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Investment in a Smaller World: The Implications of Air Travel for Investors and Firms

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Abstract. A large literature reports that proximity influences investment. We extend the measurement of proximity beyond distance and report that air travel reduces local investment bias. This result is confirmed using the initiation of connecting flights through recently opened air hubs because investment at destinations served by these connecting flights increases after, not before, their initiation. Air travel also broadens the investor base of firms and lowers their cost of equity by approximately 1%. Overall, air travel improves the diversification of investor portfolios and lowers the cost of equity for firms.

History: Accepted by Tyler Shumway, finance.

Mobility of population is death to localism. —Frederick Jackson Turner, *The Significance of the Frontier in American History*, 1873

The literature on local investment bias examines the proximity of investors to the firms in which they invest. This literature measures proximity as the distance between an investor's location and the location of a firm's headquarters. However, aviation has made the world smaller by dramatically reducing the time required to travel long distances. Once airborne, flying is more than 10 times faster than driving. We study the implications of air travel for investor portfolios and the cost of equity for firms. Instead of focusing on firms headquartered within a fixed distance of investors, we examine air travel's influence on portfolio investment throughout the United States. We also examine air travel's influence on the cost of equity to determine whether a more geographically diversified investor base is associated with a lower cost of equity (Merton 1987).

The intuition underlying our paper's first empirical test is simple: suppose air traffic between Los Angeles, California, and Austin, Texas, increases relative to air traffic between other cities and Austin. We examine whether investors in Los Angeles increase their portfolio allocations in firms headquartered in Austin by acquiring shares from investors in other cities. This reshuffling of the investor base resulting from variation in air traffic is difficult to attribute to investment opportunities in Austin because these opportunities are available to investors throughout the United States.

Air traffic represents the number of air passengers flying between an origin, where investors are located, and a destination, where firms are headquartered. Our results are similar if air traffic is defined using the number of flights between an origin and destination. We find that higher air traffic increases the number of institutional investors at the origin with equity positions in firms at the destination and the dollar-denominated amount of these positions. Thus, air traffic improves the diversification of investor portfolios. The larger portfolio allocations to distant firms as a result of air traffic also reduce local investment bias.

To address the endogenous relation between air traffic and investment opportunities, we examine the initiation and cancellation of connecting flights attributable to recently opened air hubs. Destinations with limited investment opportunities are most affected by recently opened air hubs because destinations with exceptional investment opportunities are served by direct flights. To clarify, portfolio investment near the air hub is not examined because the origin and destination of a connecting flight are distinct from the hub's location. Intuitively, our results are confirmed using variation in air traffic between two peripheral nodes in a network (origin and destination) whose connectivity is reoptimized in response to the addition of a central node (air hub).

For example, the 1997 opening of an air hub in Los Angeles (LAX) led to the initiation of connecting flights between Austin and several cities in California, such as San Jose. We hypothesize that portfolio investment in Austin firms by San Jose investors (and vice versa) increases following the initiation of a connecting flight through LAX. The decision to locate an air hub in Los Angeles is not driven by investment opportunities in either San Jose or Austin although portfolio investment in Los Angeles is not examined by our analysis of connecting flights through LAX.[1] Moreover, we confirm that the number of investors and their dollar-denominated portfolio holdings both increase after the initiation of connecting flights through a recently opened air hub but not before an air hub's opening. Thus, we conclude that portfolio investment responds to air traffic. Conversely, the reverse implication that air traffic responds to investment opportunities is not supported.

To examine local investment bias, we define air traffic share as the fraction of total air traffic from an origin to a destination. These fractions are analogous to portfolio weights. Air traffic share has a positive relation with the market-adjusted portfolio weights assigned by investors located at the origin to firms headquartered at the destination. Therefore, by facilitating portfolio investment in distant firms, air travel mitigates local investment bias.

After repeating our empirical tests separately in each calendar year, we find consistent results throughout the sample period. Consequently, the impact of air travel on portfolio investment is not diminishing over time.

Furthermore, air traffic on low-cost airlines mitigates local investment bias although low-cost airlines are less likely to be flown by institutional investors and senior management traveling for business purposes. However, air traffic does not increase the risk-adjusted return of investor portfolios, suggesting that air travel does not enable investors to gain an informational advantage. This finding parallels the conclusion of Pool et al. (2012) that familiarity motivates fund managers to overweight firms that do not generate higher returns.[2] Besides familiarity, the ability of full-service airlines to increase portfolio investment in distant firms is consistent with air travel's ability to facilitate monitoring because monitoring does not necessarily result in higher risk-adjusted returns.

We also examine the impact of air travel on corporate acquisitions. Greater air traffic increases the likelihood that firms at the destination are acquired by firms at the origin. However, as with risk-adjusted portfolio returns, air travel does not improve the returns of acquiring firms. Therefore, air travel appears to increase the familiarity of acquiring firms with distant target firms without providing an informational advantage.

Air routes initiated by the opening of an air hub confirm that air traffic facilitates portfolio investment in distant firms and, consequently, mitigates local investment bias. Route initiations attributable to air hub openings also facilitate corporate acquisitions. Moreover, variation in air traffic attributable to the opening of an air hub has an inverse relation with investor returns. Therefore, the initiation of a connecting flight through a recently opened air hub increases portfolio investment in firms headquartered at the destination but decreases the returns of investors at the origin. This evidence is consistent with air traffic's ability to lower expected returns through improved risk sharing (Merton 1987).

To examine air travel's impact on the cost of equity, we define air passenger volume as the number of airline passengers entering and departing a destination. This metric ignores the location of investors because improved risk sharing can be achieved by attracting portfolio investment from anywhere in the United States. We report that greater air passenger volume broadens the investor base of small firms and lowers their cost of equity by approximately 1%. Air hub openings confirm both these implications of air travel. To quantify the economic impact of air traffic on expected equity returns, the Gordon growth model implies that this reduction in the cost of equity increases the valuation of a typical firm by 20%.[3] Overall, the initiation of a connecting flight through a recently opened air hub results in firms at the destination attracting more institutional investors. This broadening of their investor base lowers their cost of equity, which partially explains the insignificant impact of air travel on investor returns.

Several recent studies examine the economic implications of air travel. Giroud (2013) concludes that air travel facilitates internal monitoring within firms that improves their performance, and Bernstein et al. (2016) use airline data to examine the performance of venture capitalists. These studies highlight the return implications of air travel. Our study finds air travel benefits investors through an alternative channel: improved diversification that reduces local investment bias. Our study also identifies a benefit of air travel for firms: a lower cost of equity because of improved risk sharing.

1. Data

The Research and Innovative Technology Administration (RITA) at the U.S. Department of Transportation publishes monthly data on commercial airline flights and air passengers starting from January 1990. We study all flights with scheduled passenger service between airports within the United States. A total of 1,501 airports with corresponding zip codes are studied. The zip code of each airport is hand-collected. Institutional investors are located at origin zip codes denoted i, and firm headquarters are located at destination zip codes denoted j. We exclude zip code pairs within 100 miles of each other. The location of institutional investors is obtained from Nelson's Directory of Investment Managers, and the headquarter location of firms is obtained from COMPUSTAT. Panel A of Table 1 provides an annual summary for the number of investors and firms in our study,

Table 1. Summary Statistics

Panel A: Air travel statistics

Year	Zip code pairs	Investor zip codes	Firm zip codes	Average DIST	Average AT	Average ATS, %	Average APV
1991	74,577	457	1,853	1,090	12.593	0.73	14.352
1992	83,197	472	1,881	1,093	12.469	0.70	14.346
1993	91,735	492	1,956	1,081	12.405	0.67	14.352
1994	98,439	510	2,155	1,090	12.443	0.65	14.382
1995	108,648	535	2,260	1,088	12.517	0.63	14.301
1996	116,000	572	2,293	1,081	12.537	0.62	14.283
1997	125,834	605	2,309	1,083	12.558	0.59	14.363
1998	143,782	640	2,315	1,087	12.629	0.57	14.500
1999	145,455	665	2,250	1,112	12.614	0.56	14.581
2000	159,360	724	2,218	1,123	12.682	0.57	14.638
2001	154,975	689	2,128	1,132	12.726	0.56	14.541
2002	158,834	722	2,128	1,137	12.618	0.56	14.443
2003	168,978	726	2,061	1,125	12.575	0.53	14.369
2004	181,499	768	1,994	1,125	12.587	0.52	14.419
2005	179,739	792	1,908	1,114	12.647	0.56	14.467
2006	183,127	819	1,888	1,104	12.716	0.56	14.469
2007	187,081	855	1,853	1,106	12.719	0.58	14.518
2008	180,731	875	1,804	1,119	12.699	0.61	14.521
2009	170,016	846	1,745	1,116	12.638	0.62	14.466
All	142,737	672	2,053	1,109	12.617	0.59	14.437

Panel B: Air travel statistics

	Passenger arrivals	Passenger departures	Flight departures
Average	454,748	454,469	6,031
Median	228,981	228,944	3,386
Standard deviation	569,072	568,316	7,162
25th percentile	70,030	70,067	1,456
75th percentile	618,189	617,791	7,776

Panel C: Correlations

	Passenger arrivals	Passenger departures	Flight departures
Passenger arrivals	1		
Passenger departures	0.9996	1	
Flight departures	0.9025	0.9034	1

Notes. Panel A of this table reports summary statistics for the zip codes in our analysis as well as air traffic (AT), defined in Equation (1), and distance (DIST). AT equals the log number of air passengers flying between an origin (zip code *i*), where investors are located, and a destination (zip code *j*), where firms are headquartered in a specific year. All airports within 30 miles of each zip code are evaluated. Average AT in each year is conditional on air traffic between a pair of zip codes being positive. The averages for air traffic share (ATS) defined in Equation (2) and air passenger volume (APV) defined in Equation (3) are also recorded. ATS represents the fraction of air passengers flying from an origin to a destination, and APV represents the log number of air passengers at a destination. Panel B reports additional statistics on air travel, and panel C reports their correlations.

and Figure 1 illustrates the annual variation in the average number of institutional investors and their average portfolio holdings of firms.

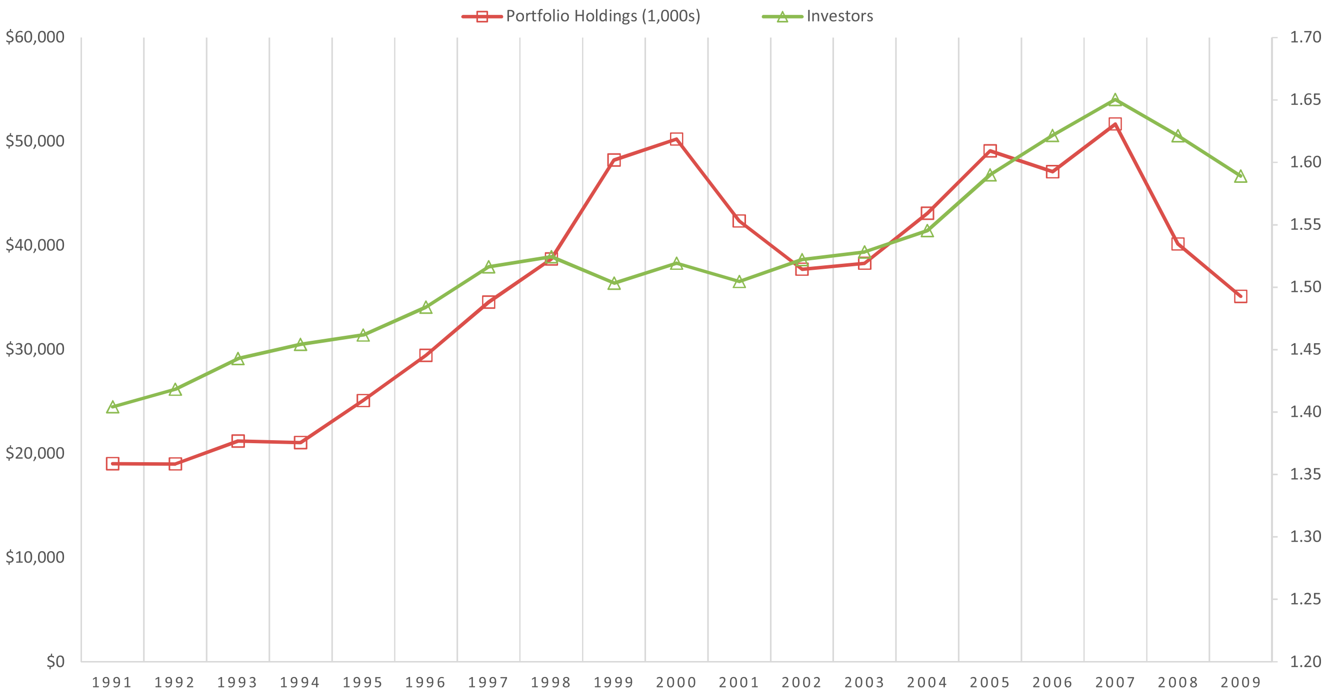
We compute three air travel metrics. Air traffic represents the log number of air passengers flying between airports within 30 miles of zip code i, the origin, and airports within 30 miles of zip code j, the destination. Specifically, air traffic in calendar year t, denoted $AT_{i,j,t}$, is computed as

$$AT_{i,j,t} = \log\big(\text{Air passengers flying between zip code } i \text{ and zip code } j\big). \quad (1)$$

Our results are not sensitive to an alternative definition of air traffic based on the number of air passengers flying one way (origin to destination) because the number of air passengers on the return flight is nearly identical according to panels B and C of Table 1. We include air passengers on return flights in Equation (1) because interactions between investors and firms can occur at the origin and destination.

Air traffic defined by the number of air passengers is well suited for studying the number of institutional investors at the origin with equity positions in firms at a destination and the dollar-denominated amount

Figure 1. (Color online) Time Series Variation in the Number of Institutional Investors and Their Portfolio Holdings over Our Sample Period



Note. These variables represent the dependent variables in our primary empirical tests regarding the impact of air traffic.

of their positions. However, air traffic is not suitable for studying portfolio weights, which are fractions. Instead, we define air traffic share as the fraction of air passengers flying from an origin to a destination. This fraction, denoted $\text{ATS}_{i,j,t}$, is computed as

$$\text{ATS}_{i,j,t} = \frac{\text{Air passengers flying from zip code } i \text{ to zip code } j}{\text{Air passengers departing from zip code } i}. \tag{2}$$

Although air traffic is symmetric between the origin and destination, air traffic share is not symmetric. For example, if the airport at the origin is larger, then air traffic share is lower at the origin than the destination.

Although air traffic and air traffic share examine the implications of air travel for investors, our second analysis studies the implications of air travel for firms. This analysis does not condition on the location of investors. Instead, air passenger volume represents the total number of air passengers flying into and out of a destination where firms are headquartered. This metric, denoted $\text{APV}_{j,t}$, is computed as

$$\text{APV}_{j,t} = \log\big(\text{Air passengers flying into and out of zip code } j\big). \tag{3}$$

Panel A of Table 1 summarizes each of the air travel metrics with the average AT and the average ATS computed between zip code pairs with positive air traffic. The number of zip code pairs increases from 74,577 in 1991 to 170,016 in 2009. However, this increase is not monotonic as air routes are frequently cancelled. Additional summary statistics in panel B of Table 1 pertain to the number of arriving and departing passengers as well as the number of departing flights. Data on flight departures is obtained from RITA. Panel C of Table 1 reports correlations exceeding 0.90 between the number of arriving passengers, the number of departing passengers, and the number of departing flights. These high correlations indicate that the number of airline passengers arriving to a location and the number of airline passengers departing flights from the same location is symmetric. Furthermore, the number of passengers is highly related to the number of flights. Therefore, later empirical tests confirm that our results are insensitive to replacing passengers with flights.

2. Empirical Strategy

We first examine the impact of air traffic on the number of institutional investors at the origin with equity positions in firms headquartered at the destination using the following panel regression:

$$\log(\text{Investors})_{i,j,t+1} = \beta_1 \, \text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha \, \text{FC}_{j,t} + \epsilon_{i,j,t}. \tag{4}$$

This specification includes origin–destination city, origin city–year, and destination city–year fixed effects, and standard errors are double-clustered by origin–destination pairs and by year. Specifically, to determine the impact of air travel on portfolio investment, we include fixed effects that capture cross-sectional variation between each origin and destination pair. These pairwise origin–destination fixed effects capture any link between the locations that is not expected to vary during the sample period, such as a common industry link. Year fixed effects for each origin and destination are also included. These origin–year and destination–year fixed effects capture variation in the funds available for investment near the origin and variation in the investment opportunities near the destination, respectively. Air traffic, which varies annually between each origin and destination, is then able to explain variation in portfolio investment that is not captured by these fixed effects. Furthermore, the possibility that air traffic has an endogenous link with portfolio investment is less likely than with real investment by corporations because the fractional portfolio positions we examine aggregate to one. Therefore, by examining whether the distribution of equity ownership is related to the distribution of air traffic, our study determines whether variation in air travel induces a "reshuffling" of portfolio holdings across investors in different locations.

A positive β_1 coefficient in Equation (4) signifies that greater air traffic results in firms at the destination attracting more institutional investors from the origin. DIST denotes the distance between the origin and destination. FC represents firm characteristics that include the book-to-market ratio (BM), market capitalization (SIZE), past returns over the prior 12 months (PRET), capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic return volatility (IVOL), leverage, and return on assets (ROA). CAPEX and the security issuance variables are normalized by total assets.

Panel A of Table 2 reports a positive β_1 coefficient for AT of 0.003 (t-statistic of 2.89) in the full specification with all control variables. Thus, an increase in air traffic is associated with more institutional investors at the origin having equity positions in firms at the destination. Furthermore, the positive coefficient for SIZE indicates that investors are more willing to invest in large firms. Falkenstein (1996) reports that institutional investor portfolios exhibit a preference for large visible stocks.

The results from Equation (4) ignore the possibility that investors increase the dollar-denominated amount of their portfolio investment in distant firms as a result of air travel. Our next panel regression addresses this possibility by examining the dollar-denominated portfolio holdings of investors

$$\log(\text{Holdings})_{i,j,t+1} = \beta_1 \text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha\, \text{FC}_{j,t} + \epsilon_{i,j,t}. \quad (5)$$

This specification includes origin–destination city, origin city–year, and destination city–year fixed effects. Standard errors are double-clustered by origin–destination city pairs and by year.

The portfolio holdings of institutional investors are obtained from 13F statements reported to the Securities and Exchange Commission (SEC). As the minimum reporting threshold is \$200,000, portfolio holdings can fluctuate above or below this threshold because of stock price fluctuations rather than the buy or sell decisions of institutional investors. To alleviate the confounding effect of price fluctuations, we impose a minimum value on investor holdings equal to their third decile (approximately \$500,000) across the entire sample period.

The positive β_1 coefficient of 0.013 (t-statistic of 2.56) in panel A of Table 2 in the full specification of Equation (5) implies that higher air traffic leads to greater dollar-denominated portfolio investment in firms at the destination by investors at the origin. This implication is confirmed using quarterly data on the number of flights departing from the origin to the destination (DEPART). According to panel B of Table 2, this alternative measure of air travel continues to have a positive relation with investor activity in firms at the destination.

In summary, the results in Table 2 indicate that air travel facilitates portfolio investment in distant firms. Furthermore, the positive coefficient for equity issuance indicates that investors increase their portfolio holdings in firms issuing securities.

Our next analysis examines whether air travel mitigates local investment bias. Local investment bias is defined as the tendency to overweight local firms relative to their market portfolio weights. Coval and Moskowitz (1999) and Pirinsky and Wang (2006) document the tendency of investors to overweight firms headquartered near their location.

To measure local bias, deviations between the portfolio weights assigned to firms by investors and their respective market portfolio weights are computed using a two-step procedure. First, for each institutional investor at an origin, we compute deviations between their investor-specific portfolio weights and the respective market portfolio weights of every firm. Second, these investor-specific deviations are then value-weighted according to each investor's assets under management to create a portfolio weight deviation variable denoted PWD for the representative investor at each origin. A positive (negative) value for PWD signifies that the representative investor at the origin is overweight (underweight) firms at the destination.

Observe that PWD and ATS in Equation (2) are both defined as fractions. For easier interpretation

Table 2. Impact of Air Traffic on Portfolio Investment

Panel A: Annual air traffic

	Number of investors		Portfolio holdings	
AT	0.007***	0.003***	0.044***	0.013**
	(4.41)	(2.89)	(3.88)	(2.56)
DIST		0.736***		1.244*
		(3.61)		(1.92)
BM		0.001		−0.068***
		(1.33)		(−4.88)
SIZE		0.064***		0.410***
		(32.95)		(52.57)
PRET		−0.018***		0.092***
		(−10.51)		(7.50)
CAPEX		−0.001***		−0.007***
		(−3.91)		(−5.18)
Equity issuance		0.023**		0.215***
		(2.47)		(6.23)
Debt issuance		−0.003**		0.024**
		(−2.71)		(2.84)
IVOL		1.519***		−4.946***
		(3.39)		(−4.29)
Leverage		0.035***		0.117***
		(7.77)		(4.53)
ROA		−0.008		0.254***
		(−1.57)		(5.49)
Fixed effects	Origin × destination Origin × year Destination × year		Origin × destination Origin × year Destination × year	
Observations	7,922,784	7,883,068	5,734,062	5,707,047
Adjusted R^2, %	25.4	28.1	29.2	37.5

Panel B: Quarterly departures from origin

	Number of investors		Portfolio holdings	
DEPART	0.018***	0.009***	0.083**	0.024*
	(3.62)	(3.09)	(2.82)	(1.95)
DIST		0.688***		1.257*
		(3.29)		(1.87)
BM		0.001		−0.074***
		(1.21)		(−4.86)
SIZE		0.066***		0.411***
		(32.32)		(51.73)
PRET		−0.018***		0.089***
		(−11.02)		(7.30)
CAPEX		−0.001***		−0.007***
		(−3.96)		(−5.03)
Equity issuance		0.025**		0.221***
		(2.59)		(6.00)
Debt issuance		−0.003*		0.024**
		(−2.03)		(2.83)
IVOL		1.521***		−4.834***
		(3.25)		(−4.60)
Leverage		0.038***		0.125***
		(7.47)		(4.55)
ROA		−0.008		0.274***
		(−1.50)		(5.68)
Fixed effects	Origin × destination Origin × year Destination × year		Origin × destination Origin × year Destination × year	
Observations	6,825,315	6,791,543	4,953,258	4,930,272
Adjusted R^2, %	24.8	27.7	28.6	37.0

Notes. Panel A of this table reports the results from the panel regression in Equation (4) that examines the impact of air traffic (AT) defined in Equation (1) on the number of investors with equity positions in firms at the destination, $\log(\text{Investors})_{i,j,t+1} = \beta_1\,\text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha\,\text{FC}_{j,t} + \epsilon_{i,j,t}$ and the results from the panel regression in Equation (5), $\log(\text{Holdings})_{i,j,t+1} = \beta_1\,\text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha\,\text{FC}_{j,t} + \epsilon_{i,j,t}$, which replaces the number of investors with dollar-denominated portfolio holdings. AT is defined annually as the log number of air passengers traveling between an origin (zip code *i*), where investors are located, and a destination (zip code *j*), where firms are headquartered. DIST denotes the distance between investors and firms. FC contains average firm characteristics at the destination for book-to-market (BM), size (SIZE), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA). Panel B reports the results from panel regressions that replace the dependent variable with the number of flights departing from an origin to a destination each quarter (DEPART). All standard errors are clustered by year and by origin × destination.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

of the coefficients, we multiply PWD and ATS by 100 in the following panel regression:

$$PWD_{i,j,t+1} = \beta_1 \, ATS_{i,j,t} + \beta_2 \log(DIST)_{i,j} + \alpha \, FC_{j,t} + \epsilon_{i,j,t}. \quad (6)$$

This specification includes origin–destination city, origin city–year, and destination city–year fixed effects. Standard errors are double-clustered by origin–destination city pairs and by year. The same panel regression is estimated using the number of flight departures (DEPART) as the independent variable measuring air travel in lieu of ATS.

As more portfolio investment in distant firms implies less portfolio investment in local firms, a positive β_1 coefficient for ATS indicates that a higher air traffic share mitigates local investment bias. According to Table 3, the β_1 coefficient equals 0.336 (t-statistic of 10.12) in the full specification. This positive coefficient indicates that, by facilitating portfolio investment in distant firms, air travel reduces local investment bias. A positive β_1 coefficient of 1.598 (t-statistic of 4.65) is also reported when DEPART measures air travel as the number of flight departures.

By providing investors with information on distant firms, improvements in information technology could decrease the importance of air travel. To address this possibility, we estimate the β_1 coefficients in Equations (4)–(6) for each year of our sample period and plot these annual coefficients in Figure 2. The results

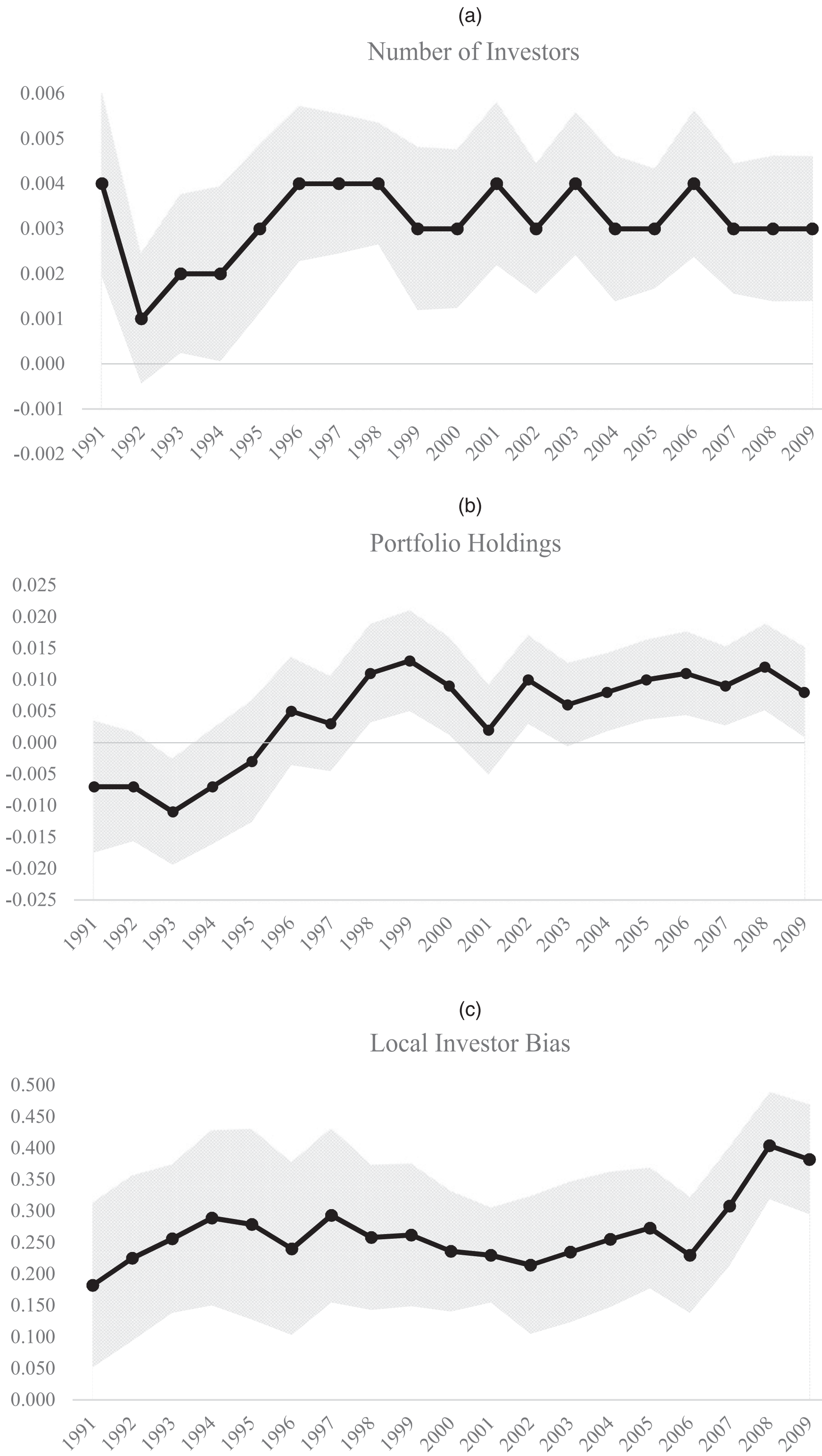
Table 3. Impact of Air Traffic on Local Investor Bias

	Portfolio weight deviation (PWD)			
ATS	0.336***	0.336***		
	(10.13)	(10.12)		
DEPART			1.602***	1.598***
			(4.68)	(4.65)
DIST		−0.466		−0.729**
		(−1.63)		(−2.38)
BM		−0.010***		−0.008***
		(−3.55)		(−3.45)
SIZE		−0.010***		−0.003
		(−4.70)		(−1.45)
PRET		0.060***		0.055***
		(9.03)		(8.59)
CAPEX		−0.001**		−0.002**
		(−2.20)		(−2.62)
Equity issuance		0.030*		0.041**
		(2.04)		(2.51)
Debt issuance		0.008**		0.009**
		(2.32)		(2.35)
IVOL		−4.218***		−3.215***
		(−4.41)		(−3.73)
Leverage		−0.012		−0.010
		(−0.86)		(−0.68)
ROA		0.052**		0.041**
		(2.18)		(2.17)
Fixed effects	Origin × destination Origin × year Destination × year		Origin × destination Origin × year Destination × year	
Observations	7,922,784	7,883,068	7,767,754	7,728,708
Adjusted R^2, %	41.5	41.5	34.4	34.4

Notes. This table reports the results from the panel regression in Equation (6) that examines the impact of air traffic share (ATS) defined in Equation (2) and distance (DIST) on the market capitalization–adjusted portfolio weights of firms, $PWD_{i,j,t+1} = \beta_1 \, ATS_{i,j,t} + \beta_2 \log(DIST)_{i,j} + \alpha \, FC_{j,t} + \epsilon_{i,j,t}$. ATS represents the fraction of air passengers flying from the origin (zip code i), where investors are located, to the destination (zip code j), where firms are headquartered. The same panel regression is also estimated with ATS replaced with DEPART, the number of flights departing from the origin to the destination. Both PWD and ATS are multiplied by 100. A positive (negative) value for PWD signifies that the representative investor at the origin is overweight (underweight) firms at the destination. FC contains average firm characteristics at the destination for book-to-market (BM), size (SIZE), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA). All standard errors are clustered by year and by origin × destination.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

Figure 2. Consistency of the Panel Regression Coefficients Computed from the Three Specifications in Equations (4)–(6)



Note. Each panel plots annual coefficients for which the dependent variable is number of investors (panel (a)), portfolio holdings (panel (b)), and local investment bias (panel (c)).

in Figure 2 indicate that the β_1 coefficients are stable or increasing, not decreasing, during our sample period. Thus, the importance of air travel to portfolio investment is not diminishing over time.

Assuming institutional investors are more likely to fly full-service airlines than low-cost airlines when traveling for business, we compute AT and ATS separately for airline passengers traveling on low-cost and full-service airlines.[4] We then reestimate Equations (4)–(6) for both types of airlines.

The β_1 coefficients for AT from Equations (4) and (5) in Table 4 indicate that full-service airlines exert a greater impact than low-cost airlines on the number of investors in distant firms and the portfolio holdings of investors in distant firms. The smaller albeit significant coefficients for low-cost airlines are consistent with investors using full-service airlines more frequently for business travel. The relative importance of full-service airlines suggests that air travel increases the willingness of investors to invest in distant firms by facilitating monitoring.

In contrast, the β_1 coefficients for ATS from Equation (6) in Table 4 are positive for low-cost airlines but insignificant for full-service airlines. These results indicate that low-cost air travel reduces local investment bias. This evidence suggests that familiarity

Table 4. Low-Cost Airlines

	Number of investors		Portfolio holdings		Local bias	
Low-cost AT	0.000**	0.000	0.003***	0.001**		
	(2.51)	(1.11)	(3.50)	(2.47)		
Full-service AT	0.004***	0.001**	0.027***	0.008**		
	(3.97)	(2.23)	(3.89)	(2.28)		
Low-cost ATS					10.131***	10.145***
					(6.15)	(6.13)
Full-service ATS					–0.002	–0.001
					(–0.86)	(–0.66)
DIST		0.736***		1.243*		–0.645*
		(3.61)		(1.92)		(–2.07)
BM		0.001		–0.068***		–0.009***
		(1.33)		(–4.88)		(–3.57)
SIZE		0.064***		0.410***		–0.004**
		(32.96)		(52.53)		(–2.33)
PRET		–0.018***		0.092***		0.054***
		(–10.50)		(7.50)		(8.97)
CAPEX		–0.001***		–0.007***		–0.002**
		(–3.91)		(–5.18)		(–2.58)
Equity issuance		0.023**		0.215***		0.039**
		(2.47)		(6.23)		(2.51)
Debt issuance		–0.003**		0.024**		0.009**
		(–2.72)		(2.84)		(2.14)
IVOL		1.519***		–4.950***		–3.105***
		(3.39)		(–4.30)		(–3.81)
Leverage		0.035***		0.116***		–0.004
		(7.77)		(4.53)		(–0.26)
ROA		–0.008		0.254***		0.051**
		(–1.56)		(5.50)		(2.48)
Fixed effects	Origin × destination Origin × year Destination × year		Origin × destination Origin × year Destination × year		Origin × destination Origin × year Destination × year	
Observations	7,922,518	7,882,802	5,733,859	5,706,844	7,299,850	7,264,794
Adjusted R^2, %	25.4	28.1	29.2	37.5	36.2	36.2

Notes. This table reports from Equation (4), which examines the impact of air traffic (AT) on the number of investors with equity positions in firms at the destination, $\log(\text{Investors})_{i,j,t+1} = \beta_1 \text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha \text{FC}_{j,t} + \epsilon_{i,j,t}$; the results from Equation (5), $\log(\text{Holdings}t)_{i,j,t+1} = \beta_1 \text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha \text{FC}_{j,t} + \epsilon_{i,j,t}$, which replaces the number of investors with dollar-denominated portfolio holdings; and the results from Equation (6), which examines the impact of air traffic share (ATS) on the market capitalization–adjusted portfolio weights of firms, $\text{PWD}_{i,j,t+1} = \beta_1 \text{ATS}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha \text{FC}_{j,t} + \epsilon_{i,j,t}$. Both PWD and ATS are multiplied by 100. AT and ATS are defined annually using passengers flying on low-cost as well as full-service airlines. The control variables in these specifications include average firm characteristics at the destination for book-to-market (BM), size (SIZE), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA). All standard errors are clustered by year and by origin × destination.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

with distant firms is relevant to air travel's impact on portfolio investment. Intuitively, even if investors use low-cost airlines for leisure, low-cost air travel can mitigate local investment bias as investors become more familiar with the operations of distant firms.

The ability of air travel to familiarize investors with distant firms and facilitate monitoring of distant firms does not imply that investors are able to earn higher returns as a result of air travel. In particular, provided air travel increases the portfolio holdings of investors in distant firms by facilitating monitoring, later results find that such increases lower firm-level expected returns. Nevertheless, our next analysis directly examines whether air travel results in the acquisition of private information that improves investor-level returns using the following panel regression:

$$\text{Return}_{i,j,t+1,t+4} = \beta_1\,\text{AT}_{i,j,t} + \beta_2\log(\text{DIST})_{i,j} + \alpha\,\text{FC}_{j,t} + \epsilon_{i,j,t}. \quad (7)$$

The dependent variable in this specification is the risk-adjusted portfolio return of investors over the subsequent year (quarter $t+1$ to quarter $t+4$). The risk adjustment is conducted with characteristics using the procedure in Daniel et al. (1997). However, similar results are obtained if the risk adjustment is conducted using a multifactor model. As in prior specifications, Equation (7) includes origin–destination city, origin

Table 5. Impact of Air Traffic on Investor Returns

	Risk-adjusted returns			
AT	0.001	0.001		
	(0.47)	(0.84)		
Low-cost AT			0.000	0.000
			(0.87)	(1.04)
Full-service AT			0.001	0.001
			(1.09)	(1.55)
DIST		0.005		0.005
		(0.03)		(0.03)
BM		0.042***		0.042***
		(3.67)		(3.67)
SIZE		−0.007**		−0.007**
		(−2.43)		(−2.43)
PRET		−0.144***		−0.144***
		(−4.88)		(−4.88)
CAPEX		0.014***		0.014***
		(7.79)		(7.78)
Equity issuance		−0.381***		−0.381***
		(−7.99)		(−7.98)
Debt issuance		−0.016*		−0.016*
		(−1.84)		(−1.84)
IVOL		8.279***		8.277***
		(3.09)		(3.09)
Leverage		−0.004		−0.004
		(−0.11)		(−0.11)
ROA		0.078		0.078
		(1.21)		(1.21)
Fixed effects	Origin × destination Origin × year Destination × year		Origin × destination Origin × year Destination × year	
Observations	7,922,766	7,883,068	7,922,500	7,882,802
Adjusted R^2, %	24.3	25.4	24.3	25.4

Notes. This table reports the results from the panel regression in Equation (7) that examines the impact of air traffic (AT) defined in Equation (1) and distance (DIST) on the returns of investor portfolios, $\text{Return}_{i,j,t+1,t+12} = \beta_1\,\text{AT}_{i,j,t} + \beta_2\log(\text{DIST})_{i,j} + \alpha\,\text{FC}_{j,t} + \epsilon_{i,j,t}$. AT is defined annually as the log number of air passengers traveling between an origin (zip code i), where investors are located, and a destination (zip code j), where firms are headquartered. AT is computed for both low-cost and full-service airlines. FC contains average firm characteristics at the destination for book-to-market (BM), size (SIZE), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA). All standard errors are clustered by year and by origin × destination.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

city–year, and destination city–year fixed effects. Standard errors are double-clustered by origin–destination city pairs and by year.

The insignificant β_1 coefficients in Table 5 indicate that air travel does not create an informational advantage. Intuitively, air travel's ability to mitigate local investment bias does not undermine the informational advantage of local investors (Coval and Moskowitz 1999). To clarify, we measure the incremental return improvement from air traffic relative to a return benchmark model when testing the information hypothesis. Our results are robust to this benchmark being the return from the four-factor model or the model of Daniel et al. (1997) for risk-adjusted returns. However, our benchmark is not the return an investor would earn in the absence of air traffic. Instead, our benchmark is the return on a passive portfolio with zero alpha after risk or characteristic adjustment. This benchmark is reasonable because investors can simply invest in this passive portfolio by default.

Overall, air travel does not grant investors an informational advantage. Instead, our results for full-service airlines suggest that air travel increases portfolio investment in distant firms by facilitating monitoring. Furthermore, our results for low-cost airlines suggest that air travel mitigates local investment bias by increasing the familiarity of investors with distant firms.

3. Air Travel and Corporate Acquisitions

Our next analysis studies the impact of air traffic on corporate investment instead of portfolio investment. Our sample of acquisitions is from the Securities Data Company's Mergers and Acquisitions database. We identify acquisitions between January 1991 and December 2011 that satisfy the following criteria:

1. The acquiring and target firm both have five-digit zip codes available.
2. The acquisition is completed.
3. The acquiring firm controls less than 50% of the target firm's shares before the acquisition and more than 50% afterward.

We then construct a sample of potential acquiring firms using unique pairs of four-digit SIC codes for acquiring and target firms each year. A minimum (maximum) of 2 (20) acquisitions per year within each SIC code pair is required. All acquiring firms in a four-digit SIC code are considered to be a potential acquiring firm for every target firm in the pair. For each target firm, an indicator variable distinguishes the actual acquiring firm from other pseudo-acquiring firms. As an illustration, suppose three acquisitions occur within a year: A (SIC 1234) buys B (SIC 5678), C (SIC 1234) buys D (SIC 5678), and E (SIC 4321) buys F (SIC 8765). The third acquisition is ignored because the target firm in SIC code 8765 has no other potential acquiring firm in SIC code 4321. However, there are two potential acquiring firms in SIC code 1234 for target firms in SIC code 5678. Therefore, the final sample contains four observations, two actual acquisitions (A buys B, C buys D) and two pseudo-acquisitions (A buys D, C buys B). An indicator variable denoted DEAL distinguishes an actual completed acquisition from a pseudo-acquisition. Specifically, DEAL equals one for each completed acquisition of a target firm at the destination and zero otherwise.

The impact of air traffic between the origin and destination on the DEAL indicator function is estimated using the following logistic regression:

$$\mathrm{DEAL}_{i,j,t+1,t+4} = \beta_1\,\mathrm{AT}_{i,j,t} + \beta_2 \log(\mathrm{DIST})_{i,j} + \alpha\,\mathrm{DC}_{j,t} + \gamma\,\mathrm{DEST}_{j,t} + \epsilon_{i,j,t}\,. \quad (8)$$

Industry fixed effects for the acquiring firm at the origin and the target firm at the destination are included separately in the specification along with year fixed effects to account for the clustering of acquisitions. Standard errors are clustered each year. Zip code fixed effects are not included because the pseudo-acquiring firms are unlikely to be in the same zip code as the actual acquiring firms.

DC represents several deal characteristics that include the acquiring firm's size, leverage, Tobin's q, and free cash flow as well as indicator functions for whether the acquisition involved a cash offer, a private target firm, or a target firm in the high-tech industry. The last deal characteristic is an indicator function that equals one if the acquisition diversified the acquiring firm's operations.

The positive β_1 coefficients in Table 6 indicate that greater air traffic increases the likelihood of an acquisition. Industry fixed effects for the acquiring and target firms do not lead to differences in the β_1 coefficients, which are 0.025 (t-statistic of 2.14) and 0.024 (t-statistic of 1.99), respectively. In contrast, the negative β_2 coefficients for DIST identify a local investment bias that may arise from the geographic clustering of firms in the same industry. Chakrabarti and Mitchell (2013) find that firms exhibit a preference for acquiring nearby firms.

Table 6 reports insignificant abnormal returns for acquiring firms in the year following their acquisition. Abnormal returns are computed using value-weighted size and book-to-market portfolio returns. After replacing the dependent variable in Equation (8) with these abnormal returns, the insignificant β_1 coefficients for AT in this return regression indicate that acquiring firms do not obtain higher returns from air travel. The inability to reject the null parallels our earlier result for portfolio investment. Therefore, the ability of air travel to increase investment is most likely a result of greater familiarity with distant firms.

Table 6. Impact of Air Traffic on Corporate Acquisitions

	Acquisition probabilities		Acquirer returns	
AT	0.025**	0.024**	−50.839	−48.691
	(2.14)	(1.99)	(−1.34)	(−1.24)
DIST	−0.148**	−0.155**	−0.387	−0.698
	(−2.29)	(−2.55)	(−0.28)	(−0.48)
Size (A)	0.037***	0.051***	−0.518	−0.024
	(3.09)	(3.52)	(−1.31)	(−0.07)
Tobin's Q (A)	0.003	−0.017*	−1.076	−0.772
	(0.32)	(−1.73)	(−1.64)	(−1.16)
Leverage (A)	0.056	0.013	10.829	6.425
	(0.29)	(0.07)	(1.60)	(1.01)
Free cash flow (A)	0.198	0.148	45.418**	41.713**
	(1.25)	(0.79)	(2.77)	(2.59)
Diversify (A)	−0.545***	−0.782***	0.793	0.703
	(−6.24)	(−6.62)	(0.65)	(0.50)
Private (T)	−0.092*	−0.133***	−0.980	−1.072
	(−1.65)	(−2.75)	(−0.80)	(−0.91)
High tech (T)	−0.269	−0.241	2.590	2.307
	(−1.14)	(−1.21)	(0.91)	(0.69)
Cash deal	0.025	−0.007	1.527	0.967
	(0.60)	(−0.16)	(0.90)	(0.65)
Population	−0.004	0.001	−0.034	0.104
	(−0.19)	(0.04)	(−0.07)	(0.17)
Income	−0.127	−0.157	1.610	3.291
	(−1.04)	(−1.36)	(0.53)	(1.17)
Fixed effects	Acquirer industry	Target industry	Acquirer industry	Target industry
	Year	Year	Year	Year
Observations	7,067	7,048	6,395	6,395
Pseudo R^2, %	8.6	8.4	5.3	3.2

Notes. This table reports the results based on pseudo-acquisition probabilities. To construct the sample of potential acquiring firms, we identify acquiring firms and target firms each year. An indicator variable denoted DEAL distinguishes the actual acquiring firm from the other potential acquiring firms. The impact of air traffic on the likelihood of acquisitions is estimated using the logistic regression in Equation (8), $\text{DEAL}_{i,j,t+1,t+4} = \beta_1 \text{AT}_{i,j,t} + \beta_2 \log(\text{DIST})_{i,j} + \alpha \text{DC}_{j,t} + \gamma \text{DEST}_{j,t} + \epsilon_{i,j,t}$. Industry fixed effects for the acquiring firm and the target firm are included separately in the specification along with year fixed effects to account for the clustering of acquisitions. Equation (8) is then reestimated with abnormal returns as the dependent variable. Abnormal returns are computed using value-weighted size and book-to-market portfolio returns. DC controls for several characteristics of the acquiring firm; size, leverage, Tobin's q, and free cash flow as well as several deal characteristics, such as indicator functions for whether the acquisition involved a cash offer, private target firm, target firm in the high-tech industry, and diversified the acquiring firm's operations. DEST controls for population and per capita income at the destination.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

4. Air Hub Openings

As higher air traffic to a destination may be in response to greater investment opportunities at the destination, we examine variation in air traffic attributable to four air hub openings (Giroud 2013) during our sample period.[5] These hub openings are not dependent on investment opportunities in any individual destination but alter air traffic to multiple destinations.

Four criteria identify the initiation and cancellation of air routes because of the opening of an air hub. First, the origin and destination are required to be at least 100 miles apart. Second, the initiation of an air route is required to transport at least 1,000 passengers in the three years following the air hub's opening. Third, for an air route cancellation to be attributed to an air hub's opening, the route must have transported at least 1,000 passengers in the previous three years. Fourth, a geographic proximity filter requires the air hub to be situated sufficiently close to either the origin or destination. Specifically, either the distance between the origin and hub (first segment), the distance between the hub and destination (second segment), or both flight segments are required to be shorter than the distance between the origin and destination. This geographic filter ensures the air hub offers a suitable connection between the origin and destination. For example, air routes along the east coast are not affected by the opening of an air hub in Los Angeles. Therefore, although multiple air hubs can open in the same year, the impact of an individual air hub opening is limited to a subset of destinations based on geography.

To clarify, our analysis does not examine portfolio investment in firms headquartered near recently opened air hubs. Instead, portfolio investment in firms headquartered near destinations with connecting flights through a recently opened air hub is examined. For example, following the opening of an air hub in Los Angeles (LAX), we examine whether investors increase their portfolio holdings in Austin firms following the initiation of air routes from several cities in California to Austin that have a connection in LAX. Investment opportunities in Austin cannot explain the decision to open an air hub in LAX. Indeed, and salient investment opportunities in Austin would justify direct flights to Austin rather than connecting flights through LAX.

The variable $\mathrm{HUB}_{i,j,t}$ captures the initiation and cancellation of air routes following an air hub's opening. This variable equals zero in the three years before the opening of an air hub and the year in which the hub is opened. In the three years following an air hub's opening, $\mathrm{HUB}_{i,j,t}$ equals one if an air route between zip code *i* and zip code *j* is initiated in the year following its opening, subject to the four preceding criteria. Conversely, in the three years following an air hub's opening, $\mathrm{HUB}_{i,j,t}$ equals −1 between these respective zip codes subject to the same four criteria if an air route is cancelled in the year following its opening. Therefore, as with air traffic, $\mathrm{HUB}_{i,j,t}$ is defined between zip code pairs.

According to Figure 3, the number of investors and their dollar-denominated portfolio holdings both increase after the initiation of connecting flights through a recently opened air hub. Moreover, portfolio investment increases after the opening of an air hub and not before. Thus, portfolio investment responds to air traffic. Conversely, air traffic does not respond to portfolio investment (investment opportunities). Figure 3 also provides empirical support for the familiarity channel as route initiations attributable to an air hub opening exert a large positive impact on portfolio investment although the impact of route cancellations attributable to an air hub opening is more muted. The weaker response from cancellations is consistent with investors already being familiar with firms at the destination. Intuitively, the cancellation of air routes does not lead investors to liquidate their positions in familiar firms because of higher information acquisition or monitoring costs.

We examine the impact of variation in air traffic induced by air hub openings on the number of investors with equity positions in firms at the destination using the following specification:

$$\log(\mathrm{Investors})_{i,j,t+1} = \beta_1\,\mathrm{HUB}_{i,j,t} + \alpha\,\mathrm{FC}_{j,t} + \epsilon_{i,j,t}\,. \quad (9)$$

This specification and subsequent specifications reported in Table 7 include origin–destination city fixed effects that subsume the distance between these locations and year fixed effects.

The results in Table 7 reinforce our earlier findings because the β_1 coefficient from Equation (9) equals 0.012 (*t*-statistic of 4.60) in the full specification. Thus, firms attract more institutional investors following an increase in air traffic. However, the HUB analysis in Equation (9) understates the economic importance of air traffic if investors increase their dollar-denominated portfolio allocations in firms at a destination because of air traffic. This increase occurs if new firms at the destination receive investment or existing firms receive larger portfolio allocations. The following specification examines the impact of variation in air traffic attributable to air hub openings on dollar-denominated portfolio holdings:

$$\log(\mathrm{Holdings})_{i,j,t+1} = \beta_1\,\mathrm{HUB}_{i,j,t} + \alpha\,\mathrm{FC}_{j,t} + \epsilon_{i,j,t}\,. \quad (10)$$

For consistency with our previous results, the third decile filter continues to be applied to portfolio holdings.

Table 7 reports a positive β_1 coefficient of 0.028 (*t*-statistic of 3.84) from Equation (10) in the full specification. This positive coefficient indicates that route initiations attributable to air hub openings increase the dollar-denominated amount of portfolio investment in firms at the respective destinations. Conversely, route cancellations have the opposite implication for portfolio investment.

We also examine the impact of air travel on local investment bias. As HUB is an indicator variable that does not represent the level of air traffic, we regress PWD directly on HUB in the following panel regression:

$$\mathrm{PWD}_{i,j,t+1} = \beta_1\,\mathrm{HUB}_{i,j,t} + \alpha\,\mathrm{FC}_{j,t} + \epsilon_{i,j,t}\,. \quad (11)$$

Table 7 reports a positive β_1 coefficient equaling 0.028 (*t*-statistic of 3.67) in Equation (11). This positive coefficient confirms that air route initiations attributable to the opening of air hubs reduce local investment bias.

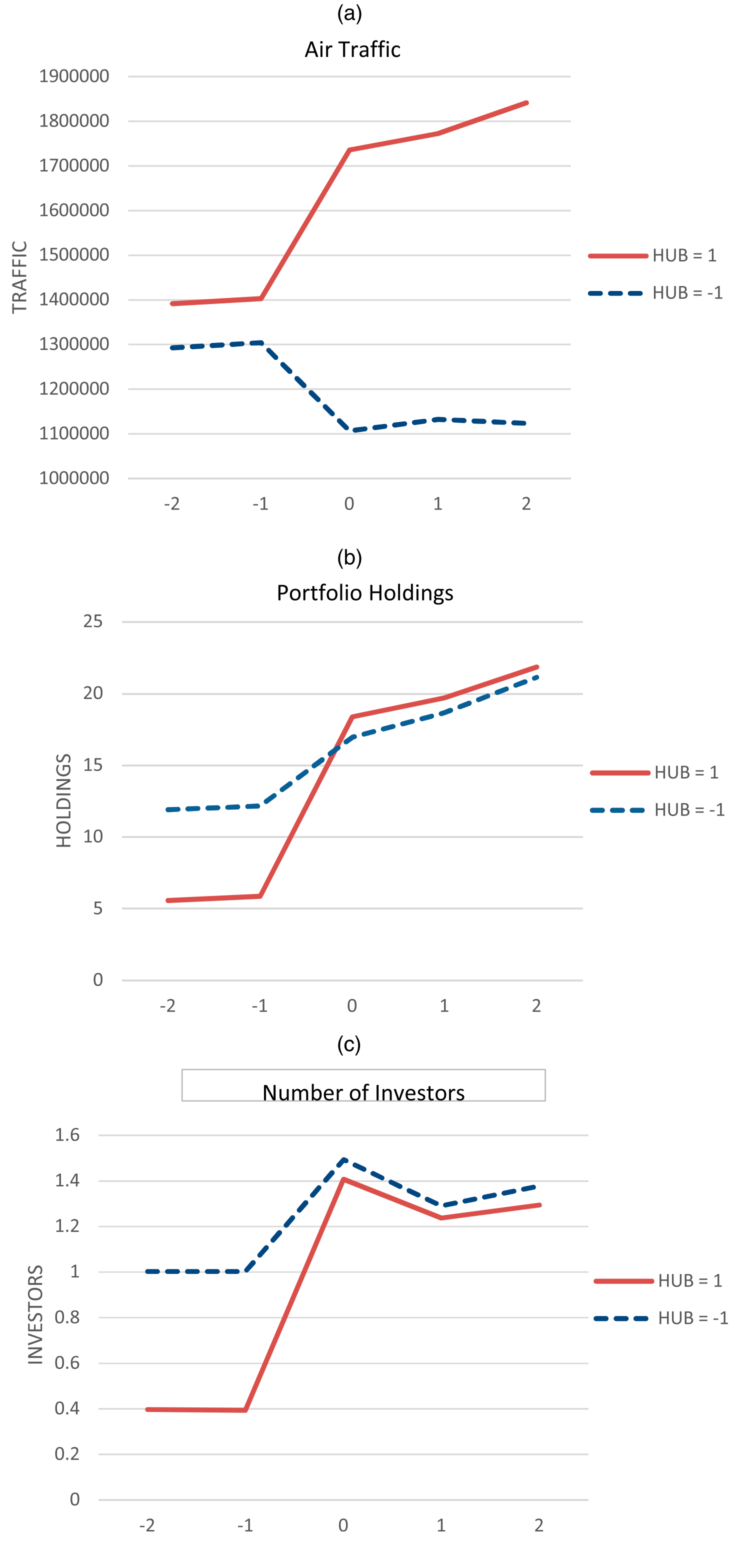
Interestingly, Table 7 reports a negative β_1 coefficient of −0.012 (*t*-statistic of −6.60) from the following panel regression:

$$\mathrm{Return}_{i,j,t+1,t+4} = \beta_1\,\mathrm{HUB}_{i,j,t} + \alpha\,\mathrm{FC}_{j,t} + \epsilon_{i,j,t}\,. \quad (12)$$

Thus, air routes initiated by air hub openings lower the risk-adjusted returns earned by investors at the origin. By focusing on firms affected by air hub openings, which tend to be smaller firms headquartered in small destinations, this inverse relation is consistent with improved risk sharing.

Finally, we compute the frequency and percentage growth in acquisitions conditional on $\mathrm{HUB}_{i,j,t}$ equal to +1 and −1. The frequency and growth of acquisitions

Figure 3. (Color online) Impact of Air Hub Openings on Air Traffic (Panel (a)), Portfolio Holdings in Millions of Dollars (Panel (b)), and Number of Investors (Panel (c))



Notes. The HUB indicator variable equals +1 if an air route is initiated between the origin and destination following an air hub opening. Conversely, this indicator variable equals –1 if an air route is cancelled following an air hub opening. Air traffic, portfolio holdings, and number of investors pertain to destinations served by connecting flights through an air hub and not the air hub's location.

Table 7. Air Hub Openings

	Number of investors		Portfolio holdings		Portfolio deviations		Investor return	
HUB	0.010***	0.012***	0.023***	0.028***	0.029***	0.028***	−0.014***	−0.012***
	(4.10)	(4.60)	(3.11)	(3.84)	(3.77)	(3.67)	(−7.45)	(−6.60)
BM		0.009**		−0.050***		0.003		0.031***
		(2.48)		(−4.61)		(0.19)		(7.63)
SIZE		0.049***		0.378***		−0.015***		−0.013***
		(48.91)		(123.30)		(−3.89)		(−13.75)
PRET		−0.029***		−0.111***		0.100***		0.016**
		(−4.93)		(−5.99)		(4.00)		(2.03)
CAPEX		−0.094		1.200***		−0.614***		−1.295***
		(−1.36)		(5.45)		(−3.26)		(−19.12)
Equity issuance		0.033		−0.159		0.027		−0.364***
		(0.98)		(−1.63)		(0.23)		(−7.52)
Debt issuance		0.015		0.133**		0.051		−0.071**
		(0.96)		(2.52)		(1.22)		(−2.51)
IVOL		−0.182		−6.649*		−8.454**		−1.769
		(−0.17)		(−1.67)		(−2.40)		(−0.85)
Leverage		0.024***		−0.081***		−0.244***		−0.029***
		(3.02)		(−3.10)		(−5.47)		(−3.93)
ROA		−0.073**		0.290***		−0.267**		0.234***
		(−2.36)		(2.93)		(−2.40)		(3.55)
Population		−0.001		−0.024***		0.010		0.024***
		(−0.45)		(−2.80)		(0.90)		(12.55)
Income		0.001		−0.133***		0.095*		0.025***
		(0.12)		(−3.34)		(1.70)		(3.57)
Fixed effects	Origin × destination Year		Origin × destination Year		Origin × destination Year		Origin × destination Year	
Observations	209,624	207,938	209,605	207,919	209,624	207,938	209,624	207,938
Adjusted R^2, %	22.0	23.0	20.1	27.2	18.5	18.5	10.9	11.7

Notes. This table reports the results from the panel regressions in Equations (9)–(11), $Y_{i,j,t+1} = \beta_1 \text{HUB}_{i,j,t} + \alpha \text{FC}_{j,t} + \epsilon_{i,j,t}$, as well as Equation (12), $\text{Return}_{i,j,t+1,t+12} = \beta_1 \text{HUB}_{i,j,t} + \alpha \text{FC}_{j,t} + \epsilon_{i,j,t}$. $Y_{i,j,t+1}$ represents the log number of institutional investors, log dollar-denominated portfolio holdings, and portfolio weight deviations, respectively, in Equations (9)–(11). $\text{HUB}_{i,j,t}$ captures the initiation and cancellation of air routes attributable to the opening of an air hub. $\text{HUB}_{i,j,t}$ equals zero in the three years before the opening of an air hub as well as during the year in which the hub is opened. In the three years following an air hub's opening, $\text{HUB}_{i,j,t}$ equals one if an air route is initiated between zip code i, where investors are located, and zip code j, where firms are headquartered in the year following its opening. Conversely, in the three years following an air hub's opening, $\text{HUB}_{i,j,t}$ equals −1 if an air route is cancelled between these respective zip codes in the year following its opening. In addition to year fixed effects, fixed effects for every origin–destination pair are included to subsume the distance between these locations, enabling the panel regressions to capture the time series relation between $\text{HUB}_{i,j,t}$ and the respective dependent variable. FC contains average firm characteristics at the destination for book-to-market (BM), size (SIZE), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA).

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

are calculated at the city level rather than the zip code level to ensure an adequate number of acquisitions are available. Acquisition growth is defined based on the number of acquisitions in the posthub period relative to the prehub period according to

$$\frac{2 \times (\text{Number of Acquistions Post-Hub} - \text{Number of Acquistions Pre-Hub})}{\text{Number of Acquistions Pre-Hub} + \text{Number of Acquistions Post-Hub}}. \qquad (13)$$

The prehub period consists of three years before the air hub opening, and the posthub period consists of three years after its opening.

The results in Table 8 are consistent with air traffic facilitating acquisitions. The increase in average acquisition activity following air route cancellations provides a benchmark for acquisition activity. The initiation of air routes leads to greater acquisition activity as the average number of acquisitions in the posthub period increases relative to the prehub period. In particular, the increase in acquisition activity is 82.6% following air route initiations compared with 63.3% following air route cancellations. The 19.3% difference in acquisition activity is significant with a t-statistic of 2.67. Thus, variation in air traffic attributable to air hub openings confirms that air travel facilitates corporate acquisitions.

5. Firm Implications of Air Travel

We utilize air passenger volume denoted APV in Equation (3) to investigate whether the investor base

Table 8. Air Hub Openings and Corporate Acquisitions

	Observations	M&A frequency	M&A growth
HUB = +1			
Prehub opening	1,002	1.219	
Posthub opening	1,002	2.483	
Difference		1.264	82.6%
HUB = −1			
Prehub opening	620	1.461	
Posthub opening	620	2.235	
Difference		0.774	63.3%
Difference-in-difference		0.490	19.3%
t-statistic		(2.41)	(2.67)

Notes. This table conditions acquisitions on the $\text{HUB}_{i,j,t}$ variable that represents air route initiations and cancellations attributable to air hub openings. $\text{HUB}_{i,j,t}$ equals zero in the three years before the opening of an air hub as well as during the year in which the hub is opened. In the three years following its opening, $\text{HUB}_{i,j,t}$ equals one if an air route is initiated between zip code *i*, where investors are located, and zip code *j*, where firms are headquartered in the year following an air hub's opening. Conversely, in the three years following an air hub's opening, $\text{HUB}_{i,j,t}$ equals −1 if an air route is cancelled between these respective zip codes in the year following an air hub's opening. The frequency and growth of acquisitions are calculated at the city level to ensure an adequate number of observations. Acquisition growth is defined based on the number of acquisitions in the posthub period relative to this number in the prehub period in Equation (13). The prehub period consists of three years before the air hub opening, and the posthub period consists of three years after its opening.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

of firms and their cost of equity respond to air travel. APV does not condition on the origin of air routes because improved risk sharing can be achieved using investors anywhere in the United States.

5.1. Investor Base

Our next empirical test determines whether air travel enables firms to broaden their investor base by attracting portfolio investment from distant investors using the following panel regression:

$$\log(\text{Investors})_{k,t+1} = \beta_1\,\text{APV}_{j,t} + \beta_2\left(\text{APV}_{j,t} \times \text{SIZE}_{k,t}\right) + \alpha\,\text{FC}_{j,t} + \epsilon_{k,t}\,, \tag{14}$$

where *k* denotes an index for firms headquartered at destination *j*. Fixed effects for each destination city are included in the specification with standard errors clustered by quarter. A positive β_1 coefficient indicates that greater air passenger volume at a destination enables nearby firms to attract a larger number of institutional investors. The β_2 coefficient pertains to an interaction variable defined by APV and firm size that allows the impact of air passenger volume on the investor base to be greater for small firms.

According to Table 9, the β_1 coefficient for APV is 0.030 (*t*-statistic of 6.15). Thus, greater air passenger volume at a destination is associated with nearby firms having a broader investor base comprised of more institutional investors. Furthermore, the negative β_2 coefficient of −0.007 (*t*-statistic of −11.36) indicates that the ability of air travel to broaden the investor base of firms is greater for small firms. These results are similar for destinations with small populations. Thus, small firms benefit from air travel more than large firms, especially those headquartered in small destinations.

5.2. Cost of Equity

According to Merton (1987), a more disperse investor base can lower a firm's cost of equity because of improved risk sharing. Motivated by this prediction, firm-level returns following an air hub opening are examined in the next panel regression:

$$\text{Cost of Equity}_{k,t+1,t+4} = \beta_1\,\text{APV}_{j,t} + \beta_2\left(\text{APV}_{j,t} \times \text{SIZE}_{k,t}\right) + \alpha\,\text{FC}_{j,t} + \epsilon_{k,t}\,. \tag{15}$$

Fixed effects for each destination city are included in this specification that has the risk-adjusted returns of individual firms as its dependent variable with standard errors clustered by quarter. A negative β_1 coefficient indicates that higher air passenger volume at a destination is associated with a lower cost of equity for nearby firms, for which the cost of equity is defined as the average annual return over a four-year horizon.

Table 9 reports a negative β_1 coefficient from Equation (15) equaling −0.032 (*t*-statistic of −5.73). Thus, greater air passenger volume at a destination lowers the cost of equity for nearby firms. In conjunction with the positive β_1 coefficient in Equation (14), our empirical evidence is consistent with air travel improving risk sharing.

The risk-sharing benefits of air travel are greater for small firms as the β_2 coefficient in Equation (15) is positive, 0.003 (*t*-statistic of 3.53). Intuitively, the familiarity of investors with large firms depends less on air travel than with small firms. Consequently, provided air travel increases the familiarity of investors with small firms at the destination, investment allocations may be diverted from large firms toward small firms.

To interpret the economic significance of the β_1 and β_2 coefficients, the log market capitalization of firms is required. In unreported results, the average log market capitalization equals 5.73, and an increase in APV from its median value to its 75th percentile equals 0.79. Therefore, the β_1 and β_2 coefficients in Table 9 for small destinations imply that this increase in APV lowers the average sized firm's expected return by $[-0.027 + 0.001 \times 5.73] \times 0.79 = -1.5\%$ per annum. For a large destination, this effect is −0.56% per annum. Thus, the average effect is close to −1%

Table 9. Impact of Air Passenger Volume on Firms

			Number of investors		Cost of equity	
	Number of investors	Cost of equity	Large destinations	Small destinations	Large destinations	Small destinations
APV	0.030***	−0.032***	0.007	0.032***	−0.030***	−0.027***
	(6.15)	(−5.73)	(0.87)	(5.88)	(−2.88)	(−3.56)
APV × SIZE	−0.007***	0.003***	−0.006***	−0.007***	0.004***	0.001
	(−11.36)	(3.53)	(−9.25)	(−7.79)	(3.40)	(0.96)
SIZE	0.728***	−0.061***	0.704***	0.724***	−0.077***	−0.037**
	(64.87)	(−4.99)	(71.18)	(51.23)	(−4.40)	(−2.44)
BM	0.024**	0.018**	0.010	0.059***	0.013*	0.032***
	(2.04)	(2.44)	(1.15)	(4.88)	(1.84)	(4.03)
PRET	−0.255***	−0.033	−0.258***	−0.247***	−0.053*	−0.013
	(−10.99)	(−1.45)	(−10.11)	(−11.35)	(−1.93)	(−0.63)
CAPEX	0.013***	0.015***	0.014***	0.395***	0.018***	−0.820***
	(8.73)	(6.45)	(8.41)	(3.97)	(7.57)	(−5.22)
Equity issuance	−0.325***	−0.410***	−0.347***	−0.276***	−0.479***	−0.334***
	(−8.15)	(−6.59)	(−7.81)	(−5.51)	(−7.74)	(−3.44)
Debt issuance	0.015*	−0.023**	0.043***	0.004	−0.069**	−0.004
	(1.74)	(−2.15)	(2.87)	(0.44)	(−2.39)	(−0.42)
IVOL	1.528	1.747***	3.894***	1.063	1.511	1.791***
	(1.44)	(4.72)	(4.23)	(1.31)	(1.23)	(5.02)
Leverage	0.120***	−0.002	0.030*	0.206***	0.022	−0.024
	(10.28)	(−0.06)	(1.94)	(15.03)	(0.59)	(−1.14)
ROA	−0.022	0.199***	−0.002	−0.114**	0.229***	0.141
	(−0.55)	(3.24)	(−0.05)	(−2.44)	(3.60)	(1.21)
Fixed effects	Destination	Destination	Destination	Destination	Destination	Destination
	Year	Year	Year	Year	Year	Year
Observation	159,529	159,529	79,750	79,778	79,750	79,778
Adjusted R^2, %	92.2	4.1	92.4	92.1	3.9	5.2

Notes. This table reports the results from the panel regression in Equation (14), $\log(\text{Investors})_{k,t+1} = \beta_1 \text{APV}_{j,t} + \beta_2 (\text{APV}_{j,t} \times \text{SIZE}_{k,t}) + \alpha \text{FC}_{j,t} + \epsilon_{k,t}$, which examines the investor base of firms. Results are also reported for the panel regression in Equation (15), $\text{Cost of Equity}_{k,t+1,t+12} = \beta_1 \text{APV}_{j,t} + \beta_2 (\text{APV}_{j,t} \times \text{SIZE}_{k,t}) + \alpha \text{FC}_{j,t} + \epsilon_{k,t}$, which examines the corresponding cost of equity per annum. APV is defined as the log number of air passengers at the destination. Fixed effects for each destination-quarter are included in both panel regressions with standard errors clustered by quarter. Both specifications are estimated separately for large and small destinations with the median population differentiating between these subsets. FC contains average firm characteristics at the destination for size (SIZE), book-to-market (BM), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA).

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

per annum. Therefore, the economic importance of air travel is significant. In particular, the Gordon growth model implies that this reduction in the cost of equity increases the valuation of a typical firm by approximately 20%.

To summarize, greater air travel to a destination lowers the cost of equity for small nearby firms by diversifying their investor base. Our next analysis uses exogenous variation in air passenger volume attributable to the opening of air hubs to confirm these implications of air travel.

5.3. Air Hub Openings

We construct an indicator variable $\text{NET}_{j,t}$ based on variation in air traffic attributable to the opening of an air hub. This indicator variable equals zero in the three years before the opening of an air hub and the year in which the hub opens. $\text{NET}_{j,t}$ equals one in the three years following an air hub's opening if more air routes involving zip code j are initiated than cancelled in the year following its opening. Conversely, $\text{NET}_{j,t}$ equals −1 in the three years following the air hub's opening if more air routes involving zip code j are cancelled than initiated in the year following its opening. On average, route initiations attributable to an air hub opening outnumber route cancellations three to one.[6]

As $\text{NET}_{j,t}$ is a discrete variable that either equals +1 or −1, we construct an indicator function $\text{LARGE}_{k,t}$ that equals one if the market capitalization of firm k headquartered at zip code j is above the 70th percentile of all stocks. We then repeat the estimation of Equations (14) and (15) with discrete variables $\text{NET}_{j,t}$ and $\text{LARGE}_{k,t}$ replacing their continuous counterparts $\text{APV}_{j,t}$ and $\text{SIZE}_{k,t}$, respectively.

The air hub opening results in Table 10 based on NET are consistent with the earlier results in Table 9

Table 10. Firm Implications of Air Hub Openings

	Number of investors	Cost of equity
NET	0.032***	−0.020**
	(2.67)	(−2.52)
NET × LARGE	−0.001	0.024**
	(−0.09)	(2.25)
LARGE	1.972***	−0.054***
	(83.75)	(−6.20)
BM	−0.087***	0.026***
	(−5.31)	(3.18)
PRET	−0.038	−0.010
	(−1.29)	(−0.43)
CAPX	1.528***	−0.908***
	(4.79)	(−4.47)
Equity issuance	−0.475***	−0.512***
	(−4.27)	(−6.30)
Debt issuance	0.012	−0.023
	(0.29)	(−0.47)
IVOL	−25.762**	1.371
	(−2.45)	(1.12)
Leverage	−0.007	0.008
	(−0.18)	(0.18)
ROA	0.103**	0.047***
	(2.13)	(3.89)
Fixed effects	Destination	Destination
	Year	Year
Observations	38,300	38,300
Adjusted R^2, %	70.67	6.23

Notes. This table reports the results from replacing $APV_{j,t}$ from the panel regression specifications in Equations (14) and (15) with the variable $NET_{j,t}$ that equals zero in the three years before the opening of an air hub as well as during the year in which the air hub is opened. In the three years following an air hub's opening, $NET_{j,t}$ equals one if more air routes involving zip code *j* are initiated than cancelled in the year following its opening. Conversely, in the three years following an air hub's opening, $NET_{j,t}$ equals −1 if more air routes involving zip code *j* are cancelled than initiated in the year following its opening. Firm size (log of market capitalization) is replaced with $LARGE_{k,t}$, an indicator function that equals one for firms whose market capitalization is above the 70th percentile. In this specification, FC contains average firm characteristics at the destination for book-to-market (BM), and past return (PRET) characteristics as well as capital expenditures (CAPEX), equity issuance, debt issuance, idiosyncratic volatility (IVOL), leverage, and return on assets (ROA). Additional independent variables control for population and per capita income at the destination.

***, **, and * denote significance at the 1%, 5%, and 10% significance levels, respectively.

because the NET coefficients are positive and negative, respectively, when the number of investors and cost of equity is the dependent variable. Specifically, these coefficients equal 0.032 (*t*-statistic of 2.67) and −0.020 (*t*-statistic of −2.52), respectively.[7] Intuitively, the initiation of an air route to a destination because of an air hub opening increases air passenger volume at the destination.

Overall, an increase in the number of air passengers at a destination as a result of an air hub opening allows nearby firms to attract more institutional investors. This broadening of the investor base lowers their cost of equity. Consequently, the implications of air travel for firms are confirmed by the opening of air hubs.

6. Conclusion

Our study finds that air travel has important asset pricing and corporate finance implications. Institutional investors are more likely to invest and allocate more investment to firms headquartered at destinations that have better air connectivity with their location. In particular, air travel mitigates local investment bias and improves portfolio diversification without influencing portfolio returns. Thus, air traffic appears to facilitate investment by increasing the familiarity of investors with distant firms. Similarly, air traffic facilitates corporate acquisitions of distant target firms. These findings are confirmed by variation in air traffic attributable to the opening of air hubs.

Furthermore, a larger number of air passengers at a destination broadens the investor base of small nearby firms and lowers their cost of equity (Merton 1987). These results are also confirmed by variation in air passengers attributable to the opening of air hubs. Overall, air travel improves the diversification of investor portfolios while lowering the cost of equity for firms.

Acknowledgments

All errors are the authors' own.

Endnotes

[1] Although aggregate investment opportunities across multiple destinations may justify opening an air hub, each individual destination served by a connecting flight through the air hub has insufficient investment opportunities to justify its opening.

[2] Huberman (2001) also concludes that familiarity influences investment decisions. In our context, air travel can increase familiarity through indirect word-of-mouth communication and social interactions (Hong et al. 2004).

[3] In the Gordon growth model, equity duration equals the price-to-dividend ratio. Therefore, for a typical firm with a price-to-dividend ratio of 20, a 1% decrease in the cost of equity increases the firm's valuation by 20%.

[4] Low-cost airlines altered the competitive landscape in air travel and, consequently, the capital structure of full-service airlines (Parise 2018). The list of low-cost airlines includes AirTran Airways, Allegiant Air, Frontier Airlines, JetBlue, Southwest Airlines, Spirit Airlines, Sun Country Airlines, and Virgin America as well as several airlines that have discontinued their operations: ATA Airlines, Hooters Air, Independence Air, MetroJet, Midway Airlines, National Airlines, Pacific Southwest Airlines, Pearl Air, People Express, Safe Air, Skybus Airlines, SkyValue, Southeast Airlines, Streamline Air, Tower Air, United Shuttle, ValuJet Airlines, Vanguard Airlines, Western Pacific Airlines, and USA3000 Airlines.

[5] These four air hub openings are (1) Columbus (CMH) in 1991, (2) Atlanta (ATL) in 1992, (3) Los Angeles (LAX) in 1997, and (4) Kansas City (MCI) in 2000. The four airlines opening these respective air hubs are America West Airlines, Trans World Airlines, United Airlines, and Midwest Airlines. We examine all airlines that have connecting flights via the air hub instead of limiting our analysis to the airline responsible for opening the hub.

[6] To focus our results on regularly scheduled air routes, we remove destinations whose airline passenger volumes are in the bottom decile.

[7] The interaction terms are only nonzero for large firms whose headquarter location is affected by an air hub opening, which seldom occurs because large firms are more likely to be headquartered in large destinations that are not affected by air hub openings.

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