651	1,651
R-squared	0.82	0.82	0.82	0.82	0.80	0.80	0.80	0.80	0.61	0.61	0.61	0.61

Table 8. Loan Facility Concentration – Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan facility concentration and global air network centrality. The dependent variables are the *Number of Amendments*, *Number of Leaders*, *Number of Participants*, *Leader Share* and *Share Allocation HHI* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Amendments				Number of Leaders				Number of Participants			
Betweenness Centrality	-0.01***				-0.05**				-0.12**			
	(-2.72)				(-2.49)				(-2.56)			
Closeness Centrality		-0.27**				-3.15**				-6.87***		
		(-2.46)				(-2.59)				(-2.67)		
Degree Centrality			-0.12***				-0.86***				-2.41***	
			(-3.33)				(-3.05)				(-4.05)	
Eigenvector Centrality				-0.09***				-0.40**				-1.22**
				(-2.69)				(-2.44)				(-2.53)
Facility Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955
R-squared	0.78	0.78	0.78	0.78	0.86	0.86	0.87	0.86	0.96	0.96	0.96	0.96

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	Leader Share				Share Allocation HHI			
Betweenness Centrality	-0.02***				-0.02***			
	(-3.08)				(-4.97)			
Closeness Centrality		-0.26**				-0.24***		
		(-2.23)				(-3.33)		
Degree Centrality			-0.23***				-0.22***	
			(-3.31)				(-5.40)	
Eigenvector Centrality				-0.11**				-0.10***
				(-2.08)				(-3.05)
Facility Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City
Observations	1,688	1,688	1,688	1,688	1,688	1,688	1,688	1,688
R-squared	0.98	0.98	0.98	0.98	0.99	0.99	0.99	0.99

Table 9. Direct Flight Between Borrower and Lead Lender – Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan facility fees and direct flight between borrower and lead lender cities. In this analysis, we exclude the loans with multiple lead lenders to eliminate the concern that the nearest lead lender is responsible for negotiating and monitoring the loan contract. The dependent variables are the *Loan Spread*, *Number of Amendments*, and *Number of Participants* in the next year $(t+1)$. The independent variable of interest is *Direct Flight*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1) Loan Spread	(2) Number of Amendments	(3) Number of Participants
Direct Flight	-125.10***	-0.63**	-6.33***
	(-3.25)	(-2.56)	(-2.67)
Facility Control	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes
Cluster	City	City	City
Observations	1,420	1,420	1,420
R-squared	0.98	0.80	0.96

Table 10. Loan Facility Fee – Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan facility fees and global air network centrality. The dependent variable is the *Annual Fee*, *Commitment Fee*, and *Upfront Fee* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Annual Fee				Commitment Fee				Upfront Fee			
Betweenness Centrality	-7.60***				-2.28				-6.18**			
	(-9.15)				(-1.53)				(-2.25)			
Closeness Centrality		-79.09***				-158.64**				-855.63***		
		(-9.15)				(-2.23)				(-4.20)		
Degree Centrality			-19.36***				-40.45***				-78.60***	
			(-9.15)				(-2.62)				(-4.05)	
Eigenvector Centrality				-12.52***				-70.30***				-53.18***
				(-9.15)				(-3.98)				(-3.02)
Facility Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	377	377	377	377	1,432	1,432	1,432	1,432	1,567	1,567	1,567	1,567
R-squared	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98

Table 11. Financial Covenant Tightness – Package-level Analysis

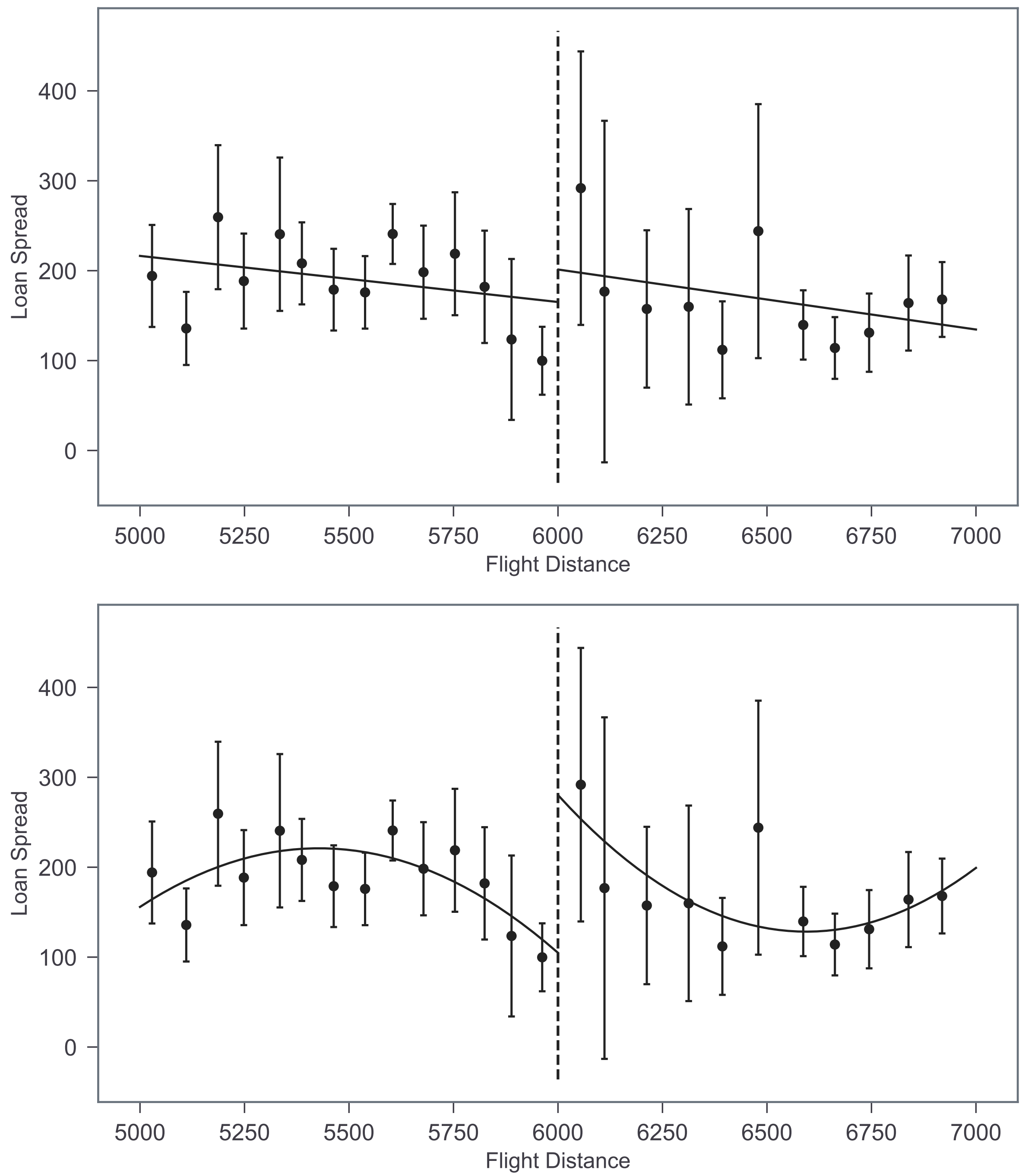
This table presents the OLS regression results on the relationship between loan spread and global air network centrality. The dependent variables are the *Number of Covenants*, *Initial Covenant*, and *Tightness* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality*. Package level controls, including *Average Maturity*, *Average LoanSize* and *Average LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects and borrower fixed effects. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

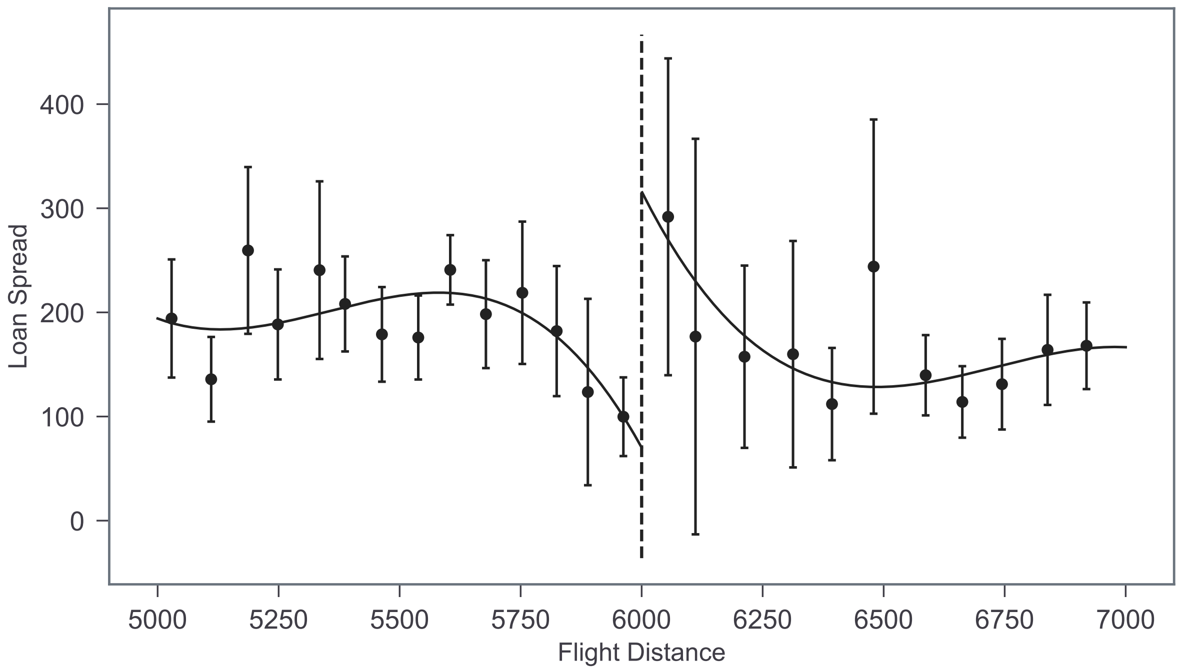
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Covenants				Initial Covenant				Tightness			
Betweenness Centrality	-0.04***				0.05***				0.34***			
	(-5.36)				(4.88)				(4.68)			
Closeness Centrality		-4.00***				3.92***				49.88***		
		(-3.29)				(4.21)				(5.77)		
Degree Centrality			-0.40***				0.34***				4.34***	
			(-4.80)				(6.48)				(4.15)	
Eigenvector Centrality				-0.33***				0.27***				2.92***
				(-4.30)				(4.23)				(3.77)
Package Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	381	381	381	381	381	381	381	381	381	381	381	381
R-squared	0.98	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99

The Appendix

Figure A1. Regression Discontinuity Design: 1,000-Mile Margin

This figure plots the fitted linear, quadratic, and cubic estimates with 90% confidence intervals within a bin of distance. The x-axis is the flight distance between the borrower and lead arranger cities, and the y-axis is the spread of loan facilities in basis points. The optimal bin width is determined by the mimicking variance evenly-spaced estimator proposed by Calonico, Cattaneo, and Titiunik (2015). Each dot on the plot represents the average loan spread within equally spaced bins, with a margin of 1,000 miles around the 6,000-mile cut-off.





400
300
200
100
0
Loan Spread
5000
5250
5500
5750
6000
6250
6500
6750
7000
Flight Distance

Table A1. Variable Definition

Variable	*Definition*	*Source*
Dependent Variables		
Loan Spread	The all-in-drawn spread over the London Interbank Offered Rate (LIBOR) charged by the lender for the loan facility, in basis points.	*Dealscan*
Number of Leaders	Number of lead arrangers of the loan facility. A lender is classified as lead arranger if the "Lead Arranger Credit" is marked "Yes" or their roles are one of the following: "Administrative Agent", "Agent", "Arranger", "Bookrunner", "Lead Arranger", "Lead Bank", "Lead Manager".	*Dealscan*
Number of Participants	Number of participant lenders of the loan facility.	*Dealscan*
Number of Loans	Number of loan facilities.	*Dealscan*
Number of Bank Term Loans	Number of bank term loan facilities. A loan facility is classified as bank term loan if the loan type is "Term Loan A".	*Dealscan*
Number of Covenants	Number of financial covenants of the loan package.	*Dealscan*
Number of Revolver Loans	Number of revolver loan facilities.	*Dealscan*
Leader Shares	The amount of lead arrangers has committed to the given facility scaled by facility size, in percentage.	*Dealscan*
Share Allocation HHI	The Herfindahl-Hirschman Index of lender share allocation of each facility.	*Dealscan*
Initial Covenant	The initial value of maximum Debt / EBITDA covenant.	*Dealscan*
Tightness	The difference between the initial maximum Debt / EBITDA covenants and actual accounting ratio, normalized by the standard deviation of the covenant variable over the previous twelve quarters.	*Dealscan*
Annual Fee	Fee paid on the entire committed amount, regardless of usage, in basis points.	*Dealscan*
Commitment Fee	Fee paid on the unused amount of loan commitments, in basis points.	*Dealscan*
Upfront Fee	The one-time fee paid by the borrower to lender(s) at the loan closing date, in basis points.	*Dealscan*
Independent Variables		
Direct Flight	Dummy variable equals one if two cities have weekly direct flights back and forth.	*ICAO*
Betweenness Centrality	Betweenness centrality of a city is the sum of the fraction of all-pairs shortest paths that pass through the city in the flight network. Specifically, the betweenness centrality of city c is calculated as follows: $BetweennessCentrality_c = \sum_{i,j \in V} \frac{\sigma(i,j\|c)}{\sigma(i,j)}$ where V is the set of cities in the network G, $\sigma(i,j)$ is the number of the shortest path between city i and j, and $\sigma(i,j\|c)$ is the number of those paths passing through city c.	*ICAO*

Continued on next page

Table A1. Variable Definition - Continued

Closeness Centrality	The inverse of the average distance between a city and every other city in the global flight network, where the distance is the shortest path connecting a city and another city in the global air network. Specifically, the closeness centrality of city c is calculated as follows: $ClosenessCentrality_c = \frac{m}{\sum_{i=0}^{m} d(m,c)}$ where m is the number of cities reachable from city c and $d(m,c)$ is the shortest-path distance between city m and c.	*ICAO*
Degree Centrality	The degree centrality of a city is calculated by dividing the number of cities it is connected to in the global air network by the total number of cities in the network. Specifically, the degree centrality of city c is calculated as follows: $DegreeCentrality_c = \sum_{i=0,i\neq c}^{n} \frac{\mathbb{1}(c,i)}{n}$ where $\mathbb{1}(\cdot)$ is an indicator function that equals one if city c and i are connected by weekly direct flight, and n is the number of cities in the network.	*ICAO*
Eigenvector Centrality	Eigenvector centrality for a city based on the centrality of its neighbors connected in the flight network, following the algorithm introduced by Bonacich (1987). Specifically, the eigenvector centrality of city c is calculated as the c-th element of the vector x defined by the equation: $EigenvectorCentrality_c = x_c$ such that $Ax = \lambda x$ where A is the adjacency matrix of the network with eigenvalue λ.	*ICAO*
Betweenness Centrality (Weighted)	The weighted betweenness centrality is calculated using the weighted global air network, where the edge weight is the log number of passengers between two cities.	*ICAO*
Closeness Centrality (Weighted)	The weighted closeness centrality calculated using the inverse of the log number of passengers as the distance between two cities.	*ICAO*
Degree Centrality (Weighted)	The weighted degree centrality calculated using the weighted global air network, where the edge weight is the log number of passengers between two cities.	*ICAO*
Eigenvector Centrality (Weighted)	The weighted eigenvector centrality calculated using the weighted global air network, where the edge weight is the log number of passengers between two cities.	*ICAO*
Direct Flight (Cargo)	Dummy variable equals one if two cities are connected by weekly cargo flight back and forth.	*ICAO*
Betweenness Centrality (Cargo)	Cargo betweenness centrality calculated using the network of cargo flights.	*ICAO*
Closeness Centrality (Cargo)	Cargo closeness centrality calculated using the network of cargo flights.	*ICAO*
Degree Centrality (Cargo)	Cargo degree centrality calculated using the network of cargo flights.	*ICAO*
Eigenvector Centrality (Cargo)	Cargo eigenvector centrality calculated using the network of cargo flights.	*ICAO*

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Table A1. Variable Definition - Continued

Analyst Number	Natural logarithm of the number of analysts following the firm in a year.	*IBES*
TechAdvantage	The difference of the local credit market development between lender j and borrower i, calculated as $Credit_j - Credit_i$. The credit market development $Credit$ is defined as the credit provided by banking sector scaled by GDP.	*Worldbank*
Foreign Sales	Firm non-domestic sales scaled by total sales, in percentage.	*FactSet*
Control Variables		
Maturity	Months to maturity given to the loan facility.	*Dealscan*
LoanSize	Natural logarithm of facility amount in USD.	*Dealscan*
LoanSizePast5Y	Natural logarithm of the total loan amount in USD between the borrower and the lead arranger in the past five years.	*Dealscan*
SalesHHI	Herfindahl-Hirschman Index of the borrower industry based on two-digit SIC.	*Worldscope*
SalesGrowth	The sales growth rate of the borrower industry based on two-digit SIC.	*Worldscope*
Assets	Natural logarithm of total assets in USD.	*Worldscope*
MarketBookRatio	Price to book ratio, calculated as (Market Value of Equity + Book Value of Liabilities) / Total Assets.	*Worldscope*
Profitability	Earnings Before Interest and Taxes / Total Assets.	*Worldscope*
Leverage	(Long Term Debt + Debt in Current Liabilities) / Total Assets.	*Worldscope*
CashFlowVolatility	Standard deviation of (Cash Flow from Operating Activities / Total Assets) over the last five fiscal years.	*Worldscope*
Tangibility	Net Property, Plant and Equipment / Total Assets.	*Worldscope*

Table A2. Loan Spread – Regression Discontinuity Design: 1,000-Mile Margin

This table presents the RD regression results on the relationship between loan spread and distance between borrower and lender. The Definitions of all variables are in the Table A1. The optimal bandwidth is determined by the mean square error (MSE) optimal bandwidth selector with a 1,000-mile margin around the 6,000-mile cut-off. Panel A, B, and C present the results using the Uniform, Triangular, and Epanech kernel methods, respectively. Standard errors are clustered by borrowers' city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

Panel A. Uniform Kernel

	(1)	(2)	(3)
	Loan Spread		
Flight Distance > 6,000 Miles	269.66**	434.51***	521.21***
	(2.52)	(2.64)	(2.96)
Polynomial	1	2	3
Cluster by Borrower City	Yes	Yes	Yes
Borrower Lender City-Pairs	415	415	415

Panel B. Triangular Kernel

	(1)	(2)	(3)
	Loan Spread		
Flight Distance > 6,000 Miles	366.15***	510.85***	628.05***
	(3.00)	(3.29)	(3.39)
Polynomial	1	2	3
Cluster by Borrower City	Yes	Yes	Yes
Borrower Lender City-Pairs	415	415	415

Panel C. Epanech Kernel

	(1)	(2)	(3)
	Loan Spread		
Flight Distance > 6,000 Miles	329.92***	451.11***	573.82***
	(2.83)	(3.15)	(3.24)
Polynomial	1	2	3
Cluster by Borrower City	Yes	Yes	Yes
Borrower Lender City-Pairs	415	415	415

Table A3. Loan Spread: Weighted Centrality - City-level Analysis

This table presents the OLS regression results on the relationship between loan spread and weighted global air network centrality. The dependent variable is the *Average Loan Spread* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality (Weighted)*, *Closeness Centrality (Weighted)*, *Degree Centrality (Weighted)* and *Eigenvector Centrality (Weighted)*. City-year controls, including the *10 Nearest Cities' Centrality*, *Average Maturity* and *Average Loan Size*; country × year fixed effects; and city fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Panel A presents the results using the passenger air network. Panel B presents the results using the cargo air network. Standard errors are clustered by city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)
	Loan Spread			
Betweenness Centrality (Weighted)	-0.53*			
	(-1.91)			
Closeness Centrality (Weighted)		-36.56**		
		(-2.06)		
Degree Centrality (Weighted)			-0.78**	
			(-2.31)	
Eigenvector Centrality (Weighted)				-7.86**
				(-2.35)
10 Nearest Cities' Centrality	-0.40	0.78	-0.54	-2.82
	(-0.74)	(0.08)	(-1.11)	(-1.40)
Average Maturity	0.42*	0.41*	0.40	0.41*
	(1.70)	(1.67)	(1.61)	(1.67)
Average LoanSize	-29.92***	-29.72***	-30.00***	-29.90***
	(-5.96)	(-5.91)	(-6.03)	(-5.98)
Constant	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	1,779	1,779	1,779	1,779
R-squared	0.833	0.832	0.831	0.833

Table A4. Loan Spread: Industry × Year Fixed Effect Robustness - Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan spread and weighted global air network centrality. The dependent variable is the *Loan Spread* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality*, *Closeness Centrality*, *Degree Centrality* and *Eigenvector Centrality*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; industry × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)
	Loan Spread			
Betweenness Centrality	-1.75**			
	(-2.10)			
Closeness Centrality		-112.67**		
		(-2.56)		
Degree Centrality			-20.90**	
			(-2.45)	
Eigenvector Centrality				-24.59**
				(-2.39)
Constant	Yes	Yes	Yes	Yes
Facility Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	4,955	4,955	4,955	4,955
R-squared	0.95	0.95	0.95	0.95

Table A5. Loan Spread: Weighted Centrality - Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan spread and weighted global air network centrality. The dependent variable is the *Loan Spread* in the next year ($t+1$). The independent variables of interest are *Betweenness Centrality (Weighted)*, *Closeness Centrality (Weighted)*, *Degree Centrality (Weighted)* and *Eigenvector Centrality (Weighted)*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)
		Loan Spread		
Betweenness Centrality (Weighted)	-1.24***			
	(-4.08)			
Closeness Centrality (Weighted)		-92.42**		
		(-2.49)		
Degree Centrality (Weighted)			-1.35**	
			(-2.40)	
Eigenvector Centrality (Weighted)				-9.55**
				(-2.59)
Constant	Yes	Yes	Yes	Yes
Facility Control	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes
Cluster	City	City	City	City
Observations	4,955	4,955	4,955	4,955
R-squared	0.93	0.93	0.93	0.93

Table A6. Number of Syndicated Loans: Weighted Centrality – City-level Analysis

This table presents the OLS regression results on the relationship between loan spread and weighted global air network centrality. The dependent variables are the *Number of Loans*, *Number of Revolver Loans*, and *Number of Bank Term Loans* in the next year ($t + 1$). The independent variables of interest are *Closeness Centrality (Weighted)*, *Degree Centrality (Weighted)*, *Betweenness Centrality (Weighted)* and *Eigenvector Centrality (Weighted)*. City-year controls, including the *10 Nearest Cities' Centrality (Weighted)*, *Average Loan Spread*, *Average Maturity* and *Average Loan Size*; country × year fixed effects; and city fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Loans				Number of Revolver Loans				Number of Bank Term Loans			
Betweenness Centrality (Weighted)	0.18***				0.07***				0.01**			
	(3.68)				(2.94)				(2.42)			
Closeness Centrality (Weighted)		3.66**				1.88**				0.72**		
		(2.19)				(2.06)				(2.47)		
Degree Centrality (Weighted)			0.27**				0.11*				0.03**	
			(2.32)				(1.82)				(2.19)	
Eigenvector Centrality (Weighted)				1.73**				0.69**				0.13**
				(2.39)				(2.05)				(2.04)
10 Nearest Cities' Centrality (Weighted)	0.06	-0.25	0.20	0.34	0.03	-0.08	0.09*	0.19	-0.01	-0.07	0.01	-0.03
	(0.65)	(-0.25)	(1.50)	(0.70)	(0.76)	(-0.20)	(1.83)	(1.05)	(-0.13)	(-0.54)	(0.02)	(-0.37)
Average LoanSpread	0.01**	0.01**	0.01**	0.01**	0.01	0.01	0.01	0.01	0.01*	0.01**	0.01*	0.01*
	(2.32)	(2.32)	(2.46)	(2.48)	(1.29)	(1.36)	(1.65)	(1.56)	(1.70)	(1.97)	(1.95)	(1.90)
Average Maturity	0.02	0.03	0.13	0.05	0.14	0.15	0.19*	0.16	-0.07**	-0.07***	-0.06**	-0.07**
	(0.08)	(0.12)	(0.64)	(0.23)	(1.38)	(1.46)	(1.75)	(1.52)	(-2.45)	(-2.59)	(-2.01)	(-2.49)
Average LoanSize	-0.01	-0.01	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.01	0.01	0.01	0.01
	(-0.05)	(-0.15)	(0.33)	(-0.12)	(-1.29)	(-1.31)	(-0.87)	(-1.35)	(0.77)	(0.73)	(0.96)	(0.69)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516	2,516
R-squared	0.83	0.83	0.84	0.83	0.83	0.83	0.83	0.83	0.58	0.58	0.59	0.58

Table A7. Loan Facility Concentration: Weighted Centrality – Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan facility concentration and weighted global air network centrality. The dependent variables are the *Number of Amendments*, *Number of Leaders*, *Number of Participants*, *Leader Share* and *Share Allocation HHI* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality (Weighted)*, *Closeness Centrality (Weighted)*, *Degree Centrality (Weighted)* and *Eigenvector Centrality (Weighted)*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Amendments				Number of Leaders				Number of Participants			
Betweenness Centrality (Weighted)	-0.01**				-0.04**				-0.12***			
	(-2.56)				(-2.52)				(-2.67)			
Closeness Centrality (Weighted)		-0.33***				-3.30***				-7.29**		
		(-2.67)				(-2.79)				(-2.49)		
Degree Centrality (Weighted)			-0.01**				-0.06***				-0.12***	
			(-2.38)				(-2.64)				(-2.68)	
Eigenvector Centrality (Weighted)				-0.09***				-0.43**				-1.27**
				(-2.65)				(-2.47)				(-2.39)
Facility Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955	4,955
R-squared	0.78	0.78	0.78	0.78	0.86	0.86	0.86	0.86	0.96	0.96	0.96	0.96

	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
	Leader Share				Share Allocation HHI			
Betweenness Centrality (Weighted)	-0.07***				-0.07***			
	(-4.06)				(-5.61)			
Closeness Centrality (Weighted)		-0.42***				-0.40***		
		(-2.76)				(-4.40)		
Degree Centrality (Weighted)			-0.04***				-0.04***	
			(-4.27)				(-5.85)	
Eigenvector Centrality (Weighted)				-0.11**				-0.11***
				(-2.06)				(-3.01)
Facility Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City
Observations	1,688	1,688	1,688	1,688	1,688	1,688	1,688	1,688
R-squared	0.98	0.98	0.98	0.98	0.99	0.99	0.99	0.99

Table A8. Loan Facility Fee: Weighted Centrality – Loan Facility-level Analysis

This table presents the OLS regression results on the relationship between loan facility fees and weighted global air network centrality. The dependent variable is the *Annual Fee*, *Commitment Fee*, and *Upfront Fee* in the next year ($t + 1$). The independent variables of interest are *Betweenness Centrality (Weighted)*, *Closeness Centrality (Weighted)*, *Degree Centrality (Weighted)*, and *Eigenvector Centrality (Weighted)*. Loan level controls, including *Maturity*, *LoanSize* and *LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects; lender × year fixed effects; borrower fixed effects; loan type fixed effects and loan purpose fixed effects are included in all regressions. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Annual Fee				Commitment Fee				Upfront Fee			
Betweenness Centrality (Weighted)	-11.37***				-2.11*				-11.90***			
	(-9.15)				(-1.86)				(-5.42)			
Closeness Centrality (Weighted)		-79.05***				-202.79**				-979.47***		
		(-9.15)				(-2.52)				(-4.84)		
Degree Centrality (Weighted)			-6.79***				-4.38				-15.36**	
			(-9.15)				(-0.71)				(-2.16)	
Eigenvector Centrality (Weighted)				-12.51***				-56.17***				-60.42***
				(-9.15)				(-3.93)				(-3.72)
Facility Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lender × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Type FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Purpose FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	377	377	377	377	1,432	1,432	1,432	1,432	1,567	1,567	1,567	1,567
R-squared	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98

Table A9. Financial Covenant Tightness: Weighted Centrality – Package-level Analysis

This table presents the OLS regression results on the relationship between loan spread and weighted global air network centrality. The dependent variables are the *Number of Covenants*, *Initial Covenant*, and *Tightness* in the next year (t + 1). The independent variables of interest are *Betweenness Centrality (Weighted)*, *Closeness Centrality (Weighted)*, *Degree Centrality (Weighted)* and *Eigenvector Centrality (Weighted)*. Package level controls, including *Average Maturity*, *Average LoanSize* and *Average LoanSizePast5Y*; industry-year controls, including *SalesHHI* and *SalesGrowth*; borrower-year controls, including *Assets*, *MarketBookRatio*, *Profitability*, *Leverage*, *CashFlowVolatility*, *Tangibility*; country × year fixed effects and borrower fixed effects. Definitions of all variables are in the Table A1. Standard errors are clustered by borrower city. Robust t-statistics are in parentheses. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Number of Covenants				Initial Covenant				Tightness			
Betweenness Centrality (Weighted)	-0.03***				0.03***				0.16***			
	(-4.56)				(3.45)				(3.66)			
Closeness Centrality (Weighted)		-3.87***				2.89***				36.89***		
		(-8.83)				(4.65)				(3.94)		
Degree Centrality (Weighted)			-0.05***				0.03***				0.81***	
			(-3.81)				(3.37)				(5.19)	
Eigenvector Centrality (Weighted)				-0.39***				0.26***				3.04***
				(-4.99)				(4.40)				(3.82)
Package Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower-Year Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	City	City	City	City	City	City	City	City	City	City	City	City
Observations	381	381	381	381	381	381	381	381	381	381	381	381
R-squared	0.98	0.98	0.98	0.98	1.00	1.00	1.00	1.00	0.99	0.99	0.99	0.99