ALL CLEAR FOR TAKEOFF:
EVIDENCE FROM AIRPORTS ON THE EFFECTS OF INFRASTRUCTURE PRIVATIZATION

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All Clear for Takeoff: Evidence from Airports on the Effects of Infrastructure Privatization
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ABSTRACT

Infrastructure assets have undergone substantial privatization around the world in recent decades. How do these assets perform post-privatization? This paper examines global airports. Our central finding is that the type of ownership matters: Volume, efficiency, and quality improve substantially under private equity (PE) ownership—both following privatization and in subsequent transactions—but there is little evidence of improvement under non-PE private ownership. This remains the case for airports sold in auctions in which PE and non-PE firms bid, mitigating concerns about selection. PE owners invest in new physical capacity and appear to negotiate more effectively with airlines, especially in the presence of a state-owned flag carrier. Higher prices and more retail revenue increase net income, with no evidence of cost reductions or layoffs. We find that improvements are concentrated when there is a competing airport nearby, under longer-term leases, and when the local government is less corrupt. One explanation for the failure of non-PE private firms to outperform government ownership is that they tend to target more corrupt locations.

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1 Introduction

Trade and transportation infrastructure have undergone massive privatization worldwide over the past 50 years. Assets such as seaports, airports, roads, bridges, railroads, water systems, and internet cables have transitioned from government ownership and operation to the private sector, via either long-term concession leases or outright ownership transfers. Over time, private equity (PE) investors—usually through dedicated infrastructure funds—have come to play an important role in this process. The privatization of traditionally publicly-owned infrastructure raises questions about what types of goods private markets can efficiently provide, a topic that economists have long debated, perhaps most famously in the context of lighthouses.[1] Studying infrastructure privatization in the modern era sheds light on the economics of these types of goods, the public policy questions around who should own these assets, and the role of PE in the economy.

We focus on airports, examining how changes in ownership relate to changes in service quality and financial performance. Airports are crucial strategic and economic assets, serving as gateways for people and goods from around the globe to enter a city and its country. Airports and infrastructure more broadly have distinctive features relative to other assets: They are large, long-term, provide an essential service, and face little competition and high barriers to entry. Unlike other types of infrastructure, however, airport revenue can be volatile and linked to the business cycle, as it depends on passenger and freight transport.

In this paper, we document airport privatization patterns over nearly four decades and examine the consequences of ownership type. Airports provide a useful setting for an international analysis because they share a common business model: Sell to passengers in terminals and charge airlines for using the terminals and gates. Around the world, airports adhere to common standards that enable aggregate performance analysis. We consider three ownership types that have dominated the industry over the past fifty years: Public, non-PE private, and PE. Under public ownership, the government owns and manages the airport. When the airport privatizes, a firm acquires the right to operate, invest in, and earn residual cash flows from the airport in either a sale or a concession. We segment the private firms into those that are owned by infrastructure funds (PE) and those that are not (non-PE private).

Relative to other work on infrastructure or privatization, one contribution of this paper is to consider PE separately. PE represents a different economic model from independent private ownership, including higher-powered incentives to maximize profits and shorter time frames for creating value. Infrastructure

[1] See Mill and Robson (1965), Pigou (1938), Samuelson (1964), and Coase (1974).

funds have been growing rapidly and are now a major asset class within private capital markets. Between 2015 and 2019, these funds invested $388 billion and had more than $300 billion of capital raised and ready to invest ("dry powder") as of 2022, up from $69 billion in 2011.[2] There is little evidence on whether PE creates value in infrastructure, which is characterized by longer holding periods and intensive government monitoring. With long term, stable cash flows, privatized infrastructure has proven an attractive class to institutional investors. However, Andonov et al. (2021) document that in practice infrastructure funds have failed to outperform the market on average. This finding contrasts with evidence of strong returns in PE overall (Harris et al., 2014). It is an open question whether infrastructure funds have similar real effects as PE in other sectors.

We combine a wide array of sources to paint a reasonably holistic picture of airport ownership and operations. We begin with an expansive dataset of 2,444 unique airports in 217 countries. In the most comprehensive, hand-collected privatization data effort to date (to our knowledge), we document that 437 have been privatized. Of these, 102 have at least once been owned by an infrastructure fund. In our main analysis, we use airport-year panel data, with information on traffic and passengers at airports with more than 10,000 passengers and 100 flights a year.

We first examine the factors that predict airport privatization. Non-PE firms target countries that score higher on a government corruption index, while PE's targeting is unrelated to local corruption. PE firms could find countries with high corruption to be less appealing since they or their investors (i.e., limited partners) may be subject to standards such as the U.S. Foreign Corrupt Practices Act.[3] In addition, PE tends to target airports with more passengers and routes, while non-PE private targets airports with more airlines and that are more likely to have a competing airport nearby.

We next explore whether the ownership type is associated with operational changes. Our empirical model, following the approach commonly used in the literature, is a differences-in-differences design. As we are interested in both how airport performance changes following privatization, and also whether PE ownership is distinct from non-PE private ownership, we employ a single specification that makes use of the four types of ownership changes we observe in the data. The first two are the privatization events, where the airport transitions from government to either private non-PE or PE ownership. The second two

[2] See EY Report, FT Article, and the Pitchbook 2021 Q1 Real Assets Report (does not include Oil & Gas).

[3] As one example of how corruption can affect an investment firm, in 2016 Och-Ziff Capital Management admitted to involvement in a bribery scheme in the Democratic Republic of the Congo, and agreed to pay a criminal penalty of more than $213 million. See DOJ Press Release.

are post-privatization transactions where an airport transitions from non-PE private to PE or vice-versa. Since airports are not randomly targeted for ownership changes, our case for causality is based on dynamic, fully saturated differences-in-differences event studies. If the event study suggests no pre-trends—i.e., the airport was not on track to the observed outcome before the acquisition—we conclude that the result has some causal interpretation within the treated population. This means that our findings do not necessarily generalize to a random airport. However, the treated population is economically relevant because airports have in practice transitioned to private and PE ownership across broad swathes of the world.

The results, estimated between 1996 and 2019, paint a consistent picture in which infrastructure funds improve airport performance. First, we consider traffic. Passengers per flight represent a key efficiency metric, enabling the airport to serve more customers with the same infrastructure. Under PE ownership, both in privatization events and in subsequent acquisitions from non-PE private firms, the number of passengers per flight increases, for example by 21% in privatization events. In contrast, non-PE privatization has no effect. Overall passenger traffic increases under both ownership types, but by more than four times as much—87%—under PE ownership. The number of flights exhibits a similar pattern.

Two types of operational changes explain the increase in passengers per flight and overall volume following PE buyouts. First, the share of larger jet planes increases at the expense of smaller aircraft. One way an airport can encourage airlines to bring larger planes is to change the fees charged to airlines, and indeed we see that fees change accordingly. Relatedly, there is a strong association between PE acquisitions and price deregulation, which could reflect lobbying by PE firms. The second mechanism is that physical capacity expands. Using satellite images of airports, we show that PE ownership is associated with expansions in terminal size, both in privatization and subsequent transactions, suggesting an important role for capital investment.

Airports are the sole gatekeepers to a key downstream sector: commercial airlines and the routes they offer. Although we find average increases in the number of airlines and routes for both non-PE and PE ownership, the event studies have strong pre-trends for non-PE, suggesting that targeting rather than operational changes explains the average effects. For PE, the increase in airlines reflects more low-cost carriers. The large increase in routes under PE ownership, which is driven by international routes, benefits passenger welfare and the local economy, as access to more routes creates new economic opportunities (Bernstein et al., 2016).

PE ownership also appears to improve airport quality. It leads to declines in the flight cancellation rate,

both in privatization and subsequent transactions. To evaluate the passenger experience, such as the quality of the stores, waiting areas, and overall cleanliness, we consider ACI World's annual ASQ awards, which recognize airport excellence based on passenger surveys. We show that post-privatization transitions to PE ownership increase the chances of winning an award.

In a rare look at the income statements of private, PE-owned firms, we see that net operating income increases by 108% after PE privatization. This increase appears to reflect higher revenues rather than substantial cost-cutting, as we see increases in operating expenditure per passenger and no change in employees per passenger. We observe increased revenue, driven by both aeronautical (i.e., charged to airlines) and non-aeronautical (i.e., terminal retail) sources. After transitions from PE to non-PE private ownership, there are declines in net income and revenue, as well as in operating expenditure per passenger.

The remainder of our analysis considers mechanisms that could potentially explain the somewhat surprising lack of improvement following privatization or acquisitions by non-PE private firms, and the remarkable benefits to the airport following PE acquisitions. Since airports are strategic national assets with high levels of state involvement, government capacity may play a role. Effective regulation and monitoring can help to drive benefits from private ownership. Alternatively, if the new owner creates value by extracting rents from low-capacity states, then we might not see much improvement. We find that in high-corruption countries, non-PE private ownership has zero or negative effects on the measures most relevant to the local economy: volume, routes, passengers per flight, number of flights. In contrast, the effects are positive in low-corruption countries. Recall from above that non-PE private firms tend to target airports in high-corruption countries for acquisition. In contrast, PE firms do not appear to select on this metric and the effects of PE ownership are much more weakly associated with corruption levels. Overall, non-PE firms are more likely to be active in corrupt countries, where return opportunities may come via rent extraction and where private benefits may be greater.

While targeting more corrupt countries may help explain the non-PE private results relative to government ownership, selection does not fully explain the differentially positive impact of PE relative to non-PE private. This is because when we limit the sample to airports in which both PE and non-PE firms bid to acquire the airport in a government-owned auction, we find results similar to the main models. In these auctions PE wins 77% of the time, consistent with PE paying a premium because of its greater ability to create value alongside, in some countries, higher tax benefits (Kaplan, 1989; Palepu, 1990).

Another mechanism for positive effects related to local government concerns the role of state-owned

airlines, often called “flag carriers," some of which have been privatized over time. Examples are British Airways, Russia’s Aeroflot, and Singapore Airlines. When government-owned, they may have cozy relationships with the local airport, allowing the flag carrier to exploit market power by foreclosing access to other airlines. One way that new, private owners could increase the number of airlines is to breach pre-existing implicit or explicit contracts between the airport and state-owned flag carriers (Shleifer and Summers, 1988). We find that PE ownership is associated with much larger increases in the number of airlines and low-cost carriers in particular when the airport has a state-owned flag carrier, suggesting that the new PE owner creates value in part by reducing the flag carrier’s pre-existing rents.

We also find that performance improvements are substantially larger when there is a competing airport nearby. This modulating role of competition is magnified under PE ownership, consistent with PE-owned firms being more responsive to competitive incentives, which could reflect high-powered compensation received by management. Moreover, volume increases under PE ownership appear to reflect market expansion rather than market stealing, because there are no negative effects on traffic at the competing airport. As in other sectors, competition plays a beneficial role in the airport industry for inducing the most productive outcomes under private ownership (see Yan and Winston (2014) for evidence from the U.S.).

Finally, an important but understudied question in corporate finance is the extent to which ownership leads to more efficient investments than control rights alone (Hart, 1995). Airport privatization presents an interesting setting for distinguishing between the roles of ownership and control by comparing concessions (which confer control rights in shorter term leases) with sales (which confer something more like ownership in longer term leases or outright sales).[4] We find that across the main outcome variables, sales lead to larger efficiency improvements than concessions, especially for PE. This suggests that ownership rights may lead to better aligned incentives, at least in our context.

We perform a number of robustness tests. Most importantly, we use three methods to address potential bias from multiple treatment periods (i.e., staggered roll-out), even though the vast majority of observations in our sample are never-treated: the Callaway and Sant’Anna (2021) estimator, a stacked regression (Cengiz et al., 2019; Baker et al., 2022) and a matching estimator (Huntington-Klein, 2021). Our key findings showing productivity gains following PE buyouts are robust to all of these approaches.

Overall, our results suggest that when infrastructure funds acquire airports, they increase volume,

[4]Following industry standards, we define a sale as either an outright sale or a long-term (>30 years) lease, while concessions are shorter-term leases.

quality, and efficiency. In contrast, under non-PE private ownership there are either no average improvements or strong pre-trends in event studies, pointing to a targeting mechanism. One caveat is that each data source does not cover all airports, and some samples have relatively small numbers of PE-owned airports, though the main results are robust to the overlapping samples. Nonetheless, we believe our sample and outcome variables represent by far the most complete picture of ownership and multi-faceted operations for a class of infrastructure to date. Future research is needed and we hope that our data will be useful in those efforts.

One takeaway from our analysis is that privatization consistently leads to better performance only with PE involvement. PE firms tend to bring knowledge of global best practices, new managers with higher-powered compensation, and capital. We show how this leads to a number of new strategies, including investment in capacity, service improvement, and better negotiating with airlines. One reason a hard-nosed airport owner may benefit the airport is the nature of airport customers. Airports negotiate access, prices, and capital expenditure with airlines, which are well-informed and well-resourced corporate stakeholders. Air travelers are relatively wealthy and may purchase less in terminals or use other means of travel, such as high-speed rail or a nearby airport, if the service quality is poor. In contrast, the settings where PE has been found to have detrimental effects, such as for-profit colleges and nursing homes, feature customers who are more vulnerable and face information asymmetry (Eaton et al. (2020), Gupta et al. (2021)). Finally, airports face intensive government scrutiny, creating an ever-present threat of regulation. For these reasons, airports may be a setting in which PE's capacity to finance and orchestrate complex operational improvements benefits at least one key non-investor stakeholder: passengers. Some airlines may suffer from higher fees, but are likely to benefit from higher passenger volume.

This paper sits at the juncture of three literatures: the political economy of privatization, infrastructure economics, and the real effects of PE. Our results offer contributions to all three. First, while the privatization literature has typically found large positive effects on firm performance of privatization (e.g., Dinc and Gupta (2011)), we find weak effects in the context of airports for non-PE private firms.[5] One possibility, in addition to the corruption relationship discussed above, is that the essential and highly salient nature of airports may lead to decent performance under government ownership compared to other infrastructure assets. Existing work on airport privatization has used small samples or case studies, with more descriptive methods, and

[5]Dinc and Gupta (2011) study drivers of firm privatization in India. While their study is mostly focused on targeting, they also find evidence of efficiency improvements after privatization. Other work on privatization includes La Porta and Lopez-de Silanes (1999), Megginson et al. (2004), Biais and Perotti (2002), and Dastidar et al. (2008).

finds mixed effects of privatization on efficiency.[6] There is also work on congestion in airports (Brueckner (2002), Mayer and Sinai (2003)).

Second, we contribute to the literature on who should own and invest in infrastructure. This literature has focused primarily on the role of government, asking how political agendas affect investment and how that investment affects macroeconomic growth (Gramlich (1994), Milesi-Ferretti et al. (2002), Esfahani and Ramırez (2003), Cadot et al. (2006)). For example, Donaldson (2018) shows the large impact of India's colonial rail network. Motivated by these findings and the fact that air travel represents the modern equivalent of the rail, boat, and road systems studied in previous works, we take a different approach, focusing on the nature of ownership. Our results shed light on control rights versus ownership rights and highlight that especially in regulated contexts, high-powered incentives matter for performance.

Finally, we contribute to work on the real effects of PE by focusing on critical trade and transportation infrastructure.[7] One immediate difference between infrastructure and other PE investments is longer holding periods; the average in our data is nearly 11 years, relative to the standard three to five years in other sectors. Andonov and Rauh (2022) document ownership changes of U.S. electric plants and find that PE charges higher prices. More broadly, existing work has found positive effects on firm performance and productivity, but focusing on sectors with relatively little government interference, transparent product quality, and high levels of competition, such as grocery stores, fast food restaurants, and manufacturing (Davis et al. (2014), **?**, Bernstein and Sheen (2016)). In contrast, there is evidence of negative effects in sectors with opaque product quality, intensive subsidy, and which traditionally rely on implicit contracts with consumers and the government (Eaton et al. (2020), Gupta et al. (2021), Phalippou (2020), Liu (2021), Ewens et al. (2022)).[8] Our analysis may help to reconcile these findings. We find largely positive effects of PE ownership in a sector with intensive government regulation and little competition. However, airport quality is salient to the local population and airports' national strategic importance and safety concerns yield motivated and politically empowered regulators, with other sophisticated stakeholders–such as airlines–also monitoring. Thus it appears that PE can work well in a highly regulated setting when incentives are well-aligned.

[6] In a sample of about 100 mostly North American airports, Oum et al. (2008) find evidence that privatization increases efficiency. Van Dender (2007) studies determinants of airport revenues in the U.S. Other work includes Oum et al. (2006), Assaf and Gillen (2012), Adler and Liebert (2014), Gutiérrez and Lozano (2016), Olariaga and Moreno (2019), and Aguirre et al. (2019).

[7] A strand of the PE literature studies returns to investors, including **?**, Sensoy et al. (2014), Cavagnaro et al. (2019), Harris et al. (2014), Robinson and Sensoy (2016), Andonov et al. (2021), and Gupta and Van Nieuwerburgh (2021). Other work considers how PE structures transactions to create value (Ivashina and Kovner (2011)).

[8] Other work on the real effects of PE includes Boucly et al. (2011), Olsson and Tåg (2017), **?**, Cohn et al. (2021), Fang et al. (2023), **?**, Gornall et al. (2021), and Liu (2021). See Jenkinson et al. (2021) and Gompers and Kaplan (2022) for surveys.

2 Institutional Context

In this section, we provide background on airport ownership, airport revenue and cost structure, and discuss the role of private equity.

2.1 Privatization Background

Airports have historically been government-owned and operated, reflecting their role as vital strategic assets for national economic growth, prestige, and security, with further implications for the local environment and economy. Regardless of ownership, these features lead airports to be closely monitored and regulated. Although today most airports remain owned by national or regional public sector agencies, there has been a wave of privatization over the past fifty years, inaugurated in 1987 when the UK floated the British Airports Authority (BAA)–which consisted of Heathrow and six other airports–on the London Stock Exchange. The rationales for this move and subsequent early privatizations were reducing public sector inefficiencies and improving service quality (Graham (2020)). After the 2008 financial crisis, the rationale for privatization shifted towards emphasizing financial gains for the public sector (i.e., reducing public debt) and accessing private capital for needed new investment (Van Nieuwerburgh et al. (2015), Cruz and Sarmento (2017)).

Alongside these ideological trends, privatization manifested in three main ways. In the early phase, IPOs were a common means, as in the case of BAA or Malaysia in 1999.[9] In the late 1990s, governments began to rely on two other forms: concessions and sales. In a concession, also called a public-private partnership (PPP), governments grant rights to a private firm to operate and potentially invest in an airport for a specific period. In exchange, the firm pays concession fees to the government, which can be fixed or variable (e.g., as a percentage of revenue). At the end of the contract period, the airport typically reverts to the government. The government remains the airport owner and has ultimate control rights (IATA (2018)). Examples of concession deals include London Luton in 1998, as well as the Delhi and Mumbai airports in India in 2006.[10] The third form, a sale, usually involves a very long lease of the whole airport (say, 100 years) to a private company. For example, in 1997 and 2002, Australia privatized the Brisbane, Melbourne, Perth, and Sydney airports this way.[11] In a sale, the private company obtains ultimate control rights over the

[9] Other examples are Vienna (1992), Copenhagen (1994), Auckland (1998), Zurich (2000), Fraport (2001), Thailand (2004), Paris (2005), and Navegacion Aerea (AENA) in Spain (2015).

[10] Further examples of concessions, which sometimes involve new terminal construction contracts, include Lima (2000), Ankara (2003), Montego Bay (2003), Brasilia/Sao Paulo (2012), Zagreb (2012), ANA in Portugal (2013), and Kansai (2015)

[11] Other examples are Dusseldorf (1998), South Africa (1998), Turin (2000), Rome (2000), Milan (2011), and Toulouse (2015),

airport. However, in both concessions or sales the private firm typically has de facto control over operations and rights to residual cash flows conditional on the local regulatory regime.

Early private airport owners were entities created to run one privatized airport, which then expanded, purchasing others as they privatized in turn. Over time, the composition of airport buyers shifted towards international funds sponsored by financial institutions, notably infrastructure-specific PE (Condie, 2015; Graham, 2020). This new type of owner brought larger amounts of capital for improvements and, in theory, more professional operational knowledge.[12] Beyond the three broad categories of public, non-PE private, and PE ownership, there are other forms of private sector involvement, such as in developing and running specific terminals. For the purposes of our study, since we do not observe terminal-level performance, we are interested in overall airport ownership. This is also the most interesting unit of observation from the perspective of control rights and residual claim to profits.

The U.S. has not privatized its airports because of strong federal government incentives to remain publicly owned and operated, which do not exist in most other countries. First, public sector airports in the U.S. can raise tax-exempt revenue bonds. Second, airports can receive large federal Airport Improvement Program grants if they commit to not making a profit from airport operations.[13] Since 2010, the federal government has offered a limited number of exceptions to the normal grant restriction, but the only successful instance of privatization has been the airport in San Juan, Puerto Rico. In other cases, such as that in Westchester County Airport and Chicago Midway, local opposition to expansion or to privatization on principle has derailed the efforts.[14]

2.2 Airport Revenue and Cost Structure

Airport revenue and pricing follows from the two basic functions of an airport: To enable the airplane to safely take off and land, and to move the passenger through the terminal. There are two primary sources of revenue. The first and larger source is aeronautical revenue, which comes from airlines, and includes per-passenger charges (fees for using the terminal building) as well as per-landing and per-takeoff charges

among many others, including regional airports in the UK.

[12] As an early example, in 2001, asset manager H.R.L Morrison & Co purchased Glasgow Prestwick Airport in the UK. More recently, in 2015, Corsair Capital purchased the Lynden Pindling International Airport in the Bahamas.

[13] https://reason.org/wp-content/uploads/annual-privatization-report-2021-aviation.pdf

[14] For example, see https://www.theexaminernews.com/opposition-to-privatization-strong-at-airport-hearing-in-armonk/a

(fees for using the runways and gates).[15] Passenger charges and runway charges represent 41% and 21% of aeronautical revenues, respectively.[16] Parking charges are the third largest source of fees (12%), and the rest varies by airports, including noise and environmental charges and government fees.

Non-aeronautical (commercial) revenue comes from retail leases as well as ancillary passenger services such as parking garages and transportation (taxis, buses). Airports earn rents from retail and restaurant space in the terminals. These leasing contracts are generally structured as minimum fixed rents plus additional profits from sales above specific thresholds. Retail leases represent 28% of non-aeronautical revenue and car parking and property (e.g., rental cars) revenue are secondary sources (20% and 18%, respectively). Non-aeronautical revenues were on average 38.8% of the total revenues in 2013.[17]

Revenue and profit margins typically increase with the number of passengers and flights.[18] Airports are subject to high fixed costs, and the world's major airports are run at almost full capacity (Gelhausen et al. (2013), Dray (2020)). Large-scale expansion such as adding runways or terminals is often risky because it requires lumpy and irreversible capital investment with much uncertainty about future demand growth. New additions also typically must clear high local land use, noise, and environmental hurdles. Thus, for boosting economic profits, it is typically most desirable to increase operating efficiency by accommodating more passengers per flight and handling a higher volume of aircraft movement per runway. Although it is not always possible to increase the number of international passengers, these are often the most profitable, especially in developing countries. Airport owners can achieve higher volume without adding space in various ways, including by investing in technology, management, and better use of existing space.

One distinctive feature of infrastructure is that governments often regulate how assets may earn revenue, sometimes with the justification that the asset represents a natural monopoly. Therefore, the price regulation regime and its capacity for change are crucial inputs to profitability. At privatized airports, airport revenues are sometimes regulated, either through rate of return limits or price caps.[19] Some governments—notably in Australia—use an explicit threat of regulation to deter monopoly pricing at wholly unregulated airports (Forsyth (2008)). From the government's perspective, there is a need to design schemes that will (a) induce

[15] Passenger- and aircraft-related charges reflect features such as the size of the craft and the timing (weekday vs. weekend, morning vs. evening) of departure and arrival. However, the airport can offer airlines volume- or route-based discounts to encourage competition or increase volume. Unfortunately, we cannot observe the airline-specific fees incorporating such discounts.

[16] According to the ACI Airport Economics Survey (2014) of 653 international airports.

[17] See ACI 2019 Airport Economics Report

[18] Based on the ACI Airport Economics Surveys, available here: https://aci.aero/.

[19] Although it is thought that there is not a major difference in practice between these forms, price cap regulation may encourage cost reductions, potentially at the expense of service quality (Starkie (2004), Gillen and Niemeier (2008)).

effort on the part of the private firm; (b) keep prices within politically acceptable limits; and (c) ensure the private firm does not risk being held up. Regulators and politicians often face pressure from local users for "fair" prices. The constituent base may prove more impactful than the interests of a few, often non-local, investors. However, holding up investors may make it more difficult to attract new infrastructure capital (Van Nieuwerburgh et al., 2015). Acharya et al. (2020) formally model these hold-up problems in the infrastructure investment setting.

Airport and airline market power also both play a role in price setting. Airports on islands, without nearby competing airports, without strong regional transport alternatives (e.g., high-speed rail), that are more congested, and those with more international traffic tend to have more market power (Basso (2008), Bel and Fageda (2010)). One reason that airports can be profitable is that airlines are believed to have low demand elasticity (Bel and Fageda (2010)). However, airlines also have negotiating power, which increases with their share of airport traffic (Borenstein and Rose (2014)).

Privatization has not always been well-received by the airline industry. During our sample period, the airline trade association, IATA, reports that about 11% of total airline revenue is paid to airports.[20] In 2017, IATA pointed out that average airport per-passenger charges in Europe increased from 16 to 33 Euros between 2006 and 2016, noting that "The share of fully privately owned airports in Europe increased from 9% to 16% between 2010 and 2016. While publicly owned airports may be considered as benign monopolists, often pursuing economic and social goals in support of their local region, this is not the case with privately-owned airports which are driven by investor returns" (IATA 2017).[21] Airline welfare is beyond the scope of this paper, but it is worth highlighting their opposition to privatization.

2.3 Private Equity

This paper studies the evolution of airport ownership across three major categories: government, non-PE private, and PE. We consider PE separately because of its business model is fundamentally different from other private ownership. PE funds are financial intermediaries, with capital raised from limited partners such as pension funds and endowments, who are not involved in day-to-day investment and operational decisions. The general partners (GPs), who own the PE firm and manage its funds, are responsible for the lifecycle of a deal: choosing the company to acquire, negotiating the transaction, adjusting operations at the target firm,

[20] International Air Transport Association-IATA. (2007). IATA economics briefing 6: Economic regulation. Geneva: IATA.

[21] https://www.iata.org/en/iata-repository/publications/economic-reports/airport-competition-myth-or-reality/

and finally harvesting value, usually via a liquidation event in which they sell the portfolio company. The traditional transaction in PE is the leveraged buyout (LBO), where the target firm is acquired with funds comprised mostly of debt—which is placed on the target firm's balance sheet—and a small portion of equity from the limited partners.[22]

PE is associated with particularly high-powered incentives to maximize profits in part because the GPs who manage PE funds are compensated through a call option-like share of the profits (Kaplan and Stromberg (2009)). Specifically, their compensation stems primarily from the right to 20% of profits from increasing portfolio company value between the time of the buyout and an exit, when the company is sold to another firm or taken public.[23] PE deals are typically not successful if the business continues as-is, motivating more aggressive and short-term value-creation strategies. In contrast, a traditional business owner running the firm as a long-term going concern with less leverage may prefer lower but more stable profits.

Kaplan and Stromberg (2009) argue that PE owners increase firm value through three channels, which they call financial, governance, and operations engineering. The first channel includes alleviating credit constraints and benefiting from leverage (Boucly et al. (2011)). Governance engineering includes new management and compensation changes that aligns incentives of employees with firm owners (Gompers et al. (2016)). Bloom et al. (2015) show that PE-owned firms are better managed than similar firms that are not PE-owned. In operations engineering, GPs apply their business expertise to add value to their investments. For example, they might invest in new technology, expand to new markets, and cut costs.

One motivation for our study is that infrastructure funds have distinctive characteristics that may lead PE to have different real effects than in other sectors. Infrastructure funds tend to be large, with more than 70% of capital raised since 2012 going to funds that raise at least $1 billion. The average infrastructure fund in recent years is $2.7 billion, while the average fund size in all other classes is $700 million. Infrastructure funds purport to offer the high returns of PE but with more stable cash flows, less business cycle correlation, and lower volatility. Preqin reports that institutional investors allocate assets to infrastructure overwhelmingly because they believe it offers diversification benefits, with low correlation with other asset classes.[24] Andonov et al. (2021) show that in contrast to the common narrative,

[22] Kaplan and Stromberg (2009), Jenkinson et al. (2021) and Gompers and Kaplan (2022) provide detailed discussions of the PE business model and review the academic evidence on their effects. In the interest of brevity, we limit our discussion. See also Kaplan (1989), Kaplan and Schoar (2005), Gadiesh and MacArthur (2008), Guo et al. (2011), Acharya et al. (2013), Harris et al. (2014), Robinson and Sensoy (2016), Korteweg and Sorensen (2017).

[23] GPs also can receive transaction and monitoring fees, which are not tied to performance.

[24] https://www.preqin.com/academy/lesson-4-asset-class-101s/infrastructure

infrastructure funds deliver below-market returns and have similar volatility and business cycle exposure as other PE vehicles. They believe that one reason is a focus on quick exits and the standard closed-ended structure with periods of 10-12 years in which to invest, create value, and liquidate assets. It remains to be seen whether this misalignment in time frames leads to negative real effects.

Infrastructure funds merit study in part because their footprint as an asset class has grown dramatically in recent decades; in 2000, they invested just $2.2 billion, while in 2018, they invested $119 billion.[25] This growth reflects more supply of private capital as well as demand from constrained governments for private capital to make needed infrastructure investment. Infrastructure fund managers typically possess specialized knowledge about regulatory and operational issues.[26] Because of their importance and visibility, changes to airport ownership are typically politically sensitive, are closely monitored by the local government, and generally are objects of close media scrutiny.

A new model in the U.S., pioneered by the New York City airports, employs PPPs for the financing, development, and operation of new airport terminals. PE has played an active role, with for example Carlyle leading a $9.5 billion development at JFK.[27] Unfortunately, operations and financials are not typically available at the terminal level, and these terminal-specific deals are also too recent for evaluation. For this reason, we do not evaluate these deals and instead treat the few airports in this category as government-owned and operated.[28] That said, it appears likely that PE's footprint in the U.S. airport sector will expand. For example, in 2017 Carlyle's then-president Glenn Youngkin said: "There's an extraordinary amount of investment needed in airports... That's probably going to be the top prospect for investing in infrastructure over the near term."[29]

3 Data Sources and Summary Statistics

This section describes the data sources and samples used in analysis.

[25] Investment declined to $39 billion in 2021, which may reflect the pandemic. Based on data from Pitchbook. We use this for data beyond airports as we do not have access to Preqin outside of airport deals.

[26] CohnReznick. "Infrastructure Investment Report." 2021.

[27] https://centreforaviation.com/analysis/reports/jfks-new-terminal-one-accentuates-the-appeal-of-the-airport-p3-590729

[28] Another reason why U.S. airports are more challenging to study is that airlines sign complex, bespoke contracts in which the airlines often manage and finance airport assets (such as terminals), and these contracts determine the payments they make (Van Dender (2007)).

[29] https://www.infrastructureinvestor.com/carlyle-lead-12bn-modernisation-new-yorks-jfk/

3.1 Ownership Type and Deals Data

We begin by constructing a list of airports around the globe with more than 10,000 passengers as of 2016.[30] This initial sample includes 2,444 international or regional airports located in 217 countries. We hand-collect the ownership history of these airports.[31] We consider three ownership types, which capture the key markers along the continuum from wholly public to high-powered private incentives:

1. Public: Government owns and manages the airport;
2. Non-PE Private: A private firm owns the majority of the airport and its management rights; and
3. PE: A private equity fund owns the majority of the airport and its management rights.[32]

The ownership breakdowns are depicted in Figure 1. While other types of investors, including sovereign wealth funds, insurance companies, and pension funds have direct stakes in airports, these tend to be smaller minority stakes and passive. We do not consider them since we are interested in airport operations.

Preqin provides transaction-level data on infrastructure fund deals that covers asset investors, funds, assets, and deal dates. In our analysis, we exploit the fact that we observe privatization to non-PE and to PE, as well as sales from non-PE private to PE. If an airport is government-owned (i.e., public) at the time of our data collection, we assume it has always been so since governments rarely buy back privatized airports.[33] Table 1 characterizes the ownership transitions in our sample of airports. We split the transition deals into concessions in Panel A and sales in Panel B. Out of 2,444 airports, 437 (18%) were privatized. Most of these deals (401) were of government-owned airports that were privatized by a non-PE group. Of the 437, 102 have been at least once owned by an infrastructure fund; specifically, there are 36 PE privatizations of government-owned airports and 82 cases of a PE fund acquiring an airport that was previously privatized.[34]

Privatization has occurred at an increasing rate over our sample period, with 15 before 1990, 97 in the 1990s, 160 in the 2000s, and 148 in the 2010s. Figure 1 describes privatization over time in terms of the number of airports (Panels A and B), the share of global passengers (Panel C) and the share of global flights (Panel D). There is an increase in the role of private and specifically PE-owned airports, even though the

[30] This list is from: https://ourairports.com/data/.

[31] To identify historical ownership changes, we combine various data sources including Preqin, privatization case reports from the International Civil Aviation Organization (ICAO), annual privatization reports by the Reason Foundation, airport annual reports from airport websites, and online news reports of airport transactions.

[32] We identify a deal as PE when the PE firm leads the transaction and has the single largest stake among the acquiring syndicate. In practice, the PE stake varies from 10% to 100%. Table 1 contains statistics on the stakes purchased by the PE firm.

[33] We were only able to observe 4 cases that went back to government-owned from private out of 436 privatized airports in our sample.

[34] Many of the airports (186) were privatized through concessions, in which the firm received the right to operate the airport's facilities but do not own it. These acquisitions are mostly by non-PE.

U.S.—with the second-largest number of airports (after China)—has no privatized airports. For example, Panel C shows that the share of total passenger volume at PE-owned airports increased from about 1% in the late 1990s to 11-12% in the 2010s.

Privatizations have taken place across the globe, though they are concentrated in certain regions. Figure 2 and Appendix Table A.1 present statistics on the number of privatizations in each decade for each country. Airport privatizations are particularly common in Latin America, with 42 in Mexico, 29 in Argentina and 19 in Brazil. In general, these events are correlated with broader privatization initiatives and adoption of more liberal, market-based economic policies.

Appendix Table A.2 describes the characteristics of funds and deals. In our data, infrastructure funds acquiring airports tend to be closed-ended (85% are closed-ended and the remainder are open-ended). However, the mean holding period in our data is 8.3 years with a median of 7, conditional on exit. In addition, only 27% of deals have exited by year 10. When we include deals that have not exited by year 10, the mean holding period rises to 10.7 years. Therefore, holding periods for airports are much longer than the traditional standard in LBOs of 3-5 years. This may reflect the longer investment lead times of airport infrastructure improvements, as well as the different types of risk, notably macroeconomic demand changes. PE may also be more adept at implementing new aviation and consumer retail technology. The table also lists the top five PE acquirers (by number of airports acquired) out of the total 49 unique PE firms in our data. The top non-PE private firms are described in Appendix Table A.3.

3.2 Regulation and Governance Data

Some countries regulate airport earnings under private ownership, as explained in Section 2.2. We obtain histories of airport price regulatory regimes from David Gillen at the University of British Columbia. The data cover 79 major airports from 1990 to 2018 in Asia, Europe, and Oceania. Twenty-four of these airports were at one time owned by PE owned and 30 by non-PE private firms.

We also employ three national governance indices. One is a measure of government corruption, which we draw from Transparency International. Their Corruption Perceptions Index (CPI) is a widely-used measure of how corrupt each country's public sector is perceived to be, according to experts and businesspeople. These data span 1995-2021 and cover 181 countries, which account for 1,839 airports.[35]

[35]The data are available here: https://www.transparency.org/en/cpi/2021. For methodology, see https://www.transparency.org/en/news/how-cpi-scores-are-calculated

The second is an Ease of Doing Business measure from the World Bank, which incorporates a variety of dimensions such as contract enforcement, ease of getting credit, minority shareholder protection, and insolvency resolution. This spans 2004-2020 and covers 213 countries and 1,867 airports.[36] Each of these measures is on a zero to 100 scale.

3.3 Airport Performance Data

We collect data on airport performance from various sources. These data and the sources are described in detail in Appendix Table A.4. On an annual basis from 1996 to 2019, we obtain information on passenger and flight traffic (separately for international and domestic flights), as well as the number of airlines and routes served. We also gather data on airport performance and safety, including the share of flights that are on-time, awards, and accidents. Awards are only available from 2016 to 2021, and fees from 2010 to 2020.

We construct two novel datasets to understand financials and investment in capacity expansion. First, we hand collect airport financial statements, allowing us to examine revenues, operating expenditure, and profitability. Second, we gather Google satellite images of privatized airports at three points around the acquisition transaction date: the year before, three years after, and five years after.[37] Appendix Figure A.6 shows the example of Adelaide Airport in Australia the year before and three years after a PE acquisition.

Last, we collect data on the fees that airports charge to airlines. These are on a per-aircraft-event basis (i.e. takeoff and landing). By far the largest are passenger and runway fees. They are based on aircraft route and size. We consider two standard aircraft types for analysis: DH4 (small domestic jet) and 77W (large international jumbo jet).

Table 2 presents summary statistics about all variables used in analysis, broken down by public, non-PE private and PE ownership. All variables are defined in Appendix B. PE-owned airports tend to be in richer countries than publicly-owned airports, while non-PE owned airports tend to be in poorer countries. The average GDP per capita for PE-owned airports is around $33,990, $20,180 for publicly-owned airports, and $17,050 for Non-PE owned airports. PE deals tend to be in countries with less corruption and more minority protections. At the airport level, there are also systematic differences. On average, PE-owned airports are relatively larger, have a higher fraction of international flights compared to the Non-PE owned ones.

[36] The data are available here: https://www.worldbank.org/en/programs/business-enabling-environment/doing-business-legacy. See variable definitions and methodology here: https://archive.doingbusiness.org/en/methodology. We impute the missing years before 2004 with the airport mean.

[37] We measure the terminal size using a ruler tool and count number of runways. These are publicly accessible using the Google Earth app https://apps.apple.com/us/app/google-earth/id293622097.

3.4 Targeting Analysis

To measure these differences while adjusting for other relevant factors, we estimate equations predicting whether an individual airport is acquired by either PE or non-PE, or if it remains government owned. In the estimation, all airport-year observations after privatization are dropped, so the equations predict privatization events. We present these estimates in Table 3. The first two columns focus on economic factors. Private equity firms target airports in countries with more trade. In contrast, non-PE firms tend to acquire airports in poorer countries, with lower GDP per capita and less trade. At the airport level, PE targets airports with more passengers and routes, while non-PE private targets airports with more airlines and that are more likely to have a competing airport nearby. Besides the variables shown here, we find no significant predictors among the other airport characteristics we observe.

The third and fourth columns examine price regulation. PE funds tend to avoid cost-based and revenue cap regulation somewhat more than non-PE private firms, and are more likely to target airports in which the regulation is considered “light". This pattern could be a natural consequence of PE being more focused on airports where improved value creation will lead to the most profits.

We next consider the local government (columns 5-6). Privatization sometimes occurs in corrupt countries when the government arranges sales to cronies at relatively low prices (see Shleifer (1998)). Non-PE firms target countries that are relatively more corrupt, while PE’s targeting is unrelated to local corruption (columns 5-6). Specifically, the coefficient of 0.42 in column 6 implies that a one standard deviation increase in the corruption index is associated with a 16% higher chance of the airport being targeted for a non-PE private acquisition.[38] Both ownership types target countries where it is easier to do business, though non-PE private firms do so more intensively. Finally, the last two columns suggest that both types target airports with lower net income, pointing to room for improvement, though the coefficients are not statistically significant.

In sum, this analysis, as well as many unreported models, points to some degree of systematic targeting on the part of airport acquirers, which differs across PE and non-PE ownership types.

[38] If a one-unit increase in the corruption index leads to a 0.42 increase in targeting, then we can multiply .42 by the standard deviation (21.6) and divide by the mean (57.8). These statistics are in Table 2.

4 Empirical Strategy

From a policy perspective, the desirability of airport privatizations clearly depends on the extent to which the transactions lead to real improvements in airport operations. This is the question we seek to understand through our analysis. We ask how airport performance changes post-privatization, and also whether PE ownership has distinct impacts relative to non-PE private ownership. We address both in a single specification that makes use of the four types of ownership changes we observe. The first two are privatization events, where the airport transitions from government to either private non-PE or PE ownership. The other two are secondary transactions where an airport transitions from non-PE private to PE or vice-versa. We employ the following differences-in-differences specification:

$$\begin{aligned} Y_{i,t} = \beta_1 \mathbb{1}(\text{Privatization by PE})_{\text{i,t}} + \beta_2 \mathbb{1}(\text{Privatization by Non-PE})_{\text{i,t}} \\ +\beta_3 \mathbb{1}(\text{Post-Priv Non-PE to PE})_{\text{i,t}} + \beta_4 \mathbb{1}(\text{Post-Priv PE to Non-PE})_{\text{i,t}} + X'_{i,t}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t}. \end{aligned} \tag{1}$$

The independent variables of interest are relative to government ownership as the base group. $\mathbb{1}(\text{Privatization by PE})_{\text{i,t}}$ is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}(\text{Privatization by Non-PE})_{\text{i,t}}$ is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}(\text{Post-Priv Non-PE to PE})_{\text{i,t}}$ is one after an airport that is already privatized by a non-PE firm transitions to PE ownership, while $\mathbb{1}(\text{Post-Priv PE to Non-PE})_{\text{i,t}}$ is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. To control for macroeconomic growth, airport size, and country governance indices related to the demand for air transportation, we include in the vector $X_{i,t}$ log GDP per capita, log trade volume, log total number of passengers, share of international passengers, government size, and the two governance measures (ease of doing business and corruption). These may evolve differently at control vs. treated airports. All models also include airport and year fixed effects. The results are also robust to using deal fixed effects. Standard errors are clustered by airport.

Table 1 documents that 401 privatizations are to non-PE while 36 are to PE, and 71 post-privatization transactions non-PE to PE while just 18 are PE to non-PE. These data highlight the way in which global airports have shifted over time from government to private and then to a higher share of infrastructure fund ownership. These trends also mean that the estimated impacts of privatization to PE as well as transitions

from PE to non-PE ownership will be noisier, as they are identified off of fewer observations.

Following the recent literature on resolving bias in two-way fixed effects models with multiple treatment periods, we test whether the main results spuriously reflect the staggered nature of the transactions. Since airports are acquired at different dates, and thus the control group depends on the year and may include not-yet-treated airports, treatment effect heterogeneity and dynamic treatment effects could lead to bias. The first test is the Callaway and Sant'Anna (2021) estimator, which estimates treatment effects specific to each group-time and then averages them together. This estimator permits only one treatment variable, so we consider only an indicator for PE ownership because this is where we find some evidence of causal effects. The second approach is a stacked regression, which Baker et al. (2022) explain resolves the concern by estimating within event-specific datasets with dataset-specific unit- and time-fixed effects, enabling entirely "clean" controls. This approach has been used in Gormley and Matsa (2011) and Cengiz et al. (2019), among others. One benefit is that we can replicate our main model and include all four treatment variables. The third approach is a matching estimator, where we address the concern by using only never-privatized airports as the controls (Huntington-Klein, 2021).

We also estimate fully saturated dynamic differences-in-differences event study models. Here, we focus on the two private ownership types, PE and non-PE, and look for the average effects of each separately, as it is infeasible to estimate all or even two effects by year in the same equation. We use Equation 2 below for PE, and employ the same specification for non-PE private acquisitions:

$$Y_{i,t} = \sum_{s \neq 0} \beta_s \text{PE Deal Year}_{\text{i,s}} + X'_{i,t}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t}. \tag{2}$$

Variables are as defined for Equation 2, and standard errors are again clustered by airport.

The event studies tell us whether, conditional on our controls, airports that are acquired by either PE or non-PE firms were on track to experience the effects that we see post-acquisition. If there are no pre-trends, we interpret the results as representing a degree of casual impact on the treated, though we cannot fully rule out the possibility that targeted airports were already on track to the changes we observe. Furthermore, since airports are not randomly assigned to ownership types, we do not argue that any results generalize to all airports. However, given the pace of privatization and the rise of PE ownership, we believe the treated population economically relevant.

5 The Effect of Ownership on Airport Performance

This section examines how privatizations and ownership type affect measures of airport performance, including traffic (Section 5.1), routes served and number of airlines (Section 5.2), quality measures (Section 5.3), and financials (Section 5.4).

5.1 The Volume of Passengers and Traffic

The number of passengers per flight coming into and out of an airport is an important metric of performance because it means more efficiency on the tarmac and more people in the terminals to shop at concessions. This metric reflects both plane size (i.e., larger plans have more passengers) and the fraction of seats that are empty. By adjusting fees and agreements with airlines, airports can induce them to fly more saturated routes with larger planes, which increases both aeronautical and non-aeronautical revenue to the airport.

Table 4 reports estimates of Equation 1. After PE privatization, airports increase passengers per flight by about 19 relative to government ownership, which is 21.6% of the mean of 90 passengers (column 1, top row). This finding is primarily driven by increases in domestic flights (columns 2-3). In contrast, there is no overall effect for non-PE privatization (column 1, row 2), though there is a small positive effect in domestic flights (column 3, row 2). In secondary transactions, there is a robust increase in passengers per flight for non-PE to PE deals, driven by domestic traffic (columns 1 and 3, row 3). There is no significant effect of transitions from PE to non-PE ownership (column 1, bottom row).

Figure 3 contains dynamic differences-in-differences estimates of Equation 2, illustrating the change in the number of passengers per flight for PE-acquired airports around the time of the acquisition. Following the acquisition (year 0), we see no effect for international flights (Panel A) but do see an increase for domestic flights (Panel B). Also consistent with the average results from Table 4, there is no similar pattern in an event study of non-PE acquired airports (Appendix Figure A.1 Panels A-B). However, note that the figures are not directly comparable with average effects because they examine all PE and all non-PE private acquisitions, rather than the four explanatory variables from Equation 1. In Appendix Table A.5 we present average results using only the two variables. Here, the coefficients represent the average effects corresponding to the event study dynamic effects. For example, the average impact of PE on domestic passengers per flight is 12.8, or 16% of the mean (Appendix Table A.5 Panel A column 3).

Creating significant value at an airport requires increasing the amount of traffic. Following PE

acquisitions, Table 4 shows that the total number of passengers increases by 87% in the initial privatization and 20% in purchasing an already-privatized airport from a non-PE firm (column 4). Note that where outcomes are skewed, we use log transformations and exponentiate to interpret. PE also increases the number of flights (columns 7-9), with PE privatization having the largest effect at 63% (column 7, first row). The event studies in Figure 3 Panels D and F indicate that after PE acquisitions, the number of domestic passengers and flights increase, again with no evidence of pre-trends. After non-PE private acquisitions, Appendix Figure A.1 Panels C-F document little change for all of these measures. Although the average effects suggest non-PE privatization also leads to more passengers and flights, this should be interpreted with caution since there is no supporting evidence from the event study.

Finally, we consider freight traffic in Appendix Table A.6. We see evidence of improved efficiency under PE ownership, measured as freight per flight, in columns 1-3. Both for privatization and subsequent transactions, there is evidence that PE ownership has statistically significantly larger effects. For levels, measured as log tons of freight, we also see much higher increases for PE ownership.

Overall, these results indicate larger volume and efficiency under PE ownership, with non-PE private ownership being no better than government ownership.

5.2 Downstream Performance: Routes and Airlines

An airport's value to the economy depends not only on the total number of passengers, but also on the choices of routes and competition among airlines. The number of locations to which one can fly on a nonstop flight can materially affect the desirability of a city as a place to live, tour, or locate a business. For example, when JP Morgan's infrastructure fund acquired the airport in Cairns, Australia (near the Great Barrier Reef), the first thing they did was to add nonstop flights to major Asian cities, which increased the number of tourists visiting the Great Barrier Reef.[39]

Table 5 columns 1-3 show increases in the number of routes in all four ownership transitions, with the largest being a 43% increase after PE privatization (column 1, first row). The PE increases are driven by international routes, which are typically more profitable. This is supported by the event studies in Figure 4 Panels A-B. In contrast, the average increases after non-PE private acquisitions appear to reflect targeting rather than a change in operations. Figure A.2 for non-PE private acquisitions shows strong pre-trends, indicating that non-PE private firms seem to select airports already on track to adding more routes, and

[39] Source: Private conversations with deal participants.

suggesting that any positive coefficients should not be interpreted as causal effects.

In addition to routes, when more airlines serve an airport, passengers will likely benefit from more options for subsequent connections and lower prices resulting from increased competition. Table 5 columns 4-5 suggest a large increase in the number of airlines after non-PE privatization, and a smaller increase driven by low-cost carriers after PE privatization. Panel C of Figure 4 confirms the discontinuous positive effect of PE ownership on the number of low-cost carriers. However, for non-PE private firms, Figure A.2 indicates strong pre-trends, pointing again to a different economic model from PE and an absence of causal effects. We do not find significant changes to airline HHI or largest airline share after transitions to PE ownership, however (columns 6-7 of Table 5).

Putting the event studies and the table together, we conclude that there is a robust and likely causal relationship between PE acquisitions and the number of both routes and airlines, but that the rest of the results should be interpreted with caution. More airlines at PE-owned airports likely increase consumer welfare through both improved choices of routes and lower prices.

5.3 Punctuality, Safety, and Awards

We are also interested in the quality of an airport from passengers' perspectives. While product quality is typically difficult to measure, we have several useful metrics in the airport setting. First, flight cancellations are perhaps the largest nuisance to passengers and also disrupt airport operations. Table 6 shows a dramatic decline in the percent of flights canceled after PE acquisitions. In privatizations, the effect is 73% of the mean, while in post-privatization acquisitions from non-PE private firms it is about 32% of the mean (column 1 rows 1 and 3). There is also a significant decline of 50% after non-PE privatizations, but not after PE to non-PE transitions (rows 2 and 4). The event studies indicate a clear decline in cancellations after PE ownership (Figure 5 Panel A). For non-PE private acquisitions, there again appears to be a pre-trend (Figure A.3). These results suggest that PE owners improve runway and gate management operations in a way that reduces canceled flights, which benefits passengers.

We next examine the fraction of flights that depart on time. There is no significant effect of PE ownership on the on-time departure rate, reported in column 2 of Table 6 (also see Figure 5 Panel B). In contrast, non-PE ownership leads to a lower on-time departure rate both following privatization and in acquisitions from PE firms. This last result, in the bottom row of column 2, points to worse management under non-PE relative to PE ownership, since the bottom row of Table 4 found no increase in congestion (which might otherwise

affect delays) in PE to non-PE transactions.

There is much more to a passenger's experience at an airport than the actual flights, including security wait times, cleanliness of the restrooms and quality of the stores and lounges. All of these vary in quality across airports and can materially affect passengers' welfare. We assess these dimensions using the ACI ASQ awards data. These prizes are offered to airports whose passengers report the most positive and smooth experiences in surveys. Column 3 of Table 6 indicates that privatization increases the likelihood that an airport wins an award. The most robust effect, however, is for transitions from non-PE private to PE ownership, in which the chance of an award increases by six percentage points, which is three times the mean. The event study in Figure 5 Panel C indicates that there is a distinct jump on the chances of winning the award after PE acquisitions.

Finally, in columns 4 and 5, we consider the possibility that airport privatization affects safety. These equations predict the number of accidents and fatalities per 1,000 flights. The coefficients on the privatization variables are small and not statistically different from zero, suggesting that privatization does not have a material impact on the safety of flying.

5.4 Financial Outcomes and Employment

The results on fees and traffic point to higher revenues after PE acquisitions, relative to airports that remain government owned. We next evaluate the impact of privatization on the financial performance of the subset of airports for which we have income statements. Increasing cash flows is a key strategy in PE. However, it is rare to observe income statements for privately owned firms, so studies of PE's operational impacts have typically been unable to show how cash flows change after buyouts and, in particular, whether revenue increases, costs decline, or both. We are able to do so because some countries require airports to publicly release elements of the income statement. However, since only a subset of airports have financial data available, the sample size is limited and thus the results should be interpreted with some caution.

The event studies in Figure 6 show that net operating income and total operating revenue increase at the time of the acquisition, an effect that persists for at least four years (Panels A and B). This appears to reflect increases in both aeronautical (fees to airlines) and non-aeronautical (retail and parking) revenue (Panels C and D). We do not see any apparent effect on operating expenditure per 1000 passengers in Panel E. Finally, we consider the number of airport employees relative to the number of passengers and see some evidence in a decline in years zero to three.

The average effects, presented in Table 7, are consistent with Figure 6. Net income increases dramatically privatization by PE; the coefficient implies a 107.5% increase (column 1, row 1). This appears to primarily come in part from an increase in operating revenue (column 2), with non-aeronautical revenue increasing by somewhat more than aeronautical revenue (columns 3-4, row 1). The higher net income does not reflect lower operating costs, because on a per-passenger basis we see an increase in operating costs and no effect on employees (column 5-6, row 1). After non-PE privatizations, there is a smaller increase in net income, but no increase in revenue (Table 7 columns 1-2, row 2). Instead, columns 5-6 show a decline in per-passenger operating expenditure and employees. After transitions from non-PE to PE, we do not see any measurable effects. However, in transitions from PE to non-PE, we see large declines in net income, revenue, and operating costs (bottom row).

Together with our previous results, this analysis suggests that in the context of airports, PE does not create value primarily by cost-cutting, but rather via growth and efficiency. Perhaps surprisingly, the means to higher income for non-PE privatization is lower expenditure. As discussed in Section 2.3 above, airports and infrastructure generally have many unique characteristics and so it is important to emphasize that the effects of PE here likely do not necessarily generalize to other sectors.

6 Mechanisms

The results from Section 5 show that airports consistently improve performance across total volume, efficiency, and passenger experience measures. Meanwhile, there is little evidence that privatization alone causes improvement; either there is no change, or pre-trends suggest that the airport was on track to improve regardless. What are PE owners doing differently? And under what circumstances does airport privatization achieve the best outcomes?

In this section, we explore the mechanisms that lead to these effects. For example, we show that PE owners expand physical capacity to accommodate more flights and passengers, suggesting that there were financial constraints facing previous owners. PE owners adjust fees to earn more revenue and to encourage airlines to bring larger planes to the airport. As part of this strategy, they appear to breach implicit contracts between the airport and the government-owned flag carrier airline. The results are consistent with better management in the presence of empowered regulators leading to improved outcomes for the airport, as opposed to a rent extraction story; we find the improvements are larger at airports in countries with better

governance and that have a competing airport nearby.

The underlying reason for the observed operational changes is likely that PE owners tend to bring in new top executives, usually with a track record of success in the sector (Gompers et al., 2016, 2023). The owners adjust compensation to be more performance-based and align management incentives with owners (Gornall et al., 2021). Both the PE firm and the new managers also may bring knowledge of best practice globally, as the PE firms in our data tend to be infrastructure specialists with investments in multiple countries. In particular, interviews with industry experts indicate that PE-managed airports have teams with better skills to (a) predict future demand across routes and airlines, a complex task if the airport is to optimize across airline and route offerings; and (b) negotiate with airlines to effectuate these adjustments. PE owners are also thought to have better commercial retail networks, including with key brands such as Starbucks and Duty Free shops, and may negotiate more favorable revenue-sharing agreements.[40]

6.1 Capacity Expansion: Larger Planes and Larger Terminals

In Section 5.1, we reported large effects of PE ownership on passengers per flight (21%), total passenger volume (87%), and total flights (63%) following privatization events. These large increases imply that either the airport previously had a large amount of slack, such as unused gate time, or the PE owners were able to add capacity. We assess whether PE ownership leads to more capacity using two measures.

First, we examine aircraft composition. The increase in passengers per flight should be driven at least in part by larger aircraft, especially since this is a dimension along which the airport has some control via fees (see below). Table 8 indicates that the share of jets increases after PE acquisitions while the share of regional and small aircraft declines (columns 1-2, rows 1 and 3). The aircraft composition does not change after Non-PE privatization, but there is a small increase in the share of jets in PE to non-PE deals (columns 1-2, rows 2 and 4). The results are consistent with PE increasing passengers per flight at least in part by inducing airlines to bring larger planes to the airport.

Second, we consider terminal square footage and number of runways using satellite imagery data, which as explained in Section 3.3, we capture for privatized airports at three points in time ($t-1$, $t+3$, and $t+5$). Appendix Table A.7 shows the average summary statistics (Panel A) and size-weighted percent increases (Panel B). In privatization events, PE ownership leads to about a 30% increase in terminal size (measured at both $t+3$ and $t+5$) and a 2% increase in the number of runways. We also see an increase in non-PE

[40] Based on conversations with Gareth Kitching, Mark Lewis, and Iain Smith at RDC Aviation.

privatizations, though it is smaller, at just 13% by $t + 3$ and 22% by $t + 5$. Post-privatization, terminal size increases in non-PE to PE deals by 22%, while in PE to non-PE deals the increase is just 7%.

We also estimate regressions with airport and year fixed effects. As we do not have data on never-privatized airports, the base group is pre-privatization. The results, in Table 8 columns 3-4, show increases of about 8% and and 20% in terminal size after privatization by PE and non-PE to PE post-privatization deals, respectively. There is also a 13% increase in the number of runways after PE privatization. In contrast, the only effect for non-PE private ownership is a 4% increase in terminal size after privatization. This analysis suggests that particularly under government ownership, the airport suffered from financial constraints, otherwise it would have likely expanded to take advantage of potential volume expansion.

6.2 Price Adjustment: Fees Charged to Airlines and Regulation

During our sample period, fees that airports charge to airlines account for about 75% of airport revenue. Adjusting these fees could be a mechanism for both the increased traffic and higher revenue shown in Sections 5.1 and 5.4. The two main charges are runway fees, which are paid for each takeoff and landing, and passenger fees, which are paid for processing passengers in terminals. In Table 9, we estimate the impact of privatization on these fees. The results indicate that, consistent with the airline industry's complaints (see Section 2.1), fees increase substantially following non-PE privatization (columns 1-6, row 2). However, total fees slightly decrease following privatization by PE (columns 1-2, row 1). Columns 3-6 of row 1 disaggregate the fees and show that runway fees increases after PE privatization while passenger fees (which dominate total fees) decline. This helps explain the higher passengers per flight and increased share of jet planes relative to smaller aircraft. By increasing the cost of a flight on the extensive but not the intensive margin, the airline is encouraged to bring larger, fuller planes.

In secondary transactions, the picture changes; there are fee increases when PE acquires airports from non-PE private owners, while there are some decreases and some increases when PE sells to non-PE (Table 9, columns 1-6, rows 3-4). In sum, both PE and non-PE ownership are associated with higher fees relative to government ownership. However, despite the higher fees, traffic increases (Table 4). Presumably, other improvements after privatization outweigh the higher fees to attract new traffic. Figure 7 presents the PE event studies, which indicate immediate and persistent increases in fees following the acquisition. The reason for the difference between the figures and the first row of Table 9 is that the figure is dominated by

the non-PE to PE transactions, which are more numerous.[41]

When airports are privatized, the government must decide whether to regulate airport prices, since airports have some degree of market power. As with other infrastructure and utility assets, regulation can take two principal forms: revenue caps and cost-based (see Section 2.2). Both limit the private owner's ability to increase profits and would be anathema to PE, where maximizing cash flows and firm value in the near-term is a key objective. Regulatory changes could be related to the operational changes and revenue increases. PE may target airports in countries on track to deregulate or may lobby the local government to deregulate post-acquisition. We study this using an indicator for no price regulation in the airport-year as the dependent variable. Since regulatory regimes change only rarely and these changes are undoubtedly related to the causes of the privatization, this model has no causal interpretation.[42] After PE acquisitions, there is a higher chance of deregulation, with the relationship after transitions from non-PE private being almost 200% of the mean (Table 9, column 7, row 3). This deregulation may help produce the incentives for the performance improvements that we see in the previous tables.

Lobbying is one possible driver for this pattern. Consider the example of three Australian airports that were privatized in 1996-7, two with majority PE ownership. Each had revenue caps for five years subsequently, which were removed in 2002 in part at the request of investor groups. As Gillen (2011) explains, the airport owners and government settled on a strategy of price monitoring, which occurs to some degree at all privatized airports without price regulation, creating an explicit threat of regulation. This essentially amounts to a trigger or "grim" strategy, in which seemingly excessive profits would lead to long-term regulation. Amid a 2018 reconsideration of airport regulation, investor owners of Australian airports submitted a brief arguing explicitly against regulation, noting that the "light-handed regulatory regime encourages commercial outcomes, incentivises innovation and allows investors to earn appropriate risk-adjusted returns $\cdots$ [A]irport owners take the threat of regulation seriously."[43] While clearly this example does not necessarily apply elsewhere, it shows that investor lobbying can yield regulatory changes.

[41] The event studies for non-PE private are in Figure A.5 also find increases, but indicate that fees at these airports start systematically higher than at control (public) airports, as indicated by the lower value for the omitted coefficient at year -1.

[42] Also, there are insufficient cases (only one) of PE to non-PE transitions in the dataset with regulation information so we exclude this transition from the model.

[43] Australian Airports Investor Group Submission to the "Productivity Commission Review of the Economic Regulation of Airports," September 2018. Available here: https://www.pc.gov.au/__data/assets/pdf_file/0011/231122/sub020-airports.pdf

6.3 State Capacity: Less Corruption and Better Performance

Government capacity may play a role in determining when privatization is effective. It could be relevant for the absence of improvement after non-PE privatization relative to government ownership, which is otherwise somewhat surprising. If non-PE private ownership has better outcomes in countries with less corruption, this could help explain the overall poor performance, because we saw in Section 3.4 that non-PE private firms tend to target airports in more corrupt countries.

Government capacity can also help us to interpret the positive effect of PE in the airport context relative to other sectors. Airports are characterized by imperfect competition and a major role for the state. In other sectors with these characteristics, such as nursing homes and for-profit colleges, PE has been found to have deleterious effects. One possible explanation for the difference between these findings and the ones reported above is that airport regulators are relatively empowered to monitor effectively in the airport sector. In addition, airport quality is easily observable. If performance improvements under PE ownership come from better monitoring and higher efficiency, they should be largest in countries with good governance. If PE earns returns for its investors by extracting rents from poorly governed states, we might expect higher returns for airport acquisitions in countries with higher corruption.

We analyze whether the effects are significantly larger or smaller when there is higher local corruption by estimating Equation 3 below, where PE and non-PE acquisitions are divided around the median according to whether local corruption is high (HighCorrupt) or low (LowCorrupt), measured in the year before the deal.

$$\begin{aligned} Y_{i,t} = \beta_1 \mathbb{1}(\text{PE x HighCorrupt})_{\text{i,t}} + \beta_2 \mathbb{1}(\text{PE x LowCorrupt})_{\text{i,t}} \\ +\beta_3 \mathbb{1}(\text{NonPE x HighCorrupt})_{\text{i,t}} + \beta_4 \mathbb{1}(\text{NonPE x LowCorrupt})_{\text{i,t}} + X'_{i,t}\gamma + \delta_i + \theta_t + \varepsilon_{i,t} \end{aligned} \tag{3}$$

Here and in subsequent cross-sectional analysis, we do not attribute any causality to the modulator because it is endogenous to the match between the buyer and the airport.

The results are shown parsimoniously in Figure 8 Panel A for four key outcomes, where each marker represents a coefficient. The first three outcomes are key performance measures from the perspective of the local economy: total passengers, number of routes, and number of airlines. In high corruption countries, the coefficients on non-PE privatization (light triangles) is near-zero or negative for all three outcomes. Conversely, the coefficients in low-corruption countries are statistically significantly higher and positive in all cases (dark triangles). For example, the first set of points show that the effect of non-PE ownership on the

number of passengers is significantly larger under low corruption. Note that we combine privatization and post-privatization deals, so results should be compared to the average effects in Appendix Table A.5, rather than results with four explanatory variables using Equation 1. For example, the overall effect of non-PE private acquisitions on the number of airlines is 2.7 (Appendix Table A.5 Panel B column 4). The results in Figure 8 Panel A show that the effect is about 4.5 in low-corruption countries (dark triangle) and about 1.5 in high-corruption countries (light triangle).

We report a broader set of results for 10 main outcomes in Appendix Table A.8. Passengers per flight and the number of flights also increase substantially under non-PE ownership in low-corruption countries, but not in high-corruption ones. In contrast with non-PE private, net income gains are dramatically higher for PE under high corruption.

The non-PE private patterns in Figure 8 Panel A do not appear for the Ease of Doing Business measure (Appendix Figure A.7), suggesting that corruption is more relevant. However, for non-PE private firms, net income effects are lower both in countries with low Ease of Doing Business as well as in those with high corruption. This points to potential private benefits as a reason for targeting these countries. In contrast, PE performance effects are larger in countries with higher Ease of Doing Business, suggesting more scope for operational changes (Appendix Figure A.7).[44]

These results point to the possibility that performance improvements under PE ownership depend on high-quality regulators. They also highlight that improvements are not necessarily tied to high profits; that is, the airports with the highest profit increases are different from those with the highest performance improvements. It seems that the combination of targeting and government capacity can lead PE firms to acquire airports where they can improve operations under the watchful eye of a competent state in ways that likely benefit the local economy. In contrast, non-PE firms are more likely to be active in corrupt countries, where returns from privatization may often come via rent extraction (Hoffman, 2011).

6.4 Pre-Existing Relationships: The Role of State-Owned Flag Carriers

Related to the role of state capacity is the presence of government-owned airlines, which often have cozy relationships with the local airport. Many countries have at some time established a government-owned airline, which is called the "flag carrier." Today, some of these have been privatized. They include the

[44] We tested two other hypotheses for the lack of performance under non-PE private ownership: minority government ownership of non-PE private firms and being headquartered in the same country as the airport. In contrast with local corruption, neither has any explanatory power.

UK's British Airways, Russia's Aeroflot, and Singapore's Singapore Airlines. One way that new, private owners may increase the number of airlines is to breach pre-existing implicit or explicit contracts between the airport and state-owned flag carriers by, for example, bringing in low-cost carriers, which compete more aggressively with mainline carriers.

We collected data on flag carriers from Wikipedia, supplemented with manual search.[45] We define a carrier as state-owned if it is majority or wholly owned by that country's government. Although some flag carriers privatize during our sample, which we capture in our data, the majority remain state-owned over time, so this should be thought of as a fixed feature of the airport. Summary statistics about this variable are in Table 2; about 30% of airport-years have a state-owned flag carrier.

To assess whether the effects are significantly larger or smaller when there is a state-owned flag carrier, we estimate a version of Equation 3 with an indicator for the airport-year having a state-owned flag carrier in place of high and low corruption. The key results are in Figure 8 Panel B. When the number of airlines is the dependent variable, the effect of PE ownership is much larger (comparing the dark and light squares in the first set of markers). The effect of non-PE ownership is also larger, though the difference is smaller. We see a similar pattern for low-cost carriers, with lower magnitudes since there are fewer low-cost carriers. The last model shows that net income increases much more after transitions to PE ownership at airports with state-owned flag carriers. This points to better value creation opportunities at these airports; for example, the new owners may be able to extract rents previously enjoyed by the state-owned carrier, or may reallocate these rents to other airlines and consumers, which ultimately benefits the owner through higher revenue.[46]

6.5 Contract Form: Duration of Lease Matters

The incentives bestowed by ownership or ownership-like long-term contracts cannot be fully contracted (Grossman and Hart, 1986; Hart and Moore, 1990). In contrast to a non-owning operator, an owner has the ability and incentives to make investments that were not initially contracted but could be valuable. The prediction for our sample of privatized airports is that if ownership leads to more value-creating investments than control without ownership, then sales should experience larger improvements than concessions. In

[45] For the Wikipedia data, see https://en.wikipedia.org/wiki/Flag_carrier

[46] We present the regression results in tabular form for 10 main outcomes in Appendix Table A.9. Non-PE acquisitions are associated with significantly more passengers, flights, and routes at airports with state-owned flag carriers. For PE, there are also somewhat more flights at airports with state-owned flag carriers. However, we do not see significant differences in the volume outcomes for PE, suggesting that breaching contracts with flag carriers can help explain the airline effect, leading to more competition, but that other drivers such as capacity increases or quality improvements explain the volume increases.

a sale, the acquirer has a much longer time horizon of control, which will pass to subsequent buyer in a secondary transaction. Fees in long-term deals are also typically fixed rather than based on revenue, as is often the case in shorter term concessions.[47] A longer lease period may incentivize more capital investment and operating improvements. Of course, as for the other cross-sectional analyses, the type of contract is known at the time an airport is acquired, and thus is endogenous to the selection decision.

We again use a variant of Equation 3 to evaluate this hypothesis. Across the four main outcomes reported in Figure 9 Panel A, the coefficient on sale for both PE and non-PE is higher than for concession. The difference is more dramatic for PE. Appendix Table A.10 shows that this holds across all our key outcomes, including number of passengers per flight, number of passengers, number of flights, number of routes, number of airlines, and operating net income. Across the board, sales to PE are associated with the largest and most robust improvements (first row). In most cases, the coefficient on sale to PE is significantly larger than the coefficient on concession to PE, as shown at the bottom of the table. For non-PE private transactions, most outcomes also exhibit a larger effect for sales, but the magnitude of the difference is smaller and usually insignificant.

Next, we assess the robustness of this finding and examine whether it comes from the extensive or intensive margin. Appendix Table A.13 uses continuous ownership and control stakes, and continues to find that higher ownership stake is associated with the most positive results. Appendix Table A.14 uses indicators for majority ownership and control stake. Overall, this analysis supports the idea that the largest and most robust improvements come after ownership transitions.

6.6 The Benefits of Competition: Nearby Airports

The presence of a competing airport may encourage performance improvements. With higher-powered incentives to maximize profits, PE ownership could be more responsive to competitive incentives than other types of ownership. This is relevant to concerns among antitrust authorities that PE firms may take more advantage of market power than other types of firms.[48]

We identify airports as having a competitor if there is a non-targeted airport within 200 km. About 65% and 68% of PE owned and non-PE privately owned airports, respeectively, have a competing airport

[47] Following industry norms, we identify sales as cases when the acquirer obtains outright ownership or a concession lasting more than 30 years. Long-term concessions are grouped together with outright sales because they create similar incentive structures. Although we can compare sales and concessions, unfortunately we cannot observe the actual contracts.

[48] For example, see here: https://www.jdsupra.com/legalnews/private-equity-subject-to-increased-4754204/.

nearby (Table 2). We again use a version of Equation 3, dividing PE and non-PE airports according to the presence of a competing airport. Figure 9 Panel B shows that for the key outcomes, improvement under PE ownership is much higher in the presence of a competing airport. Appendix Table A.11 documents that this relation holds across all the main outcome variables. For example, under PE ownership with competition, the number of flights and routes increase by 29% and 36%, respectively, while the number of airlines increases by 25% relative to the mean, compared to small and insignificant effects of PE ownership without competition (columns 3-5, first two rows). These differences do not mean that competition causes the different operational changes since the competing airport was typically in place before the acquisition and thus is intertwined with targeting. However, these results are consistent with competition playing a beneficial role in the airport industry for inducing the most productive outcomes under private ownership.

Since the volume expansion comes from airports with competition, does the additional traffic reflect market stealing or market expansion? We ask whether the competing airport loses traffic after the acquisition in Appendix Table A.12. There are no significant effects for PE, with positive coefficients. This indicates that the main results do not reflect market-stealing. For non-PE privatization, there is actually a meaningful positive effect. As this is driven by government-owned competing airports, it is possible that the government is able to focus more on the remaining airport and actually improves operations there.

6.7 Robustness

This section addresses several possible concerns about the main results.

Addressing Selection with Auction Data. The fact that targeting—i.e., selection of airports to acquire—is endogenous raises two challenges for our analysis. One is related to identification; it may be that the types of airports that PE selects are on track to experience the outcomes we observe. While the absence of pre-trends in event studies argues against this story, the pre-trends may be imprecisely measured. A second is related to external validity. Our results may be applicable only to the types of airports that PE alone has been interested in owning, making it inappropriate to compare PE-owned airports to airports under other types of private ownership.

To address these concerns, we restrict our analysis to airports for which both PE and non-PE firms bid in a government-owned auction. We gather data on auction participation by clerically researching government press releases, news articles, airport websites, and other online sources. Not all countries hold auctions and

not all auctions are accompanied by public information about participation. Of the 118 PE deals, we found 90 with auction bidder information, and of the 446 airports acquired by non-PE private firms, we found 110.[49] The top countries by number of deals with auction data are the UK (16), Australia (14), Japan (12), India (10), and France (8). Table 10 Panel A presents summary data about the auctions. There are 70 in which both PE and non-PE firms both bid, and of these, the PE firm won in 54, or 77% of the time. This is consistent with PE paying a premium because of its greater ability to create value alongside, in some countries, higher tax benefits (Kaplan, 1989; Palepu, 1990).

Panel B reports estimates of how airport ownership types affect airport performance when the sample is restricted to the 70 airports for which both PE and non-PE firms bid. We employ the 10 main outcomes from previous analysis, as in Sections 6.3-6.6. The results are consistent with and often larger in magnitude than in the full sample. For example, we see that there is an increase of 17 (12.5) passengers per flight after PE privatizations and non-PE to PE transitions, respectively, with no effect for either type of non-PE acquisition (column 1). The number of routes increases significantly after PE acquisitions, but not for non-PE (column 4). In sum, even when non-PE is also interested in buying the airport, there are still differential effects of PE ownership. This implies that selection alone does not explain our results.

Staggered Bias Tests. As explained in Section 4, we conduct three tests to address possible bias from a staggered differences-in-differences model. In all cases, we employ for parsimony the 10 key outcome variables that contain the key findings. Our first approach retains the main empirical model of Equation 1, but employs stacked datasets for each event (i.e. treatment year). We use never-treated firms as clean controls over the whole sample window for the treated cohort and stack them together. Following Baker et al. (2022), we include fixed effects for each dataset-by-airport and dataset-by-time group. The results are reported in Appendix Table A.15. The results are robust to this approach, generally with more statistical significance.

The second approach is the Callaway and Sant'Anna (2021) estimator, which has the downside of permitting only one treatment variable. Therefore, the results cannot be compared exactly to our main tables. We focus on an effect of PE acquisition on average, since this is where our average effects and dynamic models suggest there is a meaningful causal effect. The results are reported in Appendix Table A.16. We see significant effects on the key productivity outcomes, such as passengers per flight (column 1)

[49] Unfortunately, data on prices was not generally available, so it is not included in the analysis.

and number of routes (column 4). There is no significant effect on fees, consistent with the mixed results in the main tables. Possibly due to the much smaller sample and stringent fixed effects design of the estimator, we see no effect on income or expenditure per 1000 passengers in this model (columns 9-10).

The third strategy is a matching estimator, which is also helpful for addressing the selection concern. We match each privatized airport one-to-one with never-privatized, government-owned and operated non-target airports using Coarsened Exact Matching (Iacus et al. (2012)). To identify control airports, we employ observations two years before the privatization event. Each targeted airport is matched to government owned and operated control airport on region, the log GDP per capita, share of international passengers, government size, open markets, year, and log trade volume two years before the target date.[50] In the estimation, we include match cohort-year fixed effects to compare target and non-target airports within the matched group. These fixed effects ensure we compare airports with similar characteristics, since for example the airports targeted by PE have different characteristics from the airports targeted by non-PE private companies. The matched dataset includes 684 airports. Of these, PE acquires 90 and non-PE private acquires 324.

In Appendix Table A.17, we present estimates using the matched sample. The results are similar to the main findings. One downside of matching is that it eliminates many airports from the sample, which makes it more different to run heterogeneity tests. Our main analysis therefore uses the whole data with controls. Also, while matching improves homogeneity of the sample, we should keep in mind that privatized airports may be chosen precisely because their performance is likely to improve relative to other airports; for example, they could be in a growing section of the country or have been selected by a prominent airline as a “hub". We keep this possibility in mind when interpreting our results. Together, the consistent results from all three of these diverse methods offer comforting support for the basic findings.

Overlap Sample. Our main analyses use data from a variety of sources which have different coverage of airports and years. For our key outcomes, Appendix Table A.18 shows the results in a sample that overlaps across all sources, except for financials and and punctuality, where the requirement reduces the sample size too much. In unreported tests we find similar results using our main models with alternative controls, deal fixed effects, and alternative clustering of standard errors.

[50]The matched control airports need to be in the same country and have a similar passenger type, which is why we include the proportion of international passengers. The number of passengers is the best proxy for size. We follow standard practice and do not match on outcome variables, and for this reason do not match on regulatory structure because we find evidence it appears to change after PE buyouts. However, we find similar results when we do match on regulatory regime. We also find similar results when we match on alternative governance variables.

Omitting Largest Deal. There may be concern that our results are spuriously driven by one especially large deal with many airports. In Appendix Table A.19, we omit the biggest deal in each transaction type. The results are quite similar to our main findings.

Region Controls. Both PE and non-PE acquisitions take place all over the world, as shown in Figure 2. However, to assess whether our results are driven by a particular region of the world, we include region fixed effects (for Africa, Asia, Europe, North America, Oceania, and South America) in Appendix Table A.20. The results are again quite similar to our main findings.

7 Conclusion

Whether infrastructure should be privately owned—and if so, by whom—is an important policy question facing governments around the world. In practice, conventionally government-owned infrastructure assets have increasingly been privatized. One driver of this trend is the growing amount of capital allocated to private equity via dedicated infrastructure funds. Understanding what these funds do, whether they create or destroy value, and whether public infrastructure should be privatized at all, are important research questions.

To begin to address these issues, we examine airports, which are an important class of infrastructure asset that have undergone significant privatization in recent decades. As of 2020, 437 airports have been privatized, which is 18% of all airports worldwide. Of these privatizations, 102 were at least once owned by PE firms. Because of their visibility, their increasing rate of privatization, and the availability of data on their operations, airports provide an ideal place to study privatization of public assets.

Our results suggest that privatization alone does not appear to have a meaningful or causal impact on performance, but that transitions to infrastructure fund ownership leads to greater airport efficiency, volume, and quality. PE owners accomplish this by expanding capacity, negotiating more aggressively with airlines, providing better service and amenities, offering passengers nonstop flights to more places, and reducing cancellation rates. We show that one explanation for the lack of improvement after non-PE privatizations is that these non-PE private firms tend to select airports in countries with high corruption levels, yet only produce improvements in countries with low corruption levels. In contrast, PE firms do not select on the dimension of corruption and do not experience the striking difference in outcomes by corruption level.

Privatization of infrastructure and the role of PE in privatization is an important topic of research. This

paper provides evidence suggesting that PE plays a beneficial role in the privatization of airports. However, there is much more to be learned. For example, do other types of infrastructure achieve similar improvements to airports when they are privatized? From an investor's perspective, how do the financial improvements observed in our sample of airports translate to risk-adjusted returns? These and other related questions remain fruitful topics for future research.

References

Acharya, Viral V, Cecilia Parlatore, and Suresh M Sundaresan, "A model of infrastructure financing," *NYU Stern School of Business Forthcoming*, 2020.

_ , Oliver F Gottschalg, Moritz Hahn, and Conor Kehoe, "Corporate governance and value creation: Evidence from private equity," *The Review of Financial Studies*, 2013, *26* (2), 368–402.

Adler, Nicole and Vanessa Liebert, "Joint impact of competition, ownership form and economic regulation on airport performance and pricing," *Transportation Research Part A: Policy and Practice*, 2014, *64*, 92–109.

Aguirre, Julio, Pedro Mateu, and Chrissie Pantoja, "Granting airport concessions for regional development: Evidence from Peru," *Transport Policy*, 2019, *74*, 138–152.

Andonov, Aleksandar and Joshua D Rauh, "The Shifting Finance of Electricity Generation," *Available at SSRN 4287123*, 2022.

_ , Roman Kräussl, and Joshua Rauh, "Institutional investors and infrastructure investing," *The Review of Financial Studies*, 2021, *34* (8), 3880–3934.

Assaf, A Georges and David Gillen, "Measuring the joint impact of governance form and economic regulation on airport efficiency," *European Journal of Operational Research*, 2012, *220* (1), 187–198.

Baker, Andrew C, David F Larcker, and Charles CY Wang, "How much should we trust staggered difference-in-differences estimates?," *Journal of Financial Economics*, 2022, *144* (2), 370–395.

Basso, Leonardo J, "Airport deregulation: Effects on pricing and capacity," *International Journal of Industrial Organization*, 2008, *26* (4), 1015–1031.

Bel, Germà and Xavier Fageda, "Privatization, regulation and airport pricing: an empirical analysis for Europe," *Journal of Regulatory Economics*, 2010, *37* (2), 142–161.

Bernstein, Shai and Albert Sheen, "The operational consequences of private equity buyouts: Evidence from the restaurant industry," *The Review of Financial Studies*, 2016, *29* (9), 2387–2418.

_ , Xavier Giroud, and Richard R Townsend, "The impact of venture capital monitoring," *The Journal of Finance*, 2016, *71* (4), 1591–1622.

Biais, Bruno and Enrico Perotti, "Machiavellian privatization," *American Economic Review*, 2002, *92* (1), 240–258.

Bloom, Nicholas, Raffaella Sadun, and John Van Reenen, "Do private equity owned firms have better management practices?," *American Economic Review*, 2015, *105* (5), 442–46.

Borenstein, Severin and Nancy L Rose, "How airline markets work… or do they? Regulatory reform in the airline industry," in "Economic regulation and its reform: What have we learned?," University of Chicago Press, 2014, pp. 63–135.

Boucly, Quentin, David Sraer, and David Thesmar, "Growth LBOs," *Journal of Financial Economics*, 2011, *102* (2), 432–453.

Brueckner, Jan K, "Airport congestion when carriers have market power," *American Economic Review*, 2002, *92* (5), 1357–1375.

Cadot, Olivier, Lars-Hendrik Röller, and Andreas Stephan, "Contribution to productivity or pork barrel? The two faces of infrastructure investment," *Journal of Public Economics*, 2006, *90* (6-7), 1133–1153.

Callaway, Brantly and Pedro HC Sant'Anna, "Difference-in-differences with multiple time periods," *Journal of Econometrics*, 2021, *225* (2), 200–230.

Cavagnaro, Daniel R, Berk A Sensoy, Yingdi Wang, and Michael S Weisbach, "Measuring institutional investors' skill at making private equity investments," *The Journal of Finance*, 2019, *74* (6), 3089–3134.

Cengiz, Doruk, Arindrajit Dube, Attila Lindner, and Ben Zipperer, "The effect of minimum wages on low-wage jobs," *The Quarterly Journal of Economics*, 2019, *134* (3), 1405–1454.

Coase, Ronald H, "The lighthouse in economics," *The Journal of Law and Economics*, 1974, *17* (2), 357–376.

Cohn, Jonathan, Nicole Nestoriak, and Malcolm Wardlaw, "Private Equity Buyouts and Workplace Safety," *Review of Financial Studies*, 2021.

Condie, Stuart, "Airport ownership trends in Europe," *Journal of Airport Management*, 2015, *10* (1), 14–23.

Cruz, Carlos Oliveira and Joaquim Miranda Sarmento, "Airport privatization with public finances under stress: An analysis of government and investor's motivations," *Journal of Air Transport Management*, 2017, *62*, 197–203.

Dastidar, Siddhartha G, Raymond Fisman, and Tarun Khanna, "Testing limits to policy reversal: Evidence from Indian privatizations," *Journal of Financial Economics*, 2008, *89* (3), 513–526.

Davis, Steven J, John Haltiwanger, Kyle Handley, Ron Jarmin, Josh Lerner, and Javier Miranda, "Private equity, jobs, and productivity," *American Economic Review*, 2014, *104* (12), 3956–90.

Dender, Kurt Van, "Determinants of fares and operating revenues at US airports," *Journal of Urban Economics*, 2007, *62* (2), 317–336.

Dinc, I Serdar and Nandini Gupta, "The decision to privatize: Finance and politics," *The Journal of Finance*, 2011, *66* (1), 241–269.

Donaldson, Dave, "Railroads of the Raj: Estimating the impact of transportation infrastructure," *American Economic Review*, 2018, *108* (4-5), 899–934.

Dray, Lynnette, "An empirical analysis of airport capacity expansion," *Journal of Air Transport Management*, 2020, *87*, 101850.

Eaton, Charlie, Sabrina T Howell, and Constantine Yannelis, "When investor incentives and consumer interests diverge: Private equity in higher education," *The Review of Financial Studies*, 2020, *33* (9), 4024–4060.

Esfahani, Hadi Salehi and Marıa Teresa Ramırez, "Institutions, infrastructure, and economic growth," *Journal of Development Economics*, 2003, *70* (2), 443–477.

Ewens, Michael, Arpit Gupta, and Sabrina T Howell, "Local journalism under private equity ownership," Technical Report, National Bureau of Economic Research 2022.

Fang, Lily, Jim Goldman, and Alexandra Roulet, "Private Equity and Pay Gaps inside the Firm," 2023.

Forsyth, Peter, "Airport policy in Australia and New Zealand: Privatization, light-handed regulation and performance," *Aviation Infrastructure Performance: A Study in Comparative Political Economy*, 2008, pp. 65–99.

Gadiesh, Orit and Hugh MacArthur, *Lessons from private equity any company can use*, Harvard Business Press, 2008.

Gelhausen, Marc C, Peter Berster, and Dieter Wilken, "Do airport capacity constraints have a serious impact on the future development of air traffic?," *Journal of Air Transport Management*, 2013, *28*, 3–13.

Gillen, David, "The evolution of airport ownership and governance," *Journal of Air Transport Management*, 2011, *17* (1), 3–13.

_ and Hans-Martin Niemeier, "The European Union: evolution of privatization, regulation, and slot reform," 2008.

Gompers, Paul A and Steven N Kaplan, *Advanced Introduction to Private Equity*, Edward Elgar Publishing, 2022.

_ , _ , and Vladimir Mukharlyamov, "The Market for CEOs: Evidence from Private Equity," Technical Report, National Bureau of Economic Research 2023.

Gompers, Paul, Steven N Kaplan, and Vladimir Mukharlyamov, "What do private equity firms say they do?," *Journal of Financial Economics*, 2016, *121* (3), 449–476.

Gormley, Todd A and David A Matsa, "Growing out of trouble? Corporate responses to liability risk," *The Review of Financial Studies*, 2011, *24* (8), 2781–2821.

Gornall, Will, Oleg Gredil, Sabrina T Howell, and Xing Liu, "Do Employees Cheer for Private Equity? The Heterogeneous Effects of Buyouts on Job Quality," *Available at SSRN 3912230*, 2021.

Graham, Anne, "Airport privatisation: A successful journey?," *Journal of Air Transport Management*, 2020, *89*, 101930.

Gramlich, Edward M, "Infrastructure investment: A review essay," *Journal of Economic Literature*, 1994, *32* (3), 1176–1196.

Grossman, Sanford J and Oliver D Hart, "The costs and benefits of ownership: A theory of vertical and lateral integration," *Journal of political economy*, 1986, *94* (4), 691–719.

Guo, Shourun, Edith S Hotchkiss, and Weihong Song, "Do buyouts (still) create value?," *The Journal of Finance*, 2011, *66* (2), 479–517.

Gupta, Arpit and Stijn Van Nieuwerburgh, "Valuing private equity investments strip by strip," *The Journal of Finance*, 2021, *76* (6), 3255–3307.

Gupta, Atul, Sabrina T Howell, Constantine Yannelis, and Abhinav Gupta, "Does private equity investment in healthcare benefit patients? Evidence from nursing homes," Technical Report, National Bureau of Economic Research 2021.

Gutiérrez, Ester and Sebastián Lozano, "Efficiency assessment and output maximization possibilities of European small and medium sized airports," *Research in Transportation Economics*, 2016, *56*, 3–14.

Harris, Robert S, Tim Jenkinson, and Steven N Kaplan, "Private equity performance: What do we know?," *The Journal of Finance*, 2014, *69* (5), 1851–1882.

Hart, Oliver, *Firms, contracts, and financial structure*, Clarendon Press, 1995.

_ **and John Moore**, "Property Rights and the Nature of the Firm," *Journal of political economy*, 1990, *98* (6), 1119–1158.

Hoffman, David E, *The oligarchs: Wealth and power in the new Russia*, Hachette UK, 2011.

Huntington-Klein, Nick, *The effect: An introduction to research design and causality*, Chapman and Hall/CRC, 2021.

Iacus, Stefano M, Gary King, and Giuseppe Porro, "Causal inference without balance checking: Coarsened exact matching," *Political Analysis*, 2012, *20* (1), 1–24.

Ivashina, Victoria and Anna Kovner, "The private equity advantage: Leveraged buyout firms and relationship banking," *The Review of Financial Studies*, 2011, *24* (7), 2462–2498.

Jenkinson, Tim, Hyeik Kim, and Michael S Weisbach, *Buyouts: A Primer*, Vol. 1 of *Handbook of the Economics of Corporate Finance: Private Equity and Entrepreneurial Finance*, Elsevier, 2021.

Kaplan, Steven, "The effects of management buyouts on operating performance and value," *Journal of Financial Economics*, 1989, *24* (2), 217–254.

Kaplan, Steven N and Antoinette Schoar, "Private equity performance: Returns, persistence, and capital flows," *The Journal of Finance*, 2005, *60* (4), 1791–1823.

_ **and Per Stromberg**, "Leveraged buyouts and private equity," *Journal of Economic Perspectives*, 2009, *23* (1), 121–46.

Korteweg, Arthur and Morten Sorensen, "Skill and luck in private equity performance," *Journal of Financial Economics*, 2017, *124* (3), 535–562.

Liu, Tong, "Bargaining with private equity: implications for hospital prices and patient welfare," *Available at SSRN 3896410*, 2021.

Mayer, Christopher and Todd Sinai, "Network effects, congestion externalities, and air traffic delays: Or why not all delays are evil," *American Economic Review*, 2003, *93* (4), 1194–1215.

Megginson, William L, Robert C Nash, Jeffry M Netter, and Annette B Poulsen, "The choice of private versus public capital markets: Evidence from privatizations," *The Journal of Finance*, 2004, *59* (6), 2835–2870.

Milesi-Ferretti, Gian Maria, Roberto Perotti, and Massimo Rostagno, "Electoral systems and public spending," *The Quarterly Journal of Economics*, 2002, *117* (2), 609–657.

Mill, John Stuart and JM Robson, "The collected works of John Stuart Mill, volume III," *Principles of Political Economy, Part II*, 1965.

Nieuwerburgh, Stijn Van, Richard Stanton, and Leo de Bever, "A review of real estate and infrastructure investments by the Norwegian Government Pension Fund Global (GPFG)," *Report to the Norwegian Ministry of Finance*, 2015.

Olariaga, Oscar Díaz and Luis Pulido Moreno, "Measurement of airport efficiency. The case of Colombia," *Transport and Telecommunication*, 2019, *20* (1), 40–51.

Olsson, Martin and Joacim Tåg, "Private Equity, Layoffs, and Job Polarization," *Journal of Labor Economics*, 2017, *35* (3), 697–754.

Oum, Tae H, Jia Yan, and Chunyan Yu, "Ownership forms matter for airport efficiency: A stochastic frontier investigation of worldwide airports," *Journal of Urban Economics*, 2008, *64* (2), 422–435.

_ , Nicole Adler, and Chunyan Yu, "Privatization, corporatization, ownership forms and their effects on the performance of the world's major airports," *Journal of Air Transport management*, 2006, *12* (3), 109–121.

Palepu, Krishna G, "Consequences of leveraged buyouts," *Journal of Financial Economics*, 1990, *27* (1), 247–262.

Phalippou, Ludovic, "An inconvenient fact: Private equity returns and the billionaire factory," *The Journal of Investing*, 2020, *30* (1), 11–39.

Pigou, Arthur C, "The Economics of Welfare. 1920. Rev. ed," 1938.

Porta, Rafael La and Florencio Lopez de Silanes, "The benefits of privatization: Evidence from Mexico," *The Quarterly Journal of Economics*, 1999, *114* (4), 1193–1242.

Robinson, David and Berk Sensoy, "Cyclicality, performance measurement, and cash flow liquidity in private equity," *Journal of Financial Economics*, 2016, *122* (3), 521–543.

Samuelson, Paul A, "Economics—an introductory analysis McGraw-Hill Book Co," *New York*, 1964.

Sensoy, Berk A, Yingdi Wang, and Michael S Weisbach, "Limited partner performance and the maturing of the private equity industry," *Journal of Financial Economics*, 2014, *112* (3), 320–343.

Shleifer, Andrei, "State versus private ownership," *Journal of Economic Perspectives*, 1998, *12* (4), 133–150.

_ and Lawrence H Summers, "Breach of trust in hostile takeovers," in "Corporate takeovers: Causes and consequences," University of Chicago Press, 1988, pp. 33–68.

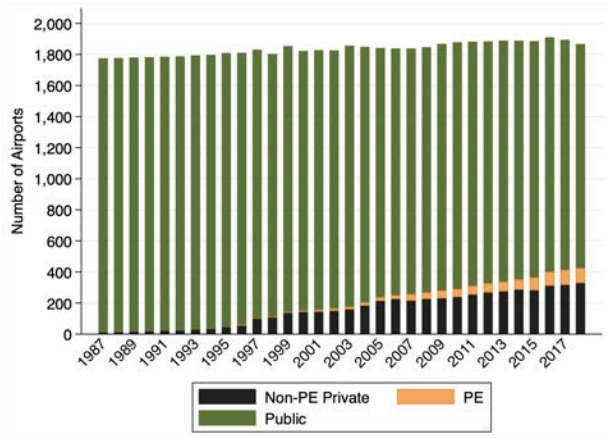
Starkie, David, "Testing the regulatory model: The expansion of Stansted airport," *Fiscal Studies*, 2004, *25* (4), 389–413.

Yan, Jia and Clifford Winston, "Can private airport competition improve runway pricing? The case of San Francisco Bay area airports," *Journal of Public Economics*, 2014, *115*, 146–157.

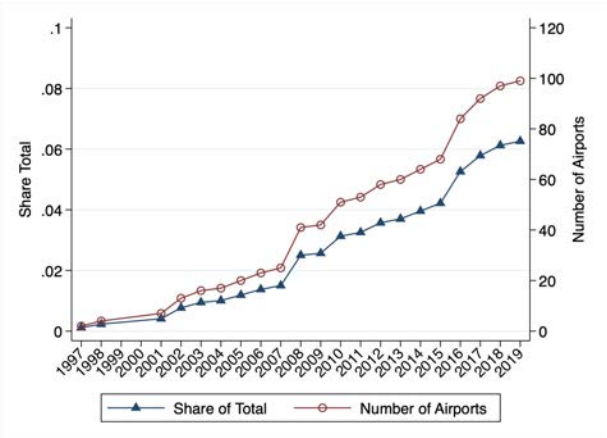
Figure 1: Airport Ownership Dynamics (1987-2019)

This figure shows airport ownership dynamics over time. Panel A presents the breakdowns of airport ownership (Public, Non-PE Private, and PE) from 1987 to 2019. Panels B, C and D present the trends of PE ownership of airports since 1997 when PE started actively purchasing airports. Panel B shows the number of airports owned by PE (right-axis) and its share of all airports (left-axis). We compare the share of airports owned by PE to that by non-PE Private in terms of the number of passengers in Panel C and the number of flights in Panel D. Note that the airports that were newly built during 2006-2019 are dropped.

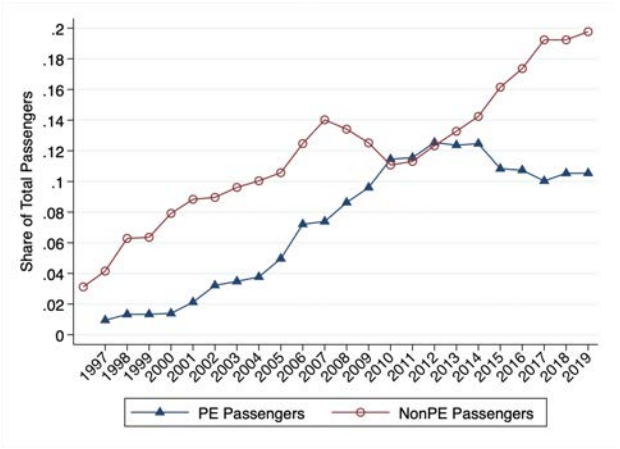
(A) Airport Ownership (1987–2019)



(B) PE Ownership of Airports (1997–2019)



(C) PE and non-PE Private Passenger Shares (1997–2019)



(D) PE and non-PE Private Flight Shares (1997–2019)

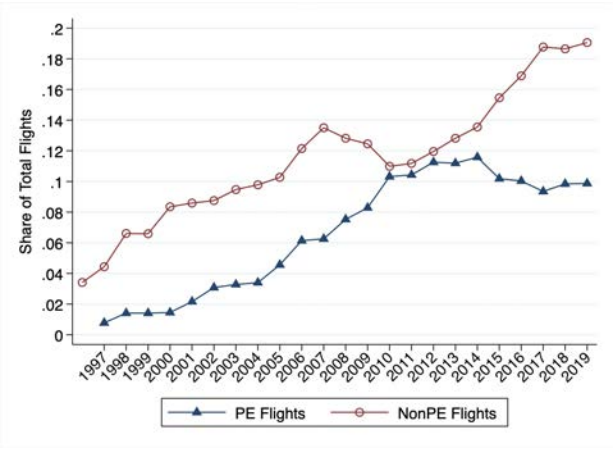
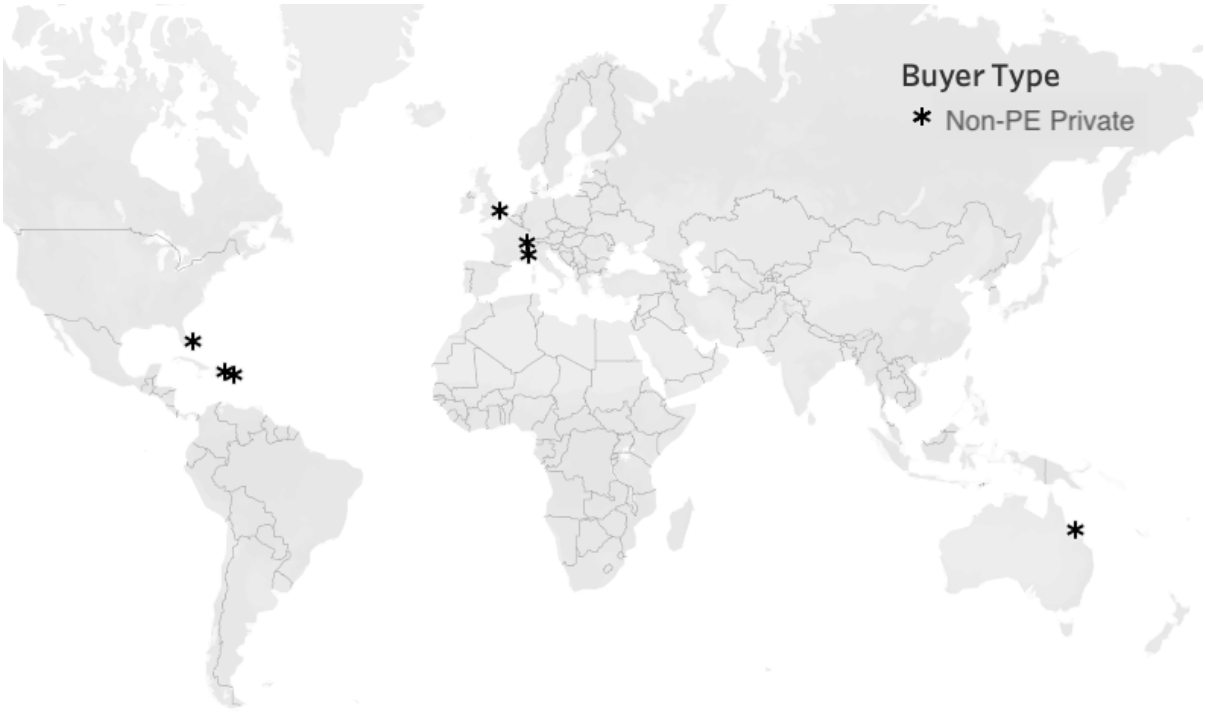


Figure 2: World Map of Privatized Airports

This figure shows the world map of privatized airports as of 1984 (Panel A) and 2019 (Panel B). Airports privatized by non-PE Private are denoted with stars and those by PE with circles.

(A) Countries with Privatized Airports (As of 1984)



(B) Countries with Privatized Airports (As of 2019)

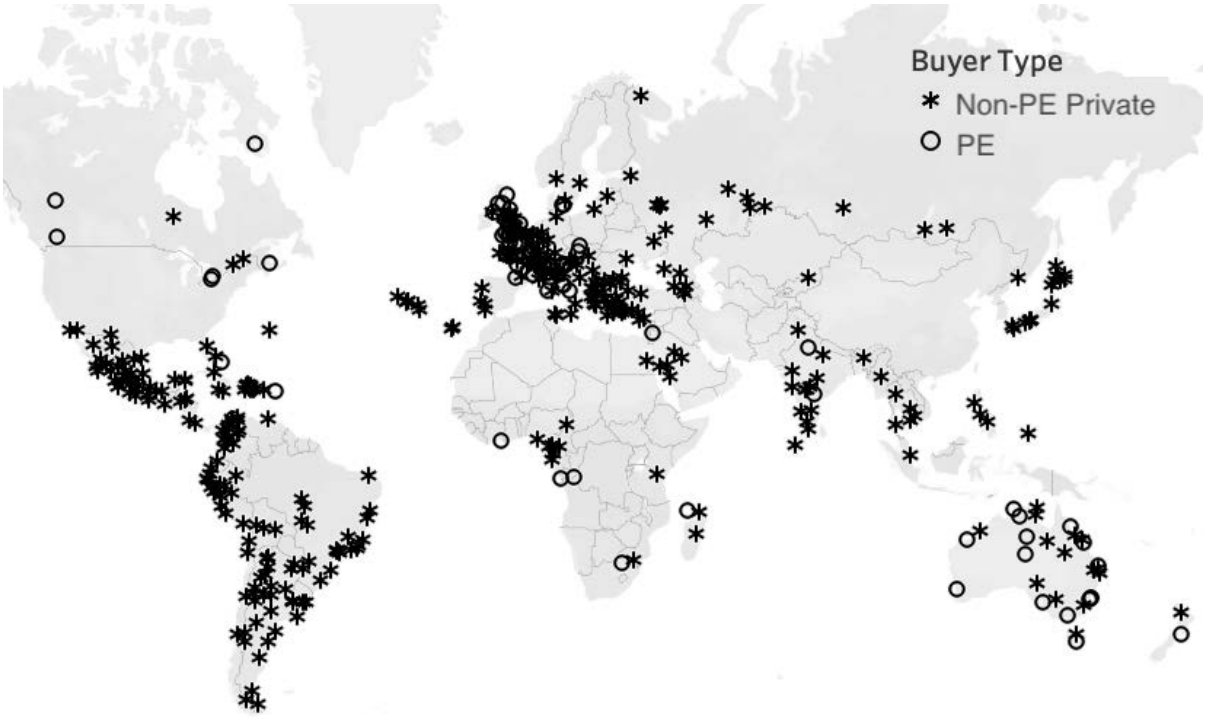
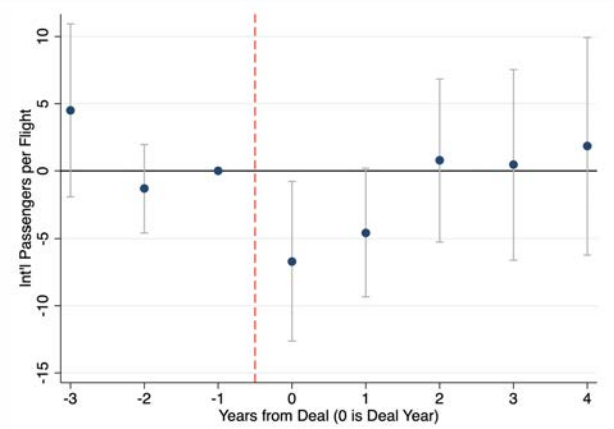


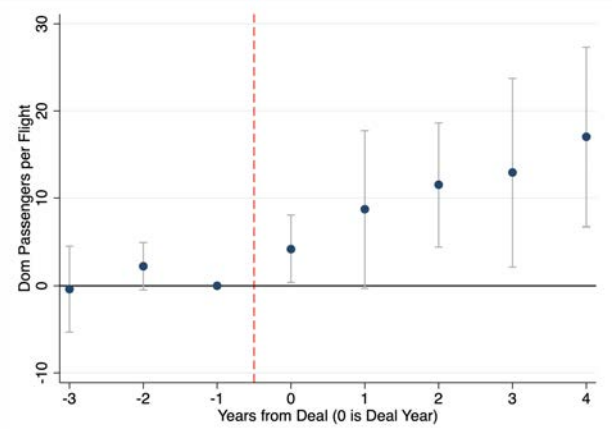
Figure 3: Event Studies on the Effect of PE Ownership: Volume of Passengers and Traffic

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to PE. The outcome variables are the number of per-flight international passengers (A) and domestic passengers (B), the log of the number of international passengers (C) and domestic passengers (D), and the log of the number of international flights (E) and domestic flights (F). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

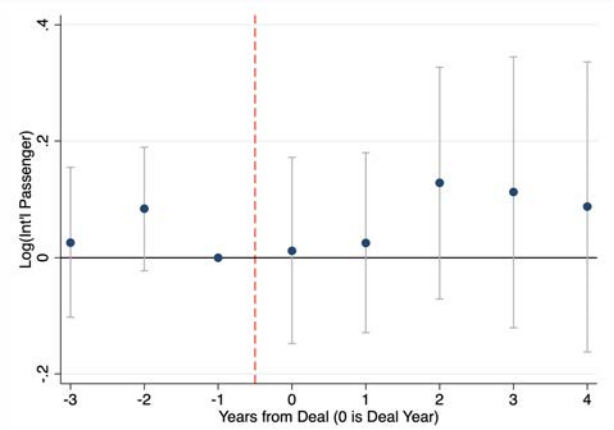
(A) Int'l per Flight Passenger Traffic



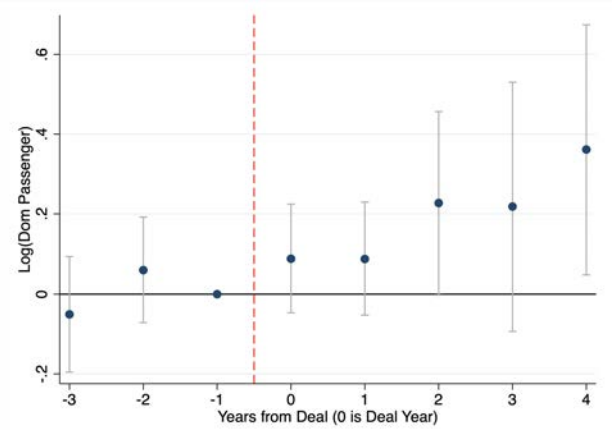
(B) Dom per Flight Passenger Traffic



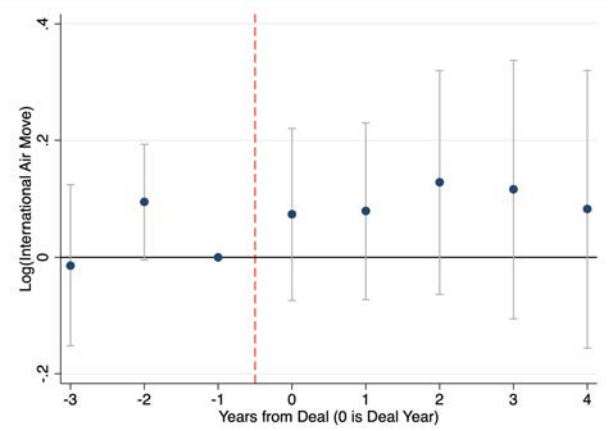
(C) Log(Number of Int'l Passengers)



(D) Log(Number of Dom Passengers)



(E) Log(Number of Int'l Flights)



(F) Log(Number of Dom Flights)

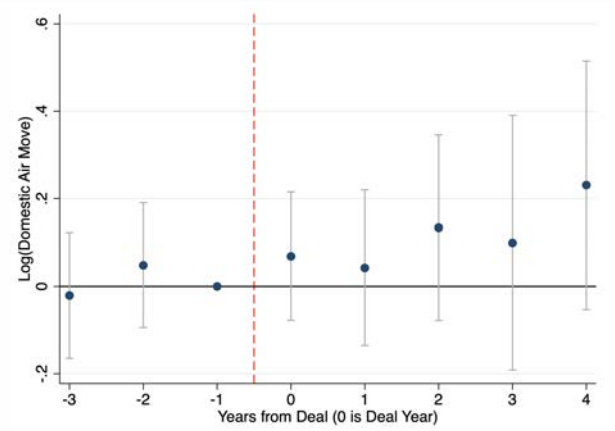
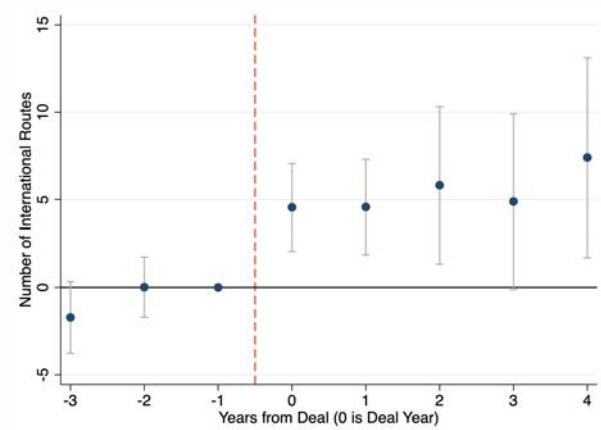


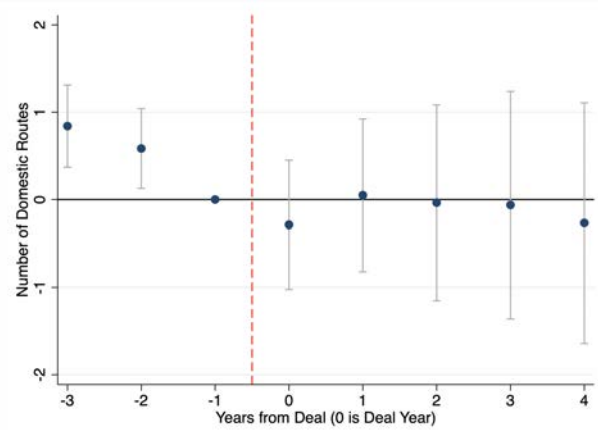
Figure 4: Event Studies on the Effect of PE Ownership: Routes and Airlines

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to PE. The outcome variables are the number of international routes (A) and domestic routes (B), the number of low-cost carriers (C) and HHI of airlines (D). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

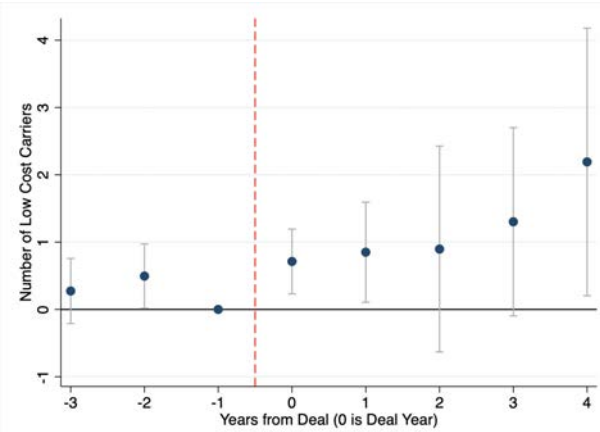
(A) Number of International Routes



(B) Number of Domestic Routes



(C) Number of Low Cost Carriers



(D) Airline HHI

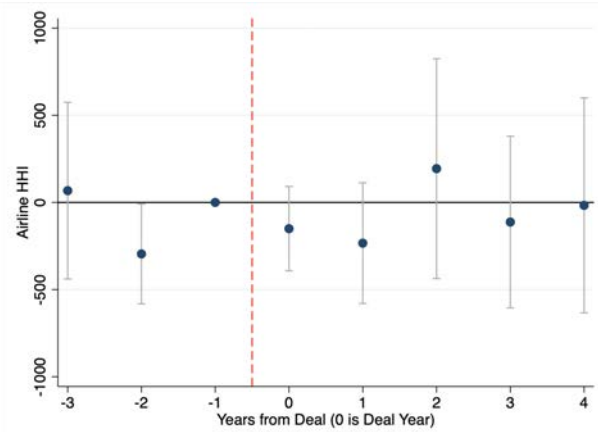
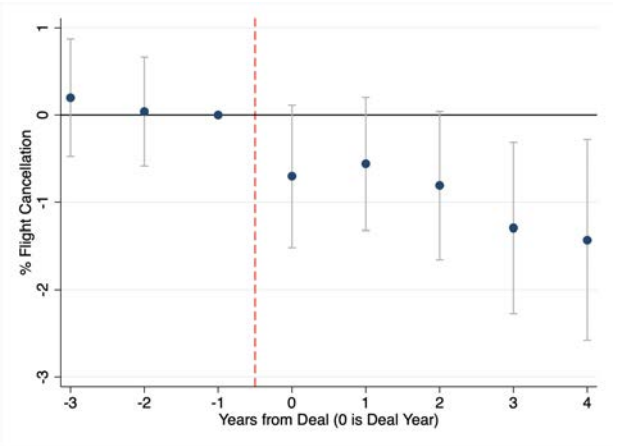


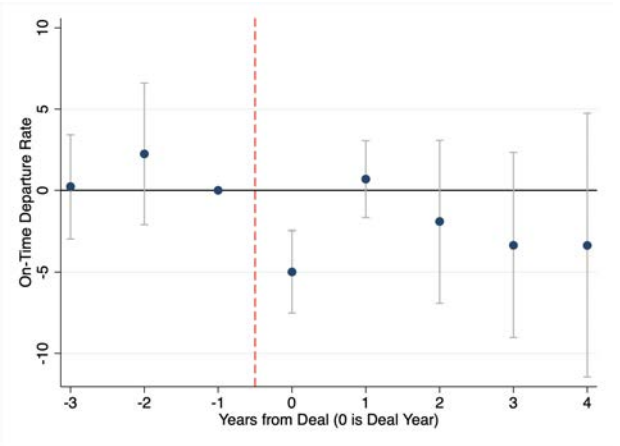
Figure 5: Event Studies on the Effect of PE Ownership: Punctuality, Safety, and Awards

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to PE. The outcome variables are flight cancellation rate (A), on-time departure rate (B), an indicator variable for awards (C), the number of accidents (D) and the number of fatalities (E). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

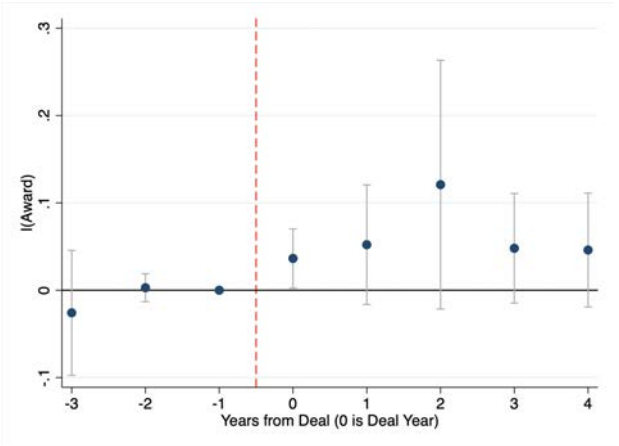
(A) Flight Cancellation Rate



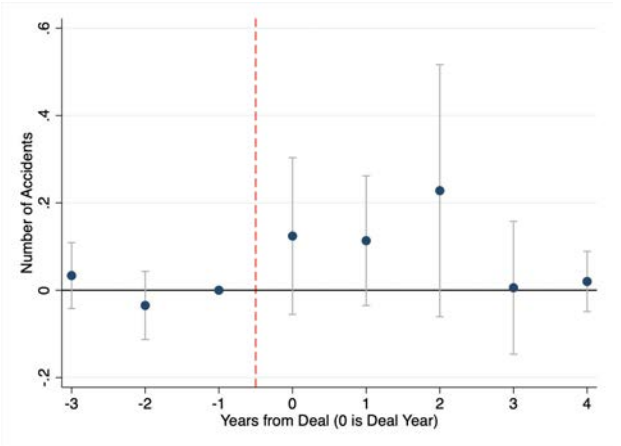
(B) On-Time Departure Rate



(C) Any Award



(D) Number of Accidents



(E) Number of Fatalities

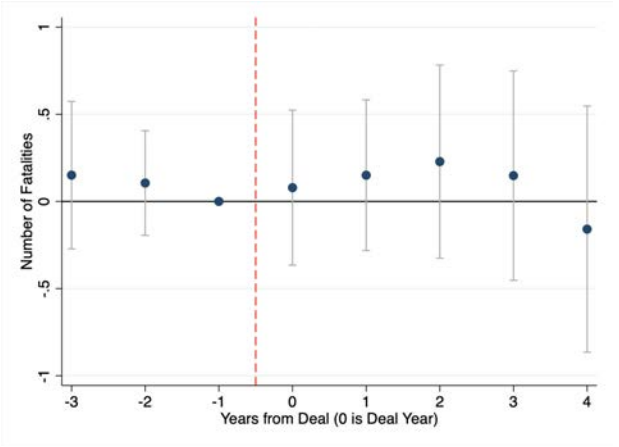
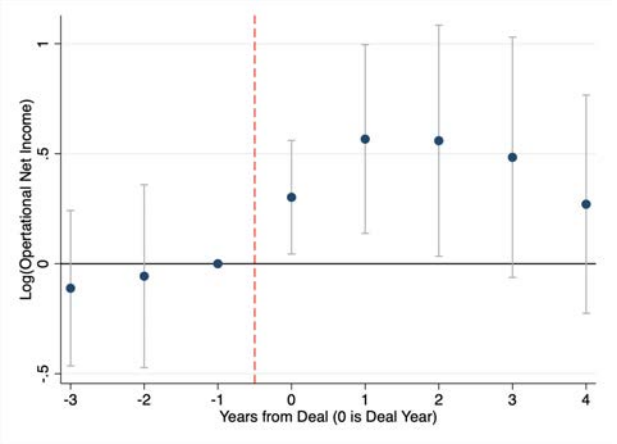


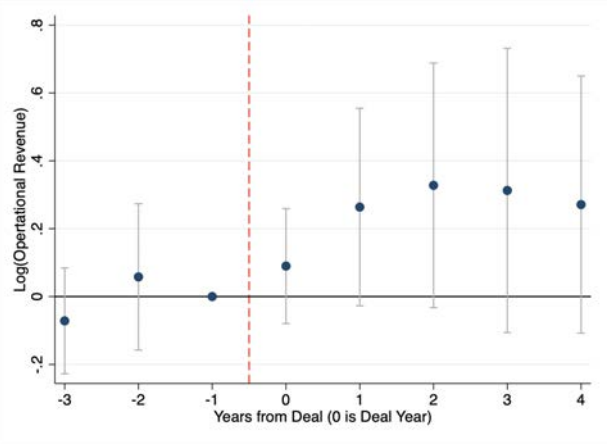
Figure 6: Event Studies on the Effect of PE Ownership: Financial Outcomes

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to PE. The outcome variables are the log of net operating income (A), the log of total operating revenue (B), the log of total aeronautical revenue (C) and non-aeronautical revenue (D), the log of total operating expenditure per 1000 passengers (E), and the number of employees per 1,000 passengers (F). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

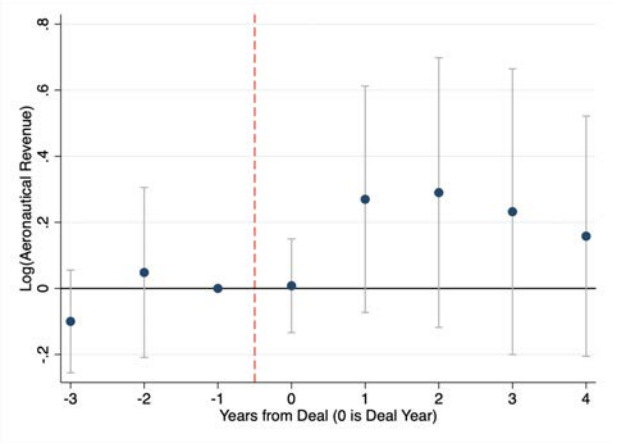
(A) Log(Net Operating Income)



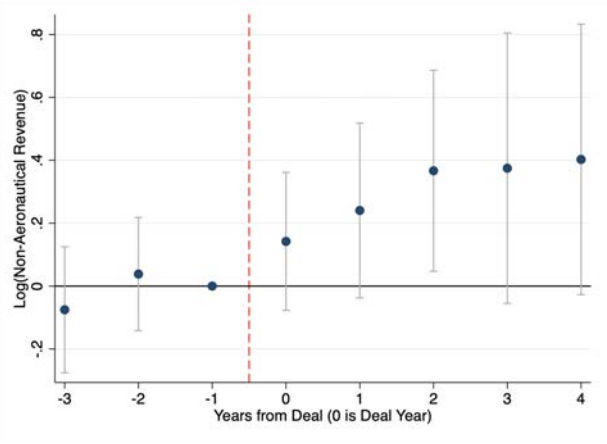
(B) Log(Total Operating Revenue)



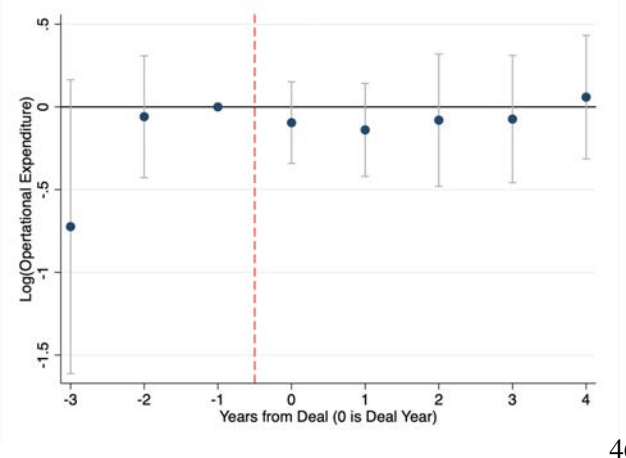
(C) Log(Total Aeronautical Revenue)



(D) Log(Total Non Aeronautical Revenue)



(E) Log(OpEx per 1000 psg)



(F) Number of Employees per 1000 Passengers

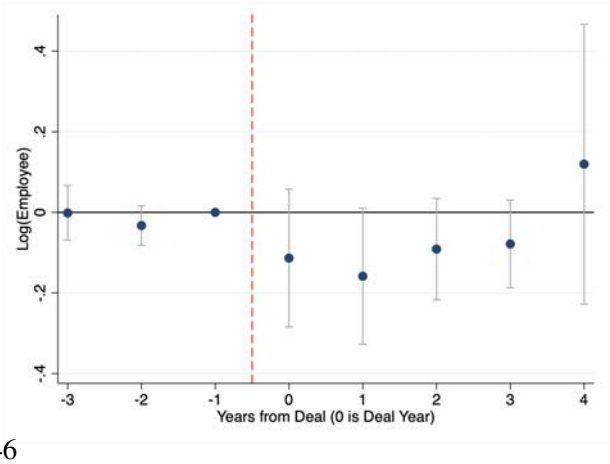
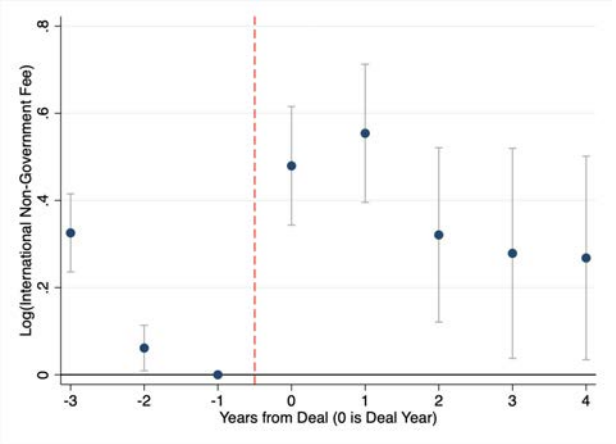


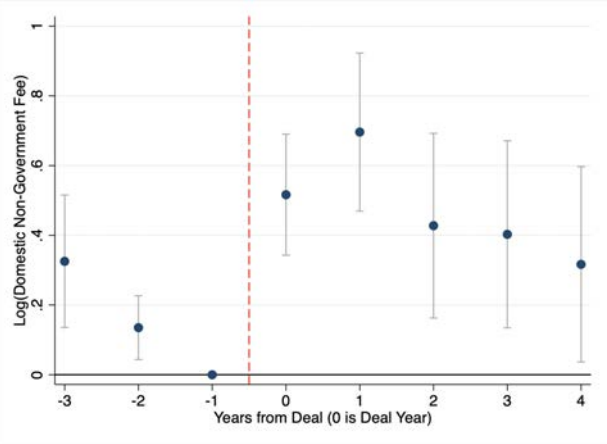
Figure 7: Event Studies on the Effect of PE Ownership: Fees Charged to Airlines

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to PE. The outcome variables are the log of total fees for international flights (A) and domestic flights (B), the log of international passenger fees(C) and domestic passenger fees (D), and the log of international runway fees (E) and domestic runway fees (F). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

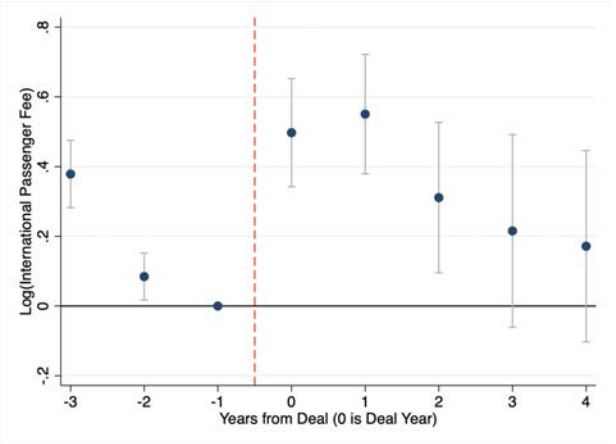
(A) Log(Int'l Fee)



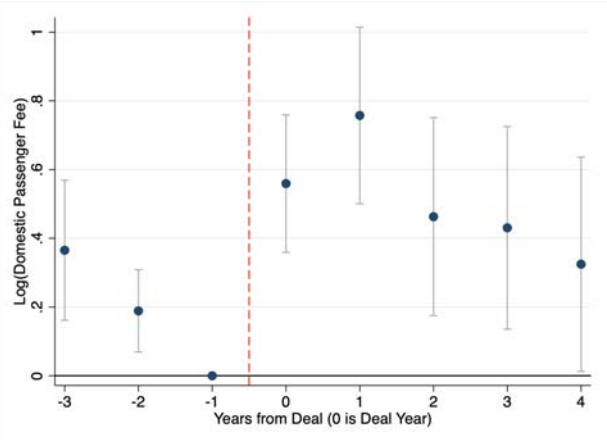
(B) Log(Dom Fee)



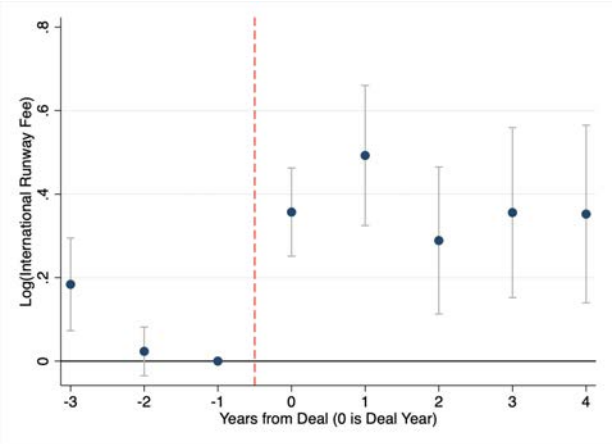
(C) Log(Int'l Passenger Fee)



(D) Log(Dom Passenger Fee)



(E) Log(Int'l Runway Fee)



(F) Log(Dom Runway Fee)

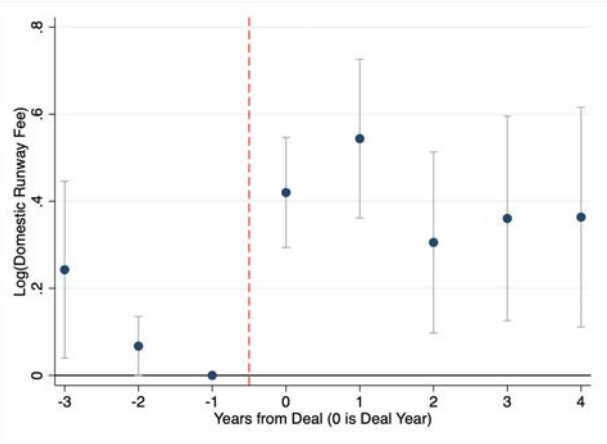
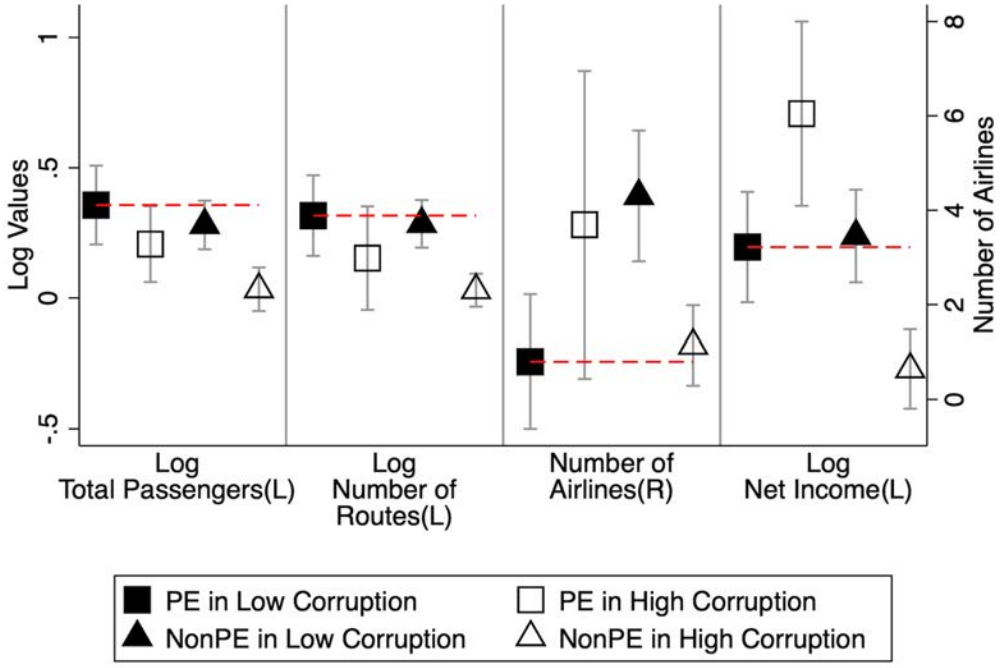


Figure 8: Heterogeneous Effects of Airport Privatization: Domestic Governance and State-owned Flag Carriers

This figure shows the heterogeneous effects of airport privatization on key outcome variables by ownership type. The points represent coefficients from a regression of an outcome variable on four indicators representing ownership type interacted with a binary characteristic. We include airport and year fixed effects. Coefficients on PE ownership are denoted as squares and those of non-PE ownership as triangles. In Panel A, the binary characteristic divides acquisitions according to whether the airport is in a country with below-median corruption (black) or above-median corruption (white). In Panel B, the binary characteristic divides acquisitions according to whether the airport has (black) or does not have (white) a state-owned flag carrier. The outcome variables are the number of airlines and the number of low-cost carriers on the two left panels (left axis) and the log of net income on the right panel (right axis). The outcome variables are the log of total passenger number (right axis), the number of routes (left axis), the number of airlines (left axis) and the log of net income (right axis).

(A) High vs. Low Corruption



(B) State-Owned Flag Carriers

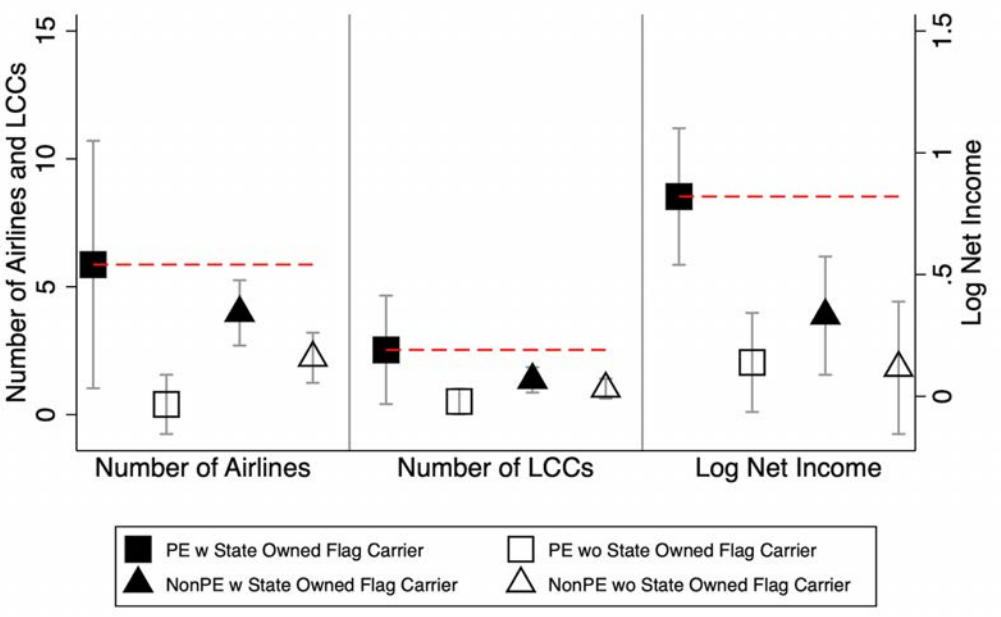
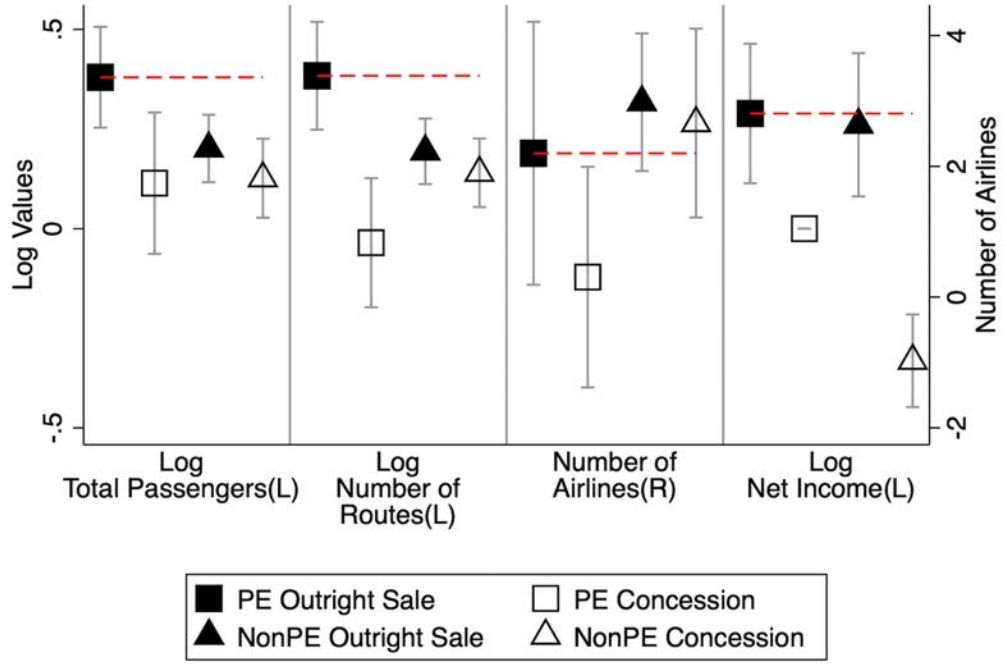


Figure 9: Heterogeneous Effects of Airport Privatization: Contract Form and Competition

This figure shows the heterogeneous effects of airport privatization on key outcome variables by ownership type. The points represent coefficients from a regression of an outcome variable on four indicators representing ownership type interacted with a binary characteristic. We include airport and year fixed effects. Coefficients on PE ownership are denoted as squares and those of non-PE ownership as triangles. In Panel A, the binary characteristic divides acquisitions according to whether the airport was privatized through an outright sale (black) or a concession (white). In Panel B, the binary characteristic divides acquisitions according to whether the airport has (black) or does not have (white) a competing airport within 200 km. The outcome variables are the log of total passenger number (right axis), the number of routes (left axis), the number of airlines (left axis) and the log of net income (right axis).

(A) Contract Form



(B) Competing Airports Nearby

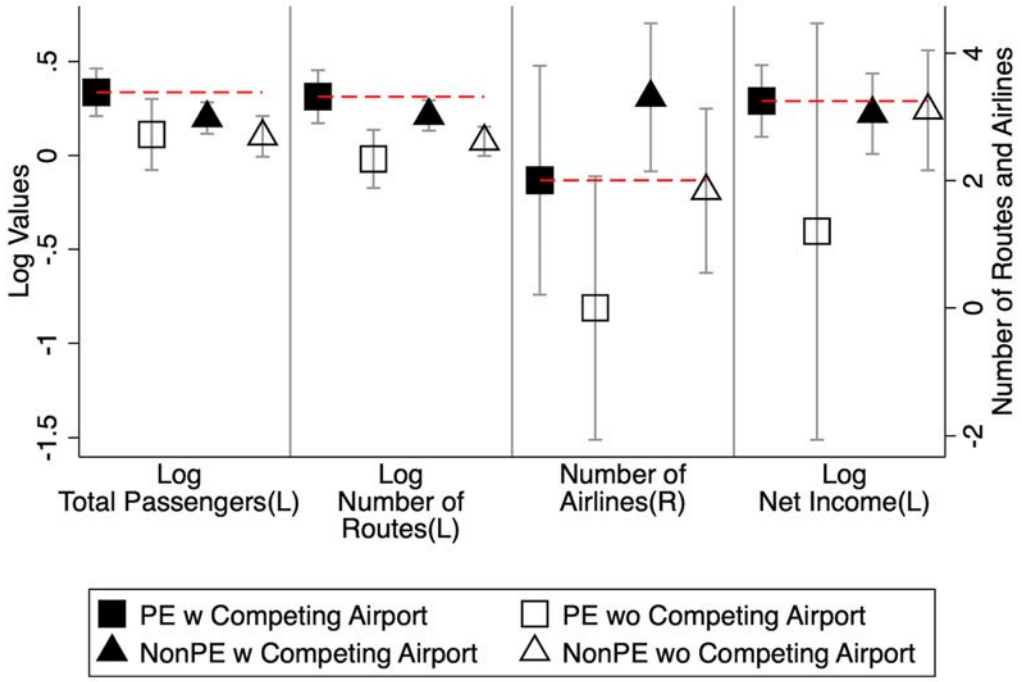


Table 1: Airport Acquisition Ownership Types and Control Stakes

This table shows the distribution of the number of transactions by privatization form and the summary statistics on the ownership and control stakes of each privatization type. All airport ownership and control transitions are first separated into concessions in Panel A and sales in Panel B. Panel A presents the number of transactions and the summary statistics on control stake (%) and concession years of the concession deals by privatization form. Panel B presents the number of transactions and the summary statistics on ownership stake (%) and concession years of sales by privatization form. Following industry standards, we consider a very long-term lease (a concession deal awarded to private parties to operate for more than 30 years) as a sale.

Panel A: Concessions

	Number of Transactions	Percent Control Stake					Duration (Years)	
	N	Mean	Median	SD	Min	Max	Mean	Median
Privatization								
Total	186	94.2	100	15.37	34	100	23.04	25
Govt to non-PE Private	178	96.8	100	11.52	34	100	23.1	25
Govt to PE	8	55.73	45.26	14.05	45	80	21	15
Post-Privatization								
Total	50	88.28	100	24.5	14	100	16.66	15
Non-PE Private to PE	36	85.21	100	25.72	14	100	17.13	17
PE to non-PE Private	11	99.24	100	1.24	97.26	100	12.75	15
PE to PE	3	65.36	63	15.31	49	80	20.82	23

Panel B: Sales

	Number of Transactions			Percent Ownership Stake					Duration if Lease(Years)	
	Total	Outright Sales	Long-Term Leases	Mean	Median	SD	Min	Max	Mean	Median
Privatization										
Total	251	129	122	86.37	100	18.98	30	100	51.1	50
Govt to non-PE Private	223	110	113	88.64	100	17.43	30	100	50.82	50
Govt to PE	28	19	9	71.88	66	22.09	36	100	55.11	45
Post-Privatization										
Total	50	43	7	70.67	66	25.93	10	100	59.14	46
Non-PE Private to PE	35	28	7	72.06	68	25.92	10	100	59.14	46
PE to non-PE Private	7	7	0	67.85	51	32.04	28	100	NA	NA
PE to PE	8	8	0	69.2	66	22.47	45	100	NA	NA

Table 2: Summary Statistics

This table reports the summary statistics at the airport-year level for the main variables used in analysis. The sources of and time spans are described in Sections 3.2 and 3.3.

	Public				Non PE Private				PE			
	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD
Country-Level Economic Characteristics:												
GDP per Capita (Th)	36,190	$ 25.4	$ 24.0	$ 21.7	3,272	$ 17.3	$ 10.0	$ 16.3	524	$ 34.0	$ 40.0	$ 17.4
Trade Volume (B)	36,190	$ 1,039	$ 428	$ 1,295	3,272	$ 427	$ 208	$ 495	524	$ 614	$ 620	$ 440
Country-Level Governance Characteristics:												
Corruption	33,830	57.8	69.0	21.6	3,202	47.8	37.0	19.5	518	66.4	74.0	19.2
Ease of Doing Business	34,079	70.9	76.3	13.8	3,212	66.8	66.6	10.2	518	76.0	79.5	8.6
Airport-Level Traffic:												
Share Passengers Intl	37,372	0.19	0.01	0.30	3,272	0.38	0.29	0.35	524	0.43	0.38	0.35
Total Passenger per Flight	36,190	85.7	77.0	53.8	3,272	118	120	41.4	524	127	133	35.8
Int'l Passenger per Flight	19,032	130	138	60.8	2,841	137	141	51.0	457	150	154	50.2
Dom Passenger per Flight	35,603	79.3	69.0	51.2	3,250	107	108	49.5	520	117	117	46.9
Total Passengers (M)	36,190	1.6	0.00	5.2	3,272	2.6	1.00	5.1	524	3.4	2.0	4.9
Int'l Passengers (M)	19,032	1.0	0.00	3.5	2,841	1.6	0.00	3.9	457	2.4	1.00	4.3
Dom Passengers (M)	35,603	1.1	0.00	3.9	3,250	1.1	0.00	2.3	520	1.3	1.00	1.9
Total Flights (Th)	36,190	13.6	3.0	37.2	3,272	19.3	7.0	32.0	524	25.7	15.0	32.3
Int'l Flights (Th)	36,190	0.00	0.00	0.00	3,272	0.00	0.00	0.00	524	0.00	0.00	0.00
Dom Flights (Th)	36,190	0.00	0.00	0.00	3,272	0.00	0.00	0.00	524	0.00	0.00	0.00
Total Freight Tons per Flight	26,778	3.3	2.0	4.5	2,969	4.4	3.0	4.6	510	6.0	3.0	8.1
Int'l Freight Tons per Flight	15,030	2,038	618	4,043	2,438	2,694	1,365	3,938	427	3,922	1,832	6,456
Dom Freight Tons per Flight	24,743	2,335	1,114	3,462	2,662	2,427	1,224	3,135	470	2,982	1,450	4,481
Total Freight Tons (Th)	26,778	77.4	6.0	280	2,969	107	22.0	228	510	190	31.0	447
Int'l Freight Tons (Th)	15,030	59.8	4.0	220	2,438	76.6	12.0	163	427	158	19.0	407
Dom Freight Tons (Th)	24,743	47.4	4.0	193	2,662	49.2	9.0	121	470	62.8	16.0	151
Airport-Level Quality Measure:												
Number of Routes	36,190	18.2	6.0	32.9	3,272	35.7	17.0	47.3	524	49.7	30.0	52.7
Number of Int'l Routes	19,031	17.1	5.0	30.5	2,841	29.6	12.0	44.7	457	43.9	23.0	53.0
Number of Dom Routes	35,599	9.3	4.0	17.3	3,250	10.0	6.0	11.5	520	11.5	9.0	9.3
$\mathbb{1}$(Award)	36,190	0.02	0.00	0.12	3,272	0.04	0.00	0.21	524	0.07	0.00	0.26
Number of Accidents per 1000 Flights	36,190	0.01	0.00	0.13	3,272	0.00	0.00	0.06	524	0.00	0.00	0.00
Number of Fatalities per 1000 Flights	36,190	0.08	0.00	2.8	3,272	0.05	0.00	0.97	524	0.00	0.00	0.04
$\mathbb{1}$(Competing Airports)	37,372	0.36	0.00	0.48	3,272	0.65	1.00	0.48	524	0.68	1.00	0.47
Airport-Level Airline Concentration:												
Number of Airlines	36,190	7.7	3.0	11.9	3,272	15.7	8.0	18.8	524	17.2	11.0	18.6
Number of Low Cost Carriers	36,190	0.86	0.00	2.0	3,272	2.3	1.00	3.1	524	3.2	2.0	3.5
Airline HHI	36,190	5,728	5,063	3,045	3,272	3,881	3,212	2,529	524	3,760	3,132	2,350
Share of Largest Airline	36,190	66.5	63.0	25.9	3,272	51.3	48.0	23.6	524	51.0	47.0	22.1
Share of Jets	36,190	0.39	0.00	0.49	3,272	0.63	1.00	0.48	524	0.73	1.00	0.45
$\mathbb{1}$(State-Owned Flag Carrier)	36,190	0.26	0.00	0.44	3,272	0.35	0.00	0.48	524	0.17	0.00	0.37

Summary Statistics (Continued)

	Public				Non PE Private				PE			
	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD
Airport-Level Price Regulation:												
No Regulation	870	0.08	0.00	0.27	387	0.23	0.00	0.42	212	0.34	0.00	0.47
Cost Based	870	0.50	1.00	0.50	387	0.16	0.00	0.36	212	0.02	0.00	0.14
Revenue Cap	870	0.06	0.00	0.24	387	0.11	0.00	0.32	212	0.03	0.00	0.17
Light	870	0.01	0.00	0.08	387	0.31	0.00	0.46	212	0.50	0.00	0.50
Other	870	0.35	0.00	0.48	387	0.37	0.00	1.0	212	0.12	0.00	0.32
Airport-Level Price Charged to Airlines:												
Int'l Fee (Th)	8,491	$ 7.8	$ 6.5	$ 5.3	1,465	$ 11.0	$ 10.4	$ 5.4	339	$ 10.8	$ 9.5	$ 5.9
Dom Fee (Th)	8,491	$ 0.78	$ 0.50	$ 0.77	1,465	$ 0.89	$ 0.70	$ 0.78	339	$ 1.4	$ 1.2	$ 1.1
Int'l Passenger Fee (Th)	8,491	$ 5.2	$ 4.2	$ 4.7	1,465	$ 8.5	$ 8.0	$ 5.0	339	$ 7.8	$ 6.4	$ 4.9
Dom Passenger Fee (Th)	8,491	$ 0.61	$ 0.30	$ 0.70	1,465	$ 0.74	$ 0.60	$ 0.68	339	$ 1.1	$ 0.90	$ 0.91
Int'l Runway Fee (Th)	8,491	$ 2.5	$ 2.0	$ 2.0	1,465	$ 2.5	$ 2.1	$ 1.8	339	$ 2.9	$ 2.0	$ 2.8
Dom Runway Fee (Th)	8,491	$ 0.17	$ 0.12	$ 0.19	1,465	$ 0.15	$ 0.08	$ 0.19	339	$ 0.28	$ 0.18	$ 0.30
Airport-Level Price Financials:												
Total Op. Rev (M)	2,016	$ 316	$ 171	$ 392	363	$ 382	$ 180	$ 455	204	$ 220	$ 101	$ 261
Total Op. Exp. per 1000 psg (Th)	1,982	$ 20.6	$ 11.4	$ 83.6	361	$ 225	$ 20.0	$ 1,011	204	$ 19.8	$ 17.6	$ 13.2
Net Op. Income (M)	1,992	$ 130	$ 65.0	$ 191	359	$ 159	$ 81.0	$ 166	204	$ 101	$ 53.0	$ 118
Total Aero Rev (M)	2,044	$ 162	$ 88.0	$ 197	364	$ 183	$ 90.5	$ 185	204	$ 107	$ 55.0	$ 127
Total Non-Aero Rev (M)	2,017	$ 155	$ 78.0	$ 230	364	$ 199	$ 94.0	$ 298	204	$ 112	$ 51.0	$ 138
Num of Employees per 1000 psg	2,015	50.6	0.00	1,791	369	2,346	0.00	20,540	205	1,346	0.00	19,273
Airport-Level On Time Performance:												
Flight Cancellation Rate (%)	4,193	2.5	1.5	5.1	673	1.6	1.0	2.3	142	1.3	0.93	1.1
On-Time Departure Rate (%)	4,193	78.5	80.7	9.8	673	77.2	78.8	8.4	142	72.8	73.5	10.3

Table 3: Economic, Regulation and Governance Predictors of Airport Privatization

This table shows predictors of airport acquisition by either a PE infrastructure fund (PE) or a non-PE private firm (Non-PE Priv). The unit of observation is the airport-year and the sample period is from 1996 to 2019, with years post-acquisition dropped. The model is OLS regression, where the dependent variable is an indicator for PE acquisition in columns 1, 3, 5 and 7 and non-PE Private acquisition in columns 2, 4, 6 and 8 (multiplied by 100 for readability). All regressions except in columns 3 and 4 include year and region fixed effects. Regions are Africa, Asia, Europe, North America, Oceania, and South America. Regulation variables in columns 3 and 4 are indicator variables and only available for major airports in Asia, Europe, and Oceania. The base group is No regulation. All other variables are described in in Sections 3.2 and 3.3. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	Economic		Regulation		Governance		Net Op. Income	
	PE	Non-PE Priv	PE	Non-PE Priv	PE	Non-PE Priv	PE	Non-PE Priv
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log GDP Per Capita	-0.093	-0.125*						
	(0.063)	(0.071)						
Log Trade Volume	0.211**	-0.159**						
	(0.095)	(0.077)						
Passengers per Flight	0.001	0.000						
	(0.003)	(0.004)						
Log Total Passengers	0.296*	-0.065						
	(0.161)	(0.130)						
Share Passengers Intl	1.175	0.339						
	(0.765)	(0.449)						
Log Number of Airlines	-1.167*	0.660**						
	(0.628)	(0.300)						
Log Number of Routes	0.683**	0.127						
	(0.289)	(0.290)						
𝟙(Competing Airports)	-0.039	1.035***						
	(0.146)	(0.305)						
Cost Based			-6.730**	-4.552**				
			(2.881)	(2.094)				
Revenue Cap			-8.271**	-5.290**				
			(3.291)	(2.032)				
Light			14.821*	-1.069				
			(8.642)	(3.480)				
Other			-2.384	-3.632*				
			(2.059)	(2.147)				
Ease of Doing Business					0.034**	0.510***		
					(0.016)	(0.086)		
Corruption					0.006	0.418***		
					(0.004)	(0.055)		
Log Op. Net Income							-0.388	-0.309
							(0.305)	(0.349)
Constant	-4.832**	2.866**	7.118**	5.436**	-2.091*	-45.881***	10.109*	7.425
	(2.100)	(1.413)	(2.924)	(2.056)	(1.100)	(7.872)	(5.481)	(6.351)
Observations	27897	25101	1404	1091	27897	27897	1391	1182
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Outcome Mean	0.419	1.068	0.419	1.068	0.419	1.068	0.419	1.068

Table 4: Airport Ownership Type and Airport Traffic

This table reports estimates of how four ownership transitions affect airport traffic. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1996 to 2019. Columns 1, 2, and 3 report changes in per flight passengers, per flight international passengers, and per flight domestic passengers. Columns 4, 5, and 6 report changes in total number of passengers, number of international passengers, number of domestic passengers. Column 7, 8, and 9 report changes in total, international, and domestic number of flights. The independent variables capture four ownership type changes, with government ownership as the base group. $\mathbb{1}$(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}$(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. $\mathbb{1}$(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight			Log(Number of Passengers)			Log(Number of Flights)		
	Total	Int'l	Domestic	Total	Int'l	Domestic	Total	Int'l	Domestic
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}$(Privatization by PE)	19.46***	7.97	20.37*	0.63***	0.39*	0.65**	0.49***	0.35	0.43***
	(5.90)	(8.57)	(10.54)	(0.18)	(0.23)	(0.27)	(0.17)	(0.23)	(0.16)
$\mathbb{1}$(Privatization by Non-PE)	2.84*	-2.85	4.13**	0.19***	0.06	0.08	0.18***	0.09*	0.06
	(1.54)	(2.66)	(1.81)	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)
$\mathbb{1}$(Post-Priv Non-PE to PE)	10.50***	4.02	19.84***	0.19**	0.16*	0.17*	0.13*	0.14*	0.02
	(3.11)	(4.69)	(6.54)	(0.08)	(0.09)	(0.09)	(0.07)	(0.08)	(0.11)
$\mathbb{1}$(Post-Priv PE to Non-PE)	2.61	6.77	-9.93	0.02	-0.15	-0.14	-0.01	-0.21	-0.04
	(7.16)	(9.47)	(6.16)	(0.17)	(0.31)	(0.28)	(0.16)	(0.33)	(0.25)
Observations	40357	22860	39898	40357	22860	39898	40357	22860	39898
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.79	0.87	0.96	0.94	0.94	0.94	0.93	0.90
Y-Mean	90.00	132.56	82.82	12.46	11.68	12.02	8.21	6.94	7.85
Pr > F Priv PE=Priv Non-PE	.01	.22	.13	.02	.16	.04	.08	.26	.03
Pr > F Non-PE to PE=PE to Non-PE	.31	.79	0	.36	.33	.3	.44	.31	.82

Table 5: Airport Ownership Type and Downstream Performance – Routes and Airlines

This table reports estimates of how four ownership transitions affect airports' route systems and airline allocation. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1996 to 2019. Columns 1 to 3 report results on the effect of ownership changes on log number of routes that are being served in the airport. Column 4 and 5 report results on the effect of ownership changes on the number of airlines being served in the airport. Column 6 and 7 report results on the effect of the airline HHI measure and the share of the largest airline in the airport. The independent variables capture four ownership type changes, with government ownership as the base group. $\mathbb{1}$(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}$(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. $\mathbb{1}$(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Log(Number of Routes)			Number of Airlines			
	Total	International	Domestic	Total	Low Cost Carriers	Airline HHI	Share of Largest Airline
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{1}$(Privatization by PE)	0.36**	0.29	0.10	1.24	2.14**	290.93	2.72
	(0.16)	(0.19)	(0.13)	(1.13)	(1.05)	(353.22)	(3.87)
$\mathbb{1}$(Privatization by Non-PE)	0.14***	0.07*	0.04	3.05***	1.19***	-246.40**	-2.51**
	(0.03)	(0.04)	(0.04)	(0.48)	(0.18)	(101.12)	(1.02)
$\mathbb{1}$(Post-Priv Non-PE to PE)	0.17***	0.20**	0.01	-0.32	0.20	154.59	0.79
	(0.06)	(0.10)	(0.05)	(0.78)	(0.33)	(225.09)	(2.44)
$\mathbb{1}$(Post-Priv PE to Non-PE)	0.23**	0.01	0.21	1.07	-0.38	-464.44	-3.89
	(0.09)	(0.12)	(0.13)	(1.59)	(1.01)	(393.34)	(6.33)
Observations	40343	22858	39897	40357	40357	40357	40357
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.94	0.91	0.89	0.93	0.68	0.79	0.76
Y-Mean	2.30	1.96	1.54	8.70	1.01	5,474.07	64.44
Pr > F Priv PE=Priv Non-PE	.18	.27	.69	.14	.37	.14	.19
Pr > F Non-PE to PE=PE to Non-PE	.6	.22	.16	.43	.58	.17	.49

Table 6: Airport Ownership Type and Service Quality – On-time Performance and Safety

This table reports estimates of how four ownership transitions affect airport service quality. The estimates in columns 1 and 2 are from OLS regressions using Equation 1 on an airport-year level panel from 2016 to 2019. The dependent variable is flight cancellation rate in column 1 and on-time departure rate in column 2. To control for the delays caused from previous airports when comparing the on-time departure rate, the regressions include the number of routes fixed effects. The estimates in columns 3 to 5 are from OLS estimates using Equation 1 on an airport-year panel from 1996 to 2019. The dependent variable is an indicator for winning an award in column 3 and the number of accidents and fatalities per 1000 flights that took off from the airport in columns 4 and 5, respectively. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Flight Cancellation Rate	On-Time Departure Rate	𝟙(Award)	Number of Accidents	Number of Fatalities
	(1)	(2)	(3)	(4)	(5)
𝟙(Privatization by PE)	-1.61***	-0.89	0.12	-0.01	-0.22
	(0.33)	(0.68)	(0.08)	(0.01)	(0.24)
𝟙(Privatization by Non-PE)	-1.10***	-1.22*	0.03**	0.00	-0.12
	(0.34)	(0.73)	(0.01)	(0.00)	(0.09)
𝟙(Post-Priv Non-PE to PE)	-0.70***	-0.92	0.06**	-0.00	-0.16
	(0.25)	(1.93)	(0.02)	(0.00)	(0.17)
𝟙(Post-Priv PE to Non-PE)	0.67	-1.10***	-0.02	0.00	0.13
	(0.53)	(0.38)	(0.06)	(0.01)	(0.12)
Observations	5103	5103	40357	40357	40357
Airport FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.54	0.84	0.31	0.08	0.06
Y-Mean	2.19	77.05	0.02	0.01	0.08
Pr > F Priv PE=Priv Non-PE	.24	.72	.26	.49	.71
Pr > F Non-PE to PE=PE to Non-PE	.02	.93	.21	.43	.15

Table 7: Airport Ownership Type and Financial Outcomes

This table reports estimates of how four ownership transitions affect financial outcomes, relative to government-owned airports. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 2001 to 2017. The dependent variables are total net operational income (column 1), total operational revenue (column 2), total operational expenditure per 1000 passengers (column 3), aeronautical revenue (column 4), non-aeronautical revenue (column 5), and number of employees per 1000 passengers (column 6). All dependent variables are logged. The independent variables capture four ownership type changes, with government ownership as the base group. $\mathbb{1}$(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}$(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. $\mathbb{1}$(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Log(Op. Net Income)	Log(Op. Revenue)	Log(Aero Revenue)	Log(Non-Aero Revenue)	Log(OpEx per 1000 psg)	Log(Employees per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}$(Privatization by PE)	0.73**	0.71**	0.71**	0.84**	0.35**	-0.00
	(0.35)	(0.33)	(0.35)	(0.34)	(0.15)	(0.07)
$\mathbb{1}$(Privatization by Non-PE)	0.30***	0.08	0.20**	-0.03	-0.23**	-0.08**
	(0.10)	(0.07)	(0.09)	(0.08)	(0.11)	(0.03)
$\mathbb{1}$(Post-Priv Non-PE to PE)	0.03	0.03	0.06	0.06	-0.01	-0.02
	(0.08)	(0.07)	(0.10)	(0.07)	(0.04)	(0.02)
$\mathbb{1}$(Post-Priv PE to Non-PE)	-0.54***	-0.49***	-0.61***	-0.35*	-0.41*	-0.07*
	(0.15)	(0.08)	(0.07)	(0.21)	(0.23)	(0.04)
Observations	2613	2715	2744	2717	2686	2749
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.94	0.91	0.93	0.92	0.88
Y-Mean	17.98	18.94	18.24	18.17	9.54	0.13
Pr > F Priv PE=Priv Non-PE	.23	.07	.16	.01	0	.36
Pr > F Non-PE to PE=PE to Non-PE	0	0	0	.06	.08	.11

Table 8: Mechanisms: Aircraft and Airport Capacity

This table reports estimates of how four ownership transitions affect the composition of operating aircraft's size and capital expenditure measures. The estimates are from OLS regressions using Equation 1 on an airport-year level panel with sample period from 1996 to 2019. Columns 1 and 2 report changes in the share of aircraft types. Jets include aircraft that take more than 150 passengers on board, while Regional/Small includes aircraft with capacity less than 100 passengers. Columns 3 and 4 report changes in the log passenger terminal size (sqmt) and the number of runways, respectively. Terminal size and number of runways are collected from the historical satellite images of airports provided by Google Earth. The sample in columns 3 and 4 includes observations of the privatized airports the one year before and three years and five years after the transactions. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Share Aircraft Type		Capex	
	Jets	Regional/Small	Log(Terminal Size)	Number of Runways
	(1)	(2)	(3)	(4)
𝟙(Privatization by PE)	0.14**	-0.14**	0.08*	0.13*
	(0.06)	(0.06)	(0.04)	(0.08)
𝟙(Privatization by Non-PE)	0.00	-0.00	0.04*	-0.01
	(0.02)	(0.02)	(0.02)	(0.01)
𝟙(Post-Priv Non-PE to PE)	0.09***	-0.09***	0.19**	-0.03
	(0.02)	(0.02)	(0.09)	(0.02)
𝟙(Post-Priv PE to Non-PE)	0.06*	-0.06*	0.04	-0.05
	(0.03)	(0.03)	(0.07)	(0.04)
Observations	40357	40357	4264	4264
Airport FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R^2	0.87	0.87	0.97	0.96
Y-Mean	0.41	0.59	9.16	1.30
Pr > F Priv PE=Priv Non-PE	.04	.04	.42	.08
Pr > F Non-PE to PE=PE to Non-PE	.53	.53	.2	.59

Table 9: Mechanisms: Fees Charged to Airlines and Regulation

This table reports estimates of how four ownership transitions affect fees charged to airlines. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 2010 to 2020. Columns 1 and 2 report changes in total international and total domestic charges. Columns 3 and 4 report changes in international passenger charges and domestic passenger charges. Columns 5 and 6 report changes in international runway charges and domestic runway charges. Column 7 considers the government regulatory regime. The sample in column 7 is an airport-year level panel from 1990 to 2018. The dependent variable is 𝟙(No Regulation), which indicates whether an airport has no price regulations at the transaction year. There are no airports with data for PE to non-PE transitions for this outcome. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Log(Total Fee)		Log(Passenger Fee)		Log(Runway Fee)		
	International	Domestic	International	Domestic	International	Domestic	No Regulation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
𝟙(Privatization by PE)	-0.02**	-0.05***	-0.06***	-0.06***	0.13***	0.18***	0.14*
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.07)
𝟙(Privatization by Non-PE)	0.28***	0.31***	0.55***	0.49***	0.05	0.11***	-0.05
	(0.08)	(0.08)	(0.15)	(0.11)	(0.03)	(0.04)	(0.06)
𝟙(Post-Priv Non-PE to PE)	0.17**	0.18**	0.54**	0.43*	0.04	0.06	0.28**
	(0.07)	(0.08)	(0.27)	(0.22)	(0.05)	(0.05)	(0.11)
𝟙(Post-Priv PE to Non-PE)	0.03	0.05	-0.03	0.04	0.07**	0.09*	
	(0.07)	(0.05)	(0.09)	(0.06)	(0.03)	(0.05)	
Observations	9125	9123	9125	9125	9125	9115	1514
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.95	0.96	0.97	0.97	0.98	0.98	0.72
Y-Mean	8.82	6.23	8.01	5.64	7.54	4.55	0.16
Pr > F Priv PE=Priv Non-PE	0	0	0	0	.03	.05	.04
Pr > F Non-PE to PE=PE to Non-PE	.19	.18	.05	.1	.59	.69	

Table 10: Selection Robustness – Key Outcomes using a Sample of Airports where both PE and non-PE Firms Bid

This table reports estimates of the main outcome variables using a sample of airports that both PE and non-PE firms. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1996 to 2019. Panel A describes the summary statistics of auction outcomes. The table shows the number of airports where both PE and non-PE firms bid, only PE firms bid, and only non-PE firms bid, separately. The second (last) column indicates the number of airports where a PE firm (non-PE firm) won the auction and acquired the airport. Panel B reports estimates of how airport ownership types affect airport performance when the sample is restricted to the 70 airports for which PE and NonPE bid. The estimates are from OLS regressions using Equation 1 on an airport-year level panel. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Auction Outcome Summary

	Total	PE Wins	Non-PE Wins
Both PE & Non-PE Bid	70	54	16
Only PE Bid	20	20	0
Only Non-PE Bid	40	0	40

Panel B: Regression Results in Sample of Airports where both PE and non-PE Firms Bid

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(Privatization by PE)	17.10*	0.77***	0.66***	0.57***	1.87	466.02	-0.02*	-0.02	0.96***	0.14
	(8.90)	(0.26)	(0.23)	(0.19)	(1.47)	(379.41)	(0.01)	(0.01)	(0.23)	(0.19)
𝟙(Privatization by Non-PE)	-4.45	0.13*	0.20**	0.11	5.00***	-399.23	0.16***	0.05	0.28	-0.19
	(5.11)	(0.07)	(0.09)	(0.09)	(1.67)	(424.47)	(0.02)	(0.06)	(0.23)	(0.20)
𝟙(Post-Priv Non-PE to PE)	12.47***	0.20**	0.13	0.18**	0.65	263.36	0.16	0.08	0.25***	-0.04
	(2.76)	(0.09)	(0.11)	(0.09)	(1.62)	(399.12)	(0.15)	(0.12)	(0.07)	(0.05)
𝟙(Post-Priv PE to Non-PE)	2.01	0.20	0.13	0.13	-2.00***	552.25***	0.22***	0.17***	-0.06	-0.60***
	(4.49)	(0.13)	(0.12)	(0.10)	(0.74)	(198.49)	(0.01)	(0.02)	(0.17)	(0.10)
Observations	35041	35041	35041	35029	35041	35041	7427	7425	2170	2220
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.78	0.96	0.96	0.92	0.90
Y-Mean	85.97	12.32	8.13	2.21	7.99	5,696.54	8.74	6.24	17.95	9.41
Pr > F Priv Non-PE=Priv PE	.04	.02	.06	.03	.16	.13	0	.24	.02	.19
Pr > F Non-PE to PE=PE to Non-PE	.05	1	.97	.73	.14	.51	.71	.47	.03	0

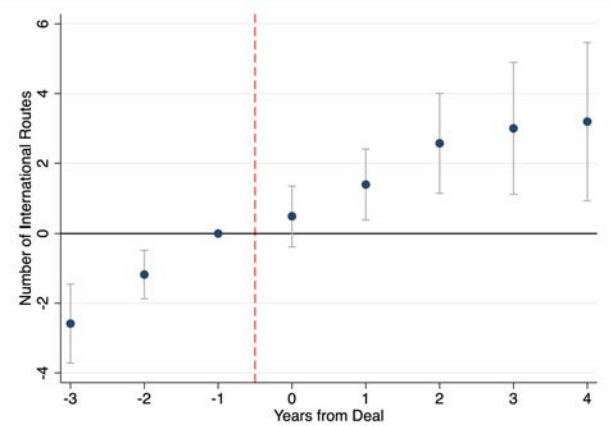
Appendix

(For Online Publication)

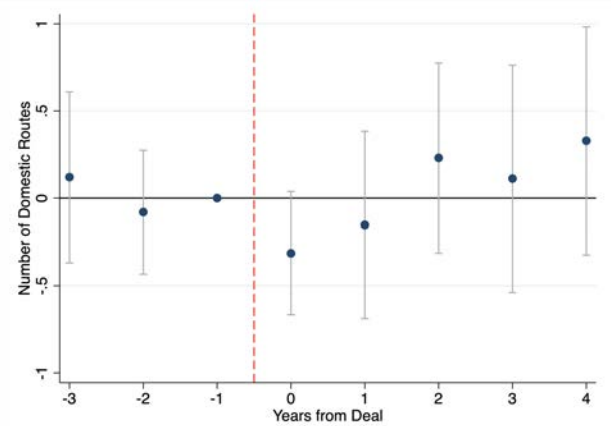
Figure A.2: Event Studies on the Effect of non-PE Private Ownership: Routes and Airlines

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to non-PE Private. The outcome variables are the number of international routes (A) and domestic routes (B), the number of low-cost carriers (C) and HHI of airlines (D). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

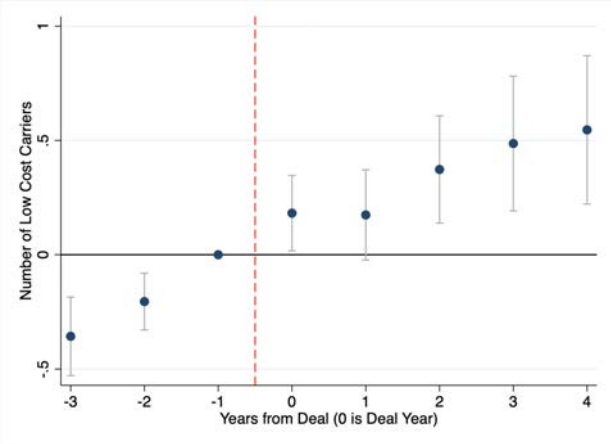
(A) Number of International Routes



(B) Number of Domestic Routes



(C) Number of Low Cost Carriers



(D) Airline HHI

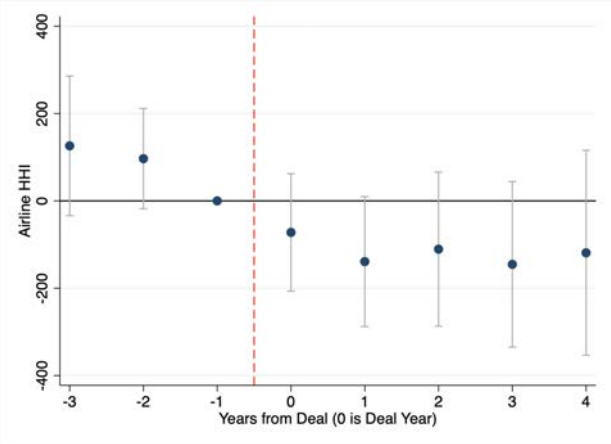
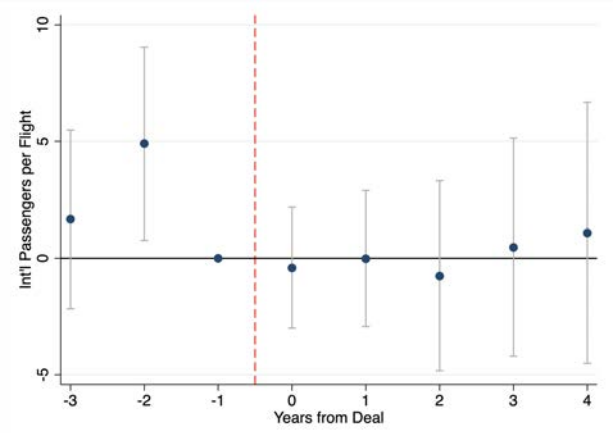


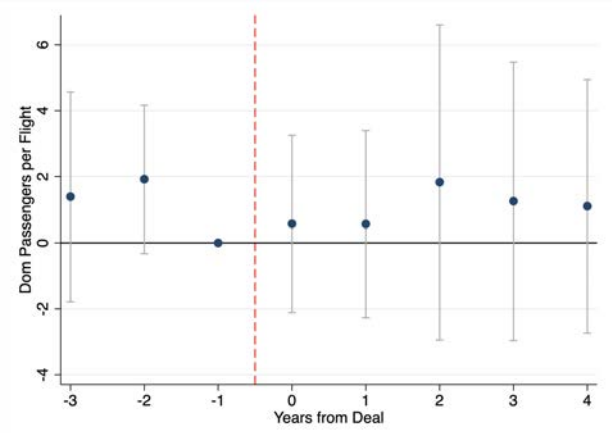
Figure A.1: Event Studies on the Effect of non-PE Private Ownership: Volume of Passengers and Traffic

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to non-PE Private. The outcome variables are the number of per-flight international passengers (A) and domestic passengers (B), the log of the number of international passengers (C) and domestic passengers (D), and the log of the number of international flights (E) and domestic flights (F). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

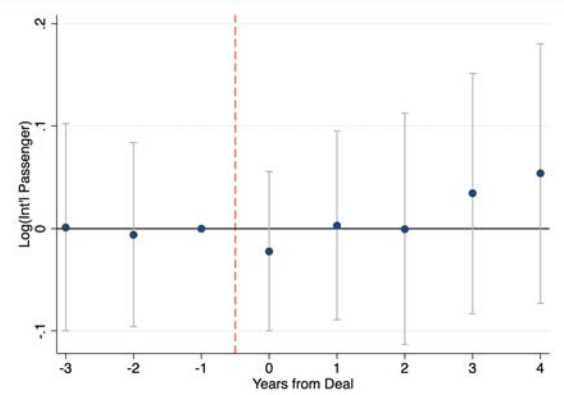
(A) Int'l per Flight Passenger Traffic



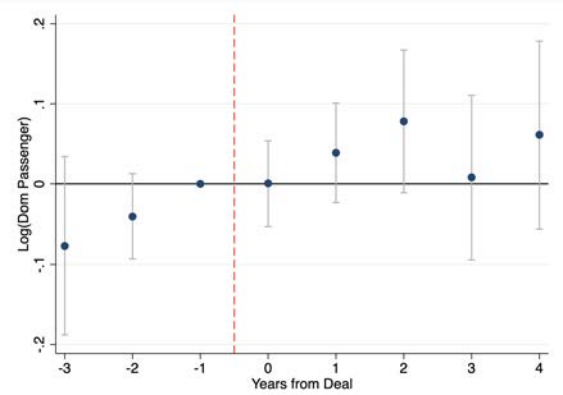
(B) Dom per Flight Passenger Traffic



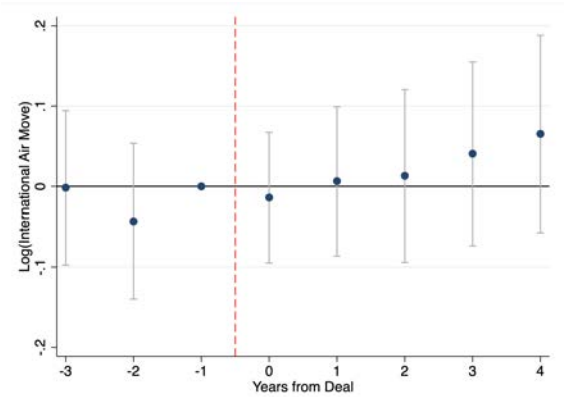
(C) Log(Number of Int'l Passengers)



(D) Log(Number of Dom Passengers)



(E) Log(Number of Int'l Flights)



(F) Log(Number of Dom Flights)

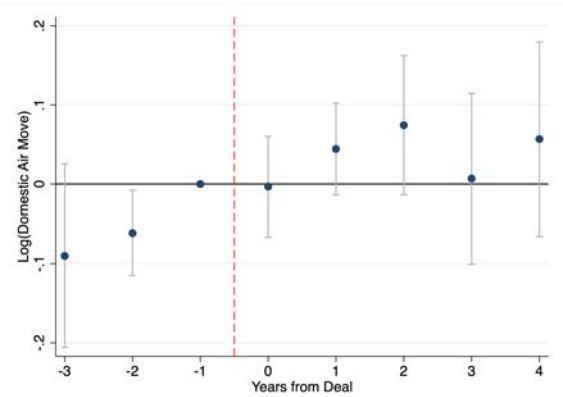
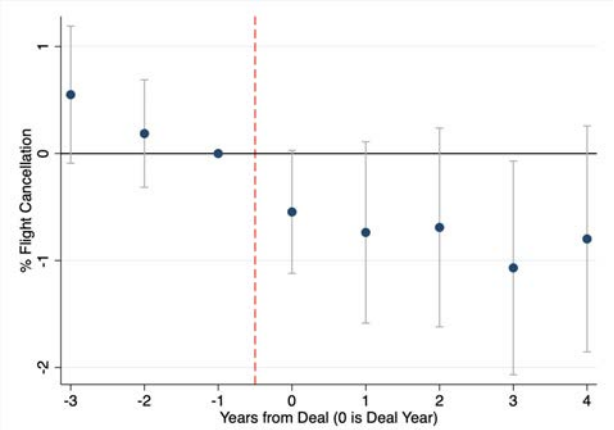


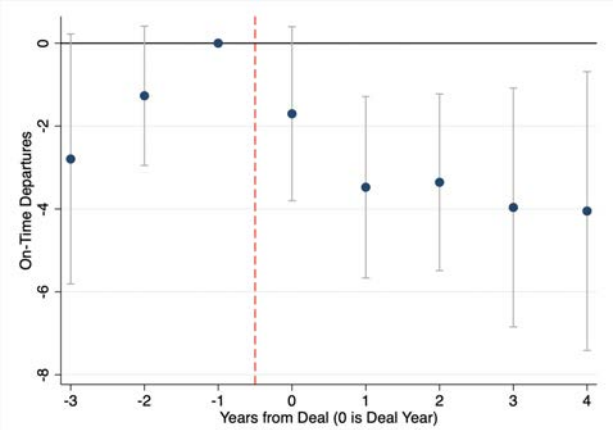
Figure A.3: Event Studies on the Effect of non-PE Private Ownership: Punctuality, Safety, and Awards

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to non-PE Private. The outcome variables are flight cancellation rate (A), on-time departure rate (B), an indicator variable for awards (C), the number of accidents (D) and the number of fatalities (E). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

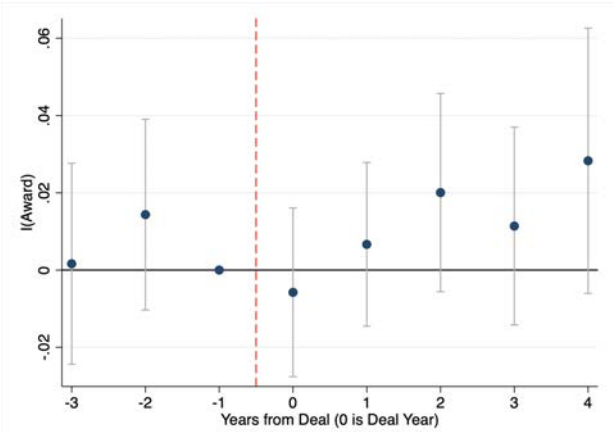
(A) Flight Cancellation Rate



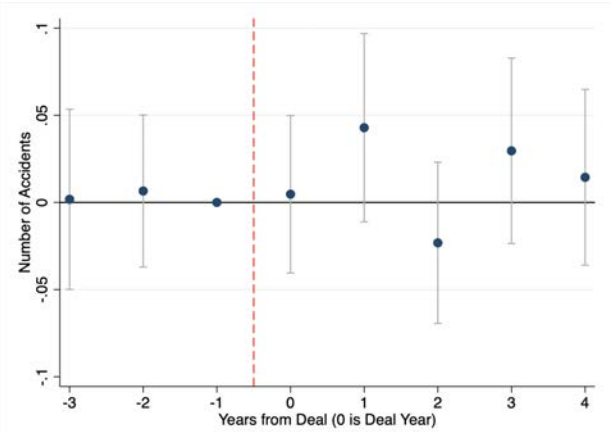
(B) On-Time Departure Rate



(C) Any Award



(D) Number of Accidents



(E) Number of Fatalities

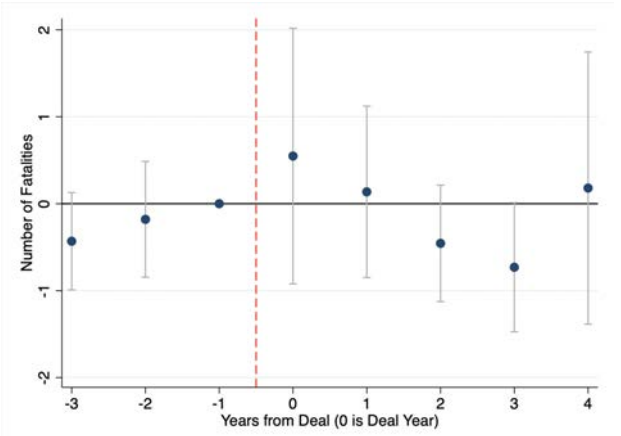
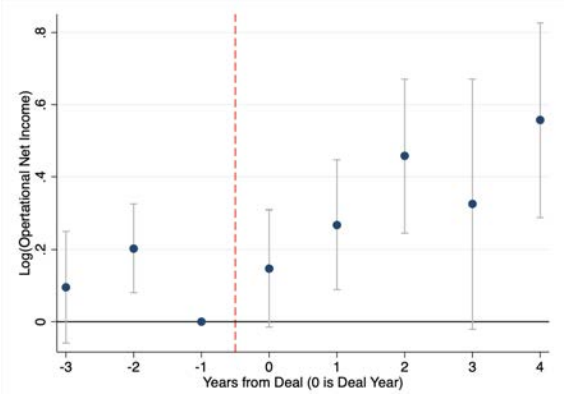


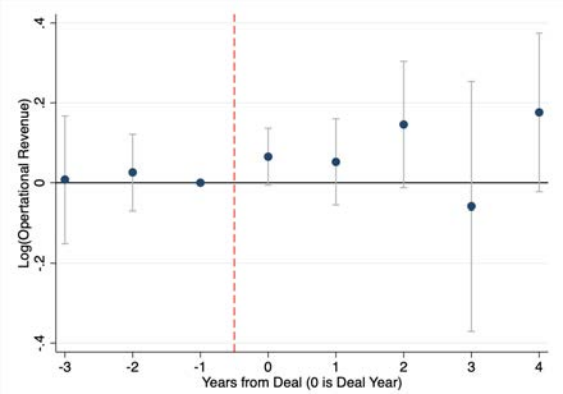
Figure A.4: Event Studies on the Effect of non-PE Private Ownership: Financial Outcomes

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to non-PE Private. The outcome variables are the log of net operating income (A), the log of total operating revenue (B), the log of total aeronautical revenue (C) and non-aeronautical revenue (D), the log of total operating expenditure per 1000 passengers (E) and the number of employees per 1,000 passengers. The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

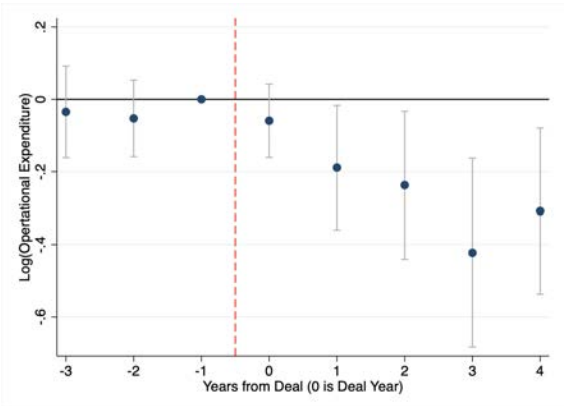
(A) Log(Total Net Operating Income)



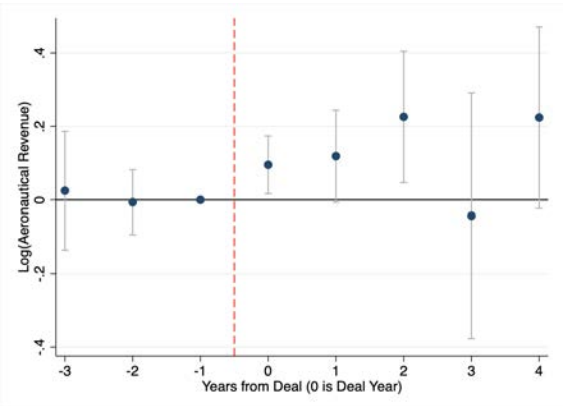
(B) Log(Total Operating Revenue)



(C) Log(OpEx per 1000 psg)



(D) Log(Total Aeronautical Revenue)



(E) Log(Total Non-Aeronautical Revenue)

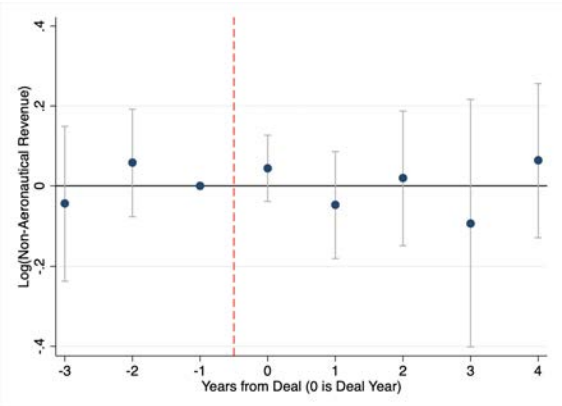
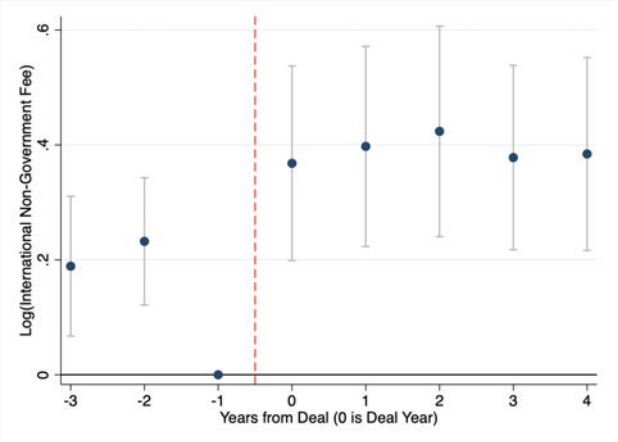


Figure A.5: Event Studies on the Effect of non-PE Private Ownership: Fees Charged to Airlines

This figure presents the dynamic differences-in-differences event studies around the airport ownership transition to non-PE Private. The outcome variables are the log of total fees for international flights (A) and domestic flights (B), the log of international passenger fees(C) and domestic passenger fees (D), and the log of international runway fees (E) and domestic runway fees (F). The regression includes airport and year fixed effects and standard errors are clustered by airport. The coefficients for the seven years around the transaction relative to the year before the deal (t=-1) and 95% confidence intervals are shown in the graph.

(A) Int'l Fee



(B) Dom Fee

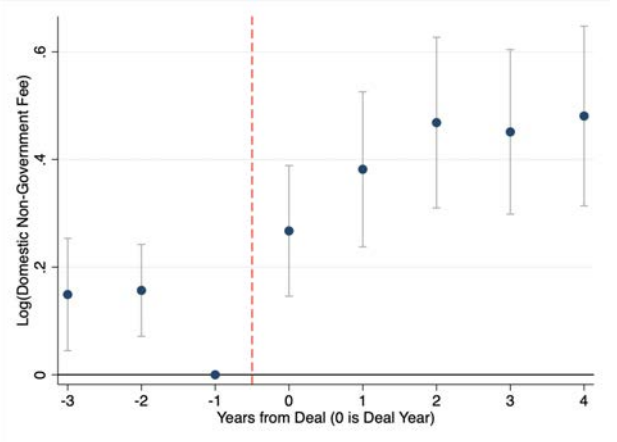


Figure A.6: Example of Satellite Image Data

These figures show two photos of Adelaide Airport, which was acquired by PE investors (IFM Investors and Whitehelm Capital) through an LBO in 2002. Panel A shows the airport in 2001 (year t-1) and Panel B shows the airport in 2005 (year t+3)

(A) Panel A

(B) Panel B

Figure A.7: Heterogeneous Effects of Airport Privatization: Ease of Doing Business

This figure shows the heterogeneous effects of airport privatization on key outcome variables by ownership type. The points represent coefficients from a regression of an outcome variable on four indicators representing ownership type interacted with a binary characteristic. We include airport and year fixed effects. Coefficients on PE ownership are denoted as squares and those of non-PE ownership as triangles. The binary characteristic divides acquisitions according to whether the airport is in a country with above-median ease of doing business (black) or below-median ease of doing business (white). The outcome variables are the log of total passenger number (right axis), the number of routes (left axis), the number of airlines (left axis) and the log of net income (right axis).

(A) High vs. Low Ease of Doing Business

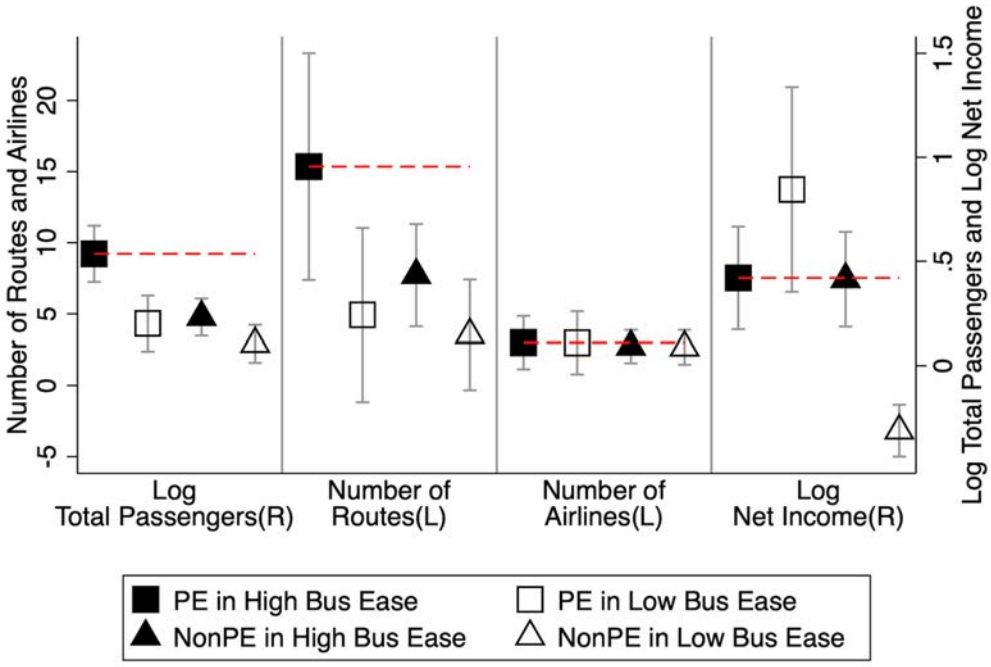


Table A.1: Airport Privatization by Country and Decade

This table shows the distribution of airport privatization events by country and time. We identify privatization events for 2,444 airports in 75 countries that served more than 10,000 passengers in 2016. There are 436 airports that were privatized either by PE or non-PE Private during the period 1929-2020.

Country	Before 1990s	1990s	2000s	2010s	2020s	Total
Albania	0	0	1	0	0	1
Argentina	0	28	1	0	0	29
Armenia	0	0	2	0	0	2
Australia	1	14	11	3	0	29
Austria	0	0	1	1	0	2
Bahamas	1	0	1	0	0	2
Belgium	0	0	1	2	0	3
Bermuda	0	0	0	1	0	1
Bolivia	0	3	0	0	0	3
Brazil	0	0	0	18	1	19
Bulgaria	0	0	2	2	1	5
Cambodia	0	3	0	0	0	3
Cameroon	0	3	0	0	0	3
Canada	0	6	1	1	0	8
Chile	0	3	2	0	0	5
Colombia	0	0	3	7	0	10
Congo	0	0	0	3	0	3
Costa Rica	0	0	1	1	0	2
Cote D'Ivoire	0	1	0	0	0	1
Croatia	0	1	0	1	0	2
Cyprus	0	0	2	0	0	2
Czech Republic	0	0	0	1	0	1
Denmark	0	0	4	0	0	4
Dominican Republic	2	1	6	0	0	9
Ecuador	0	0	2	0	0	2
Egypt	0	1	0	0	0	1
Equatorial Guinea	0	0	2	0	0	2
France	0	1	9	23	0	33
Gabon	1	0	0	0	0	1
Georgia	0	0	2	0	0	2
Germany	0	2	3	2	0	7
Greece	0	1	0	14	0	15
Honduras	0	0	3	0	0	3
Hungary	0	0	1	0	0	1
India	0	1	9	1	5	16
Indonesia	0	0	0	1	0	1
Italy	1	4	6	7	0	18
Jamaica	0	0	1	1	0	2
Japan	0	0	0	6	8	14
Jordan	0	0	1	0	0	1
Kazakhstan	0	0	0	0	1	1
Kosovo	0	0	0	1	0	1
Latvia	0	0	0	1	0	1
Macedonia	0	0	2	0	0	2
Madagascar	0	0	0	2	0	2

Airport Privatization by Country and Decade (Continued)

Country	Before 1990s	1990s	2000s	2010s	2020s	Total
Malaysia	0	0	1	0	0	1
Maldives	0	0	0	1	0	1
Malta	0	0	1	0	0	1
Mexico	0	0	41	1	0	42
Moldova	0	0	0	1	0	1
Myanmar	0	0	0	1	0	1
Netherlands	0	0	1	0	0	1
New Zealand	0	2	0	0	0	2
Nigeria	0	1	0	0	0	1
Norway	0	1	0	0	0	1
Pakistan	0	0	1	0	0	1
Peru	0	0	13	1	0	14
Philippines	0	0	0	3	0	3
Portugal	0	0	2	10	0	12
Puerto Rico	0	0	0	1	0	1
Russia	0	3	0	15	0	18
Saudi Arabia	0	0	0	5	0	5
Serbia	0	0	0	1	0	1
Slovenia	0	0	1	1	0	2
South Africa	0	0	1	1	0	2
Sweden	0	1	0	1	0	2
Switzerland	1	0	1	0	0	2
Tanzania	0	1	0	0	0	1
Thailand	1	1	0	0	0	2
Tunisia	0	0	2	0	0	2
Turkey	0	2	6	0	0	8
UK	7	10	10	2	0	29
US	0	1	0	1	0	2
Ukraine	0	0	1	0	0	1
Uruguay	0	1	1	0	0	2
Total	15	97	163	146	16	437

Table A.2: Statistics for Top PE Firms and PE Funds in Airport Deals

This table presents the statistics of PE firms and PE funds that are active in airport privatization. Panel A shows the list of top five private equity firms by the number of airports deals during our sample period. Panel B shows the statistics of PE Infrastructure funds that invested in airport acquisitions. PE fund and deal statistics are based on the data from Pitchbook and Preqin.

Panel A: Top 5 Firms by Number of Airports

	Number of Airports
Ciclad	16
Macquarie	11
Advent International	7
IFM Investors	6
F2i	5

Panel B: Fund and Deal Statistics

	Mean	Median	N
Fund Size	2.71b	1.17b	43
Closed-Ended	85%		20
Deals Exited	37.78%		90
Deals Exited by Year 10	26.67%		90
Years to Exit	8.32	7	34
Years to Exit (with > 10)	10.65	9	48
Fund Region			
EU	41.3%		46
NA	23.91%		46
OC	17.39%		46
AS	6.52%		46
SA	6.52%		46
AF	4.35%		46
Same Region as Airport	76.74%		43

Table A.3: Government Ownership of Top 10 Non-PE Private Firms

This table shows the list of top 10 non-PE private firms by the number of airport acquisition deals. The table presents each non-PE Private firm's government ownership (%) and the list of its major owners as of 2022.

Non-PE Private Firms	Country	# of Deals	Gov't (%)	Major owners
Aeropuertos Argentina 2000	Argentina	33	15	Corporacion America S.A. 75.65% Government 15.00% Cedicor 9.35%
Vinci Airports	France	29	0	Subsidiary of VINCI SA. VINCI SA Ownership: Vinci Sa 13.94% Qatar Holding Llc 3.74% Partners Group (UK) Ltd. 0.02%
Fraport	Germany	20	52.02	State of Hesse 31.31% City of Frankfurt 20.71% Deutsche Lufthansa AG 8.44%
Grupo Aeroportuario del Sureste	Mexico	18	0	Fernando Gerardo Chico Pardo 21.0% Grupo ADO 13.3%
TAV Airports Holding	Turkey	17	0	Aeroports de Paris SA 46.1% Tepe Insaat Sanayi AS 5.06%
SNC-Lavalin	France	15	0	The Caisse de depot et placement du Quebec 19.9% Jarislowsky, Fraser Ltd. 10.7% RBC Global Asset Management, Inc. 10.1%
Grupo Aeroportuario del Pacifico	Mexico	13	0	Weston Hill Equity Holdings LP 5.62% Controladora Mexicana de Aeropuertos SA 4.39% Grupo Mexico, S.A.B. de C.V. 3.58%
Grupo Aeroportuario Centro Norte	Mexico	12	0	Fintech Holdings, Inc. 19.9% Norges Bank Investment Management 4.11% Fidelity Management & Research Co. LLC 4.11%
Egis	France	8	0	The Vanguard Group, Inc. 2.91% Norges Bank Investment Management 1.72% Dimensional Fund Advisors LP 1.34%

Table A.4: Sources of Airport Performance Data

The following table shows the description of airport performance datasets and the sources and coverage of each dataset.

Dataset	Source	Sample period	# airports	# PE	# non-PE Private
Traffic	International Civil Aviation Organization (ICAO), Official Aviation Guide of the Airways (OAG)	1996–2019	3,062	93	328
Airlines and Routes	Official Aviation Guide of the Airways (OAG)	1996–2019	3,062	93	328
Punctuality	Official Aviation Guide of the Airways (OAG)	2016–2020	1,559	62	226
Awards	Airports Council International (ACI)	2016–2021	260	24	65
Accidents and Fatalities	Flight Safety Foundation's Aviation Safety Network (ASN)	1920–2022	2,649	42	127
Financials	Air Transport Research Society (ATRS) at Embry-Riddle Aeronautical University	2001–2017	239	33	49
Physical Capacity	Google satellite images	1996–2019	297	96	251
Fees	RDC Aviation	2010–2020	2,965	100	323

Traffic Passenger and flight traffic data are provided separately for international and domestic flights. As ICAO data begin only after 2014 for some airports, we supplement them with data from Official Aviation Guide of the Airways (OAG). We consider airports with more than 10,000 passengers and 100 flights a year to focus commercial airports, excluding airports that are exclusively for general aviation or military activities.

Airlines and Routes As the downstream performance measures, we use the information on the list of routes, the number of passengers and flight frequencies of each route and the operating airlines. The data include airport-year-airline-route level traffic information. We drop airports with less than 10,000 passengers and 100 flights a year.

Punctuality We obtain information on airport on-time performance, including cancellation rates and on-time departure rates, from the monthly airport punctuality reports provided by OAG.

Awards We obtain information on airport awards from Airports Council International (ACI), which gives awards every year the airports with the best service quality through the ASQ Awards program, a airport passenger satisfaction program with airports in 95 countries. According to their website: "ACI World's annual ASQ Awards recognize airport excellence in customer experience worldwide based on data from ASQ's renowned Departures and Arrivals Surveys." When constructing the award indicator, we consider all airport-years that were not included in the dataset to be non awarded airport-year.
See: https://aci.aero/programs-and-services/asq/asq-awards-and-recognition/.

Accidents and Fatalities We obtain information on the number of accidents and fatalities for flights that took off from the airport by scraping the airport safety information from the ASN Aviation Safety Database. When constructing the number of accidents and fatalities variables, we consider all airport-years that were

not included in the dataset to have 0 number of accidents and fatalities. See: https://aviation-safety.net/database/

Financials The dataset provides financial statements of 225 airports worldwide, which are focused on large international airports in the US, Europe, and Asia. We collect the main financial performance measures, including total operational revenue, total operational expenditure per 1000 passengers, net operational income, total aeronautical revenue, total non-aeronautical revenue, and number of employees.

Physical Capacity We gather Google satellite images of airports at three points around the acquisition transaction date: the year before, three years after, and five years after. These are publicly accessible using the Google Earth app https://apps.apple.com/us/app/google-earth/id293622097. We measure the terminal size using a ruler tool and count number of runways. Appendix Figure A.6 shows the example of Adelaide Airport in Australia the year before and three years after a PE acquisition. We only acquire satellite images of privatized airports.

Fees The fees that airports charge to airlines are on a per-aircraft-event basis (i.e. takeoff and landing) and are related to services provided to passengers and airlines, such as passenger service fees, runway fees, plane parking fees, infrastructure fees, aircraft security fees, and noise fees. By far the largest are passenger and runway fees. The fees in the data are based on three different aircraft types based on their route and size: small domestic jet, short-haul international mid-sized jet, and long-haul international jumbo jet. We consider two standard aircraft types for analysis: DH4 (small domestic jet) and 77W (long international jumbo jet). DH4 can carry up to 78 passengers per flight, and 77W can carry up to 348 passengers. Per passenger charges are calculated assuming that aircraft is 80% full. Charges with fixed aircraft type and the number of passengers make it convenient to examine the change in the fixed price charged to airlines after privatization. The data set includes each fee type by aircraft type.

Table A.5: Main Outcomes of Airport Privatization Using Two Explanatory Variables

This table estimates the main effects of PE and Non-PE Private, grouping together privatization and post-privatization transactions. 𝟙(PE) is one after an airport is owned by PE and zero otherwise. Similarly, 𝟙(Non-PE Private) is one if an airport is owned by Non-PE private. Panel A shows the main effects on airport traffic, Panel B shows the main effects on the number of routes and airlines, Panel C shows the main effects on the service quality and fees, Panel D shows the main effects on the financial outcomes, and Panel E shows the main effects on the mechanisms. We report p-values on F-tests for equality of the two ownership coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Airport Traffic

Dependent Variable:	Passengers per Flight			Log(Number of Passengers)			Log(Number of Flights)		
	Total	Int'l	Domestic	Total	Int'l	Domestic	Total	Int'l	Domestic
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	10.97***	3.40	12.80***	0.29***	0.21***	0.21***	0.22***	0.18**	0.10
	(2.38)	(3.97)	(4.17)	(0.06)	(0.07)	(0.07)	(0.05)	(0.07)	(0.09)
𝟙(Non-PE Private)	2.20	-1.06	3.11*	0.17***	0.05	0.06	0.17***	0.06	0.05
	(1.50)	(2.54)	(1.70)	(0.03)	(0.05)	(0.05)	(0.03)	(0.05)	(0.05)
Observations	40357	22860	39898	40357	22860	39898	40357	22860	39898
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.79	0.87	0.96	0.94	0.94	0.94	0.93	0.90
Y-Mean	90.00	132.56	82.82	12.46	11.68	12.02	8.21	6.94	7.85
Pr > F PE = Non-PE Priv	0	.26	.02	.03	.04	.05	.36	.12	.53

Panel B: Routes and Airlines

Dependent Variable:	Log(Number of Routes)			Number of Airlines			
	Total	International	Domestic	Total	Low Cost Carriers	Airline HHI	Share of Largest Airline
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
𝟙(PE)	0.21***	0.25***	0.05	1.24*	0.82***	-29.90	-0.52
	(0.05)	(0.08)	(0.05)	(0.71)	(0.31)	(174.77)	(1.79)
𝟙(Non-PE Private)	0.15***	0.10**	0.06*	2.67***	1.07***	-243.88**	-2.51**
	(0.03)	(0.04)	(0.04)	(0.45)	(0.17)	(97.51)	(0.99)
Observations	40343	22858	39897	40357	40357	40357	40357
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.94	0.92	0.89	0.93	0.68	0.79	0.76
Y-Mean	2.30	1.96	1.54	8.70	1.01	5,474.07	64.44
Pr > F PE=Non-PE Private	.3	.04	.8	.05	.44	.22	.28

Main Outcomes of Airport Privatization With PE and NonPE Private (Continued)

Panel C: Service Quality – On time Performance and Fees

Dependent Variable:	Flight Cancellation Rate	On-Time Departure Rate	𝟙(Award)	Log(Int'l Fee)	Log(Domestic Fee)	No Regulation
	(1)	(2)	(3)	(4)	(5)	(6)
𝟙(PE)	-1.13***	-0.67	0.06**	0.09**	0.14**	0.18**
	(0.32)	(0.96)	(0.03)	(0.04)	(0.06)	(0.09)
𝟙(Non-PE Private)	-0.71**	-0.55	0.03**	0.01	0.06	0.06
	(0.33)	(0.55)	(0.01)	(0.03)	(0.06)	(0.06)
Observations	5103	5103	40357	9125	9123	1514
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.54	0.84	0.31	0.94	0.96	0.71
Y-Mean	2.19	77.05	0.02	8.80	6.24	0.16
Pr > F PE=Non-PE Private	.16	.9	.25	.09	.21	.24

Panel D: Financial Outcomes

Dependent Variable:	Log(Op. Net Income)	Log(Op. Revenue)	Log(Aero Revenue)	Log(Non-Aero Revenue)	Log(OpEx per 1000 psg)	Log(Employees per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)
𝟙(PE)	0.28***	0.16*	0.23**	0.12	-0.00	-0.07**
	(0.09)	(0.08)	(0.11)	(0.08)	(0.07)	(0.03)
𝟙(Non PE Private)	0.24***	0.07	0.16*	-0.00	-0.18*	-0.06**
	(0.09)	(0.07)	(0.08)	(0.07)	(0.09)	(0.03)
Observations	2613	2715	2744	2717	2686	2749
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.94	0.91	0.92	0.92	0.88
Y-Mean	17.98	18.93	18.24	18.16	9.54	0.13
Pr > F PE=Non PE Private	.69	.28	.44	.15	.04	.82

Panel E: Mechanisms: Aircraft and Airport Capacity

Dependent Variable:	Share Aircraft Type		Capex	
	Jets	Regional/Small	Log(Terminal Size)	Number of Runways
	(1)	(2)	(3)	(4)
𝟙(PE)	0.08***	-0.08***	0.10***	-0.02
	(0.02)	(0.02)	(0.04)	(0.03)
𝟙(Non-PE Private)	0.00	-0.00	0.03	-0.01
	(0.01)	(0.01)	(0.03)	(0.01)
Observations	40357	40357	4264	4264
Airport FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R^2	0.87	0.87	0.97	0.96
Y-Mean	0.41	0.59	9.16	1.30
Pr > F PE=Non-PE Private	0	0	.19	.71

Table A.6: Airport Ownership Type and Freight Traffic

This table reports estimates of how four ownership transitions affect freight traffic. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1990 to 2019. The dependent variables are freight per flight in columns 1-3 and the log of freight in tons in columns 4-6. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Freight per Flight			Log(Freight Tons)		
	Total	In'l	Domestic	Total	In'l	Domestic
	(1)	(2)	(3)	(4)	(5)	(6)
𝟙(Privatization by PE)	2.43**	-0.27	2.61*	1.02**	0.13	1.00**
	(1.20)	(0.91)	(1.50)	(0.46)	(0.46)	(0.44)
𝟙(Privatization by Non-PE)	-0.15	-0.76**	-0.12	0.05	0.03	0.03
	(0.20)	(0.33)	(0.22)	(0.09)	(0.10)	(0.12)
𝟙(Post-Priv Non-PE to PE)	1.10	1.50	1.79*	0.16	0.35	0.41
	(1.00)	(1.15)	(0.92)	(0.26)	(0.28)	(0.29)
𝟙(Post-Priv PE to Non-PE)	-0.85	3.44	-4.64**	-0.46	0.28	0.10
	(3.98)	(4.34)	(2.08)	(0.46)	(0.43)	(0.85)
Observations	30917	18440	28664	30917	18440	28664
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.53	0.52	0.47	0.80	0.84	0.76
Y-Mean	3.43	5.73	3.03	12.46	8.39	8.33
Pr > F Priv PE=Priv Non-PE	.03	.62	.07	.04	.84	.04
Pr > F Non-PE to PE=PE to Non-PE	.63	.66	0	.23	.89	.73

Table A.7: Changes in Terminal Size and Number of Runways around Airport Acquisitions

This table shows statistics on changes in the terminal size and the number of runways of the airports acquired by PE and non-PE Private around the deal. Panel A presents the size of the passenger terminals in square meters and the number of runways in one year before (t-1) and three (t+3) and five (t+5) years after the deals. Panel B presents the size-weighted percentage change, where the weights are terminal size.

Panel A: Raw Terminal Size (SQMT) and # of Runways

		Passenger Terminal (sqmt)			# of Runways		
	Obs.	t-1	t+3	t+5	t-1	t+3	t+5
Privatization							
Govt to PE	32	21357	27391	27846	1.43	1.43	1.43
Govt to Non-PE Private	239	13530	15275	16422	1.23	1.24	1.25
Post-Privatization							
Non-PE Private to PE	67	13289	14424	14814	1.40	1.40	1.40
PE to PE	10	22489	25507	25507	1.10	1.20	1.20
PE to Non-PE Private	16	14453	15134	15483	1.19	1.19	1.19

Panel B: Size Weighted Average Percentage Change

		Passenger Terminal (sqmt)		# of Runways	
	Obs.	t-1 -> t+3	t-1 -> t+5	t-1 -> t+3	t-1 -> t+5
Privatization					
Govt to PE	32	28%	30%	2%	2%
Govt to Non-PE Private	239	13%	22%	2%	2%
Post-Privatization					
Non-PE Private to PE	67	19%	22%	2%	2%
PE to PE	10	13%	13%	18%	18%
PE to Non-PE Private	16	5%	7%	0%	0%

Table A.8: Heterogeneous Effect of Airport Privatization by Low vs. High Corruption

This table reports estimates of how airport ownership types affect airport performance depending on the level of government corruption. The estimates are from OLS regressions using Equation 1 on an airport-year level panel. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables include the indicators of PE and non-PE Private ownership, which are further separated into low vs. high governance based on government corruption. A country is defined as high corruption country if its Corruption Index from Transparency International is above the median. We report two p-values on F-tests for equality of coefficients. The first compares PE Low Corruption to PE High Corruption and the second compares non-PE Low Corruption to non-PE High Corruption. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(PE Low Corruption)	13.63***	0.36***	0.25***	0.32***	0.80	-99.40	-0.01	0.04	0.20*	-0.13*
	(3.00)	(0.08)	(0.07)	(0.08)	(0.73)	(232.05)	(0.03)	(0.05)	(0.11)	(0.07)
𝟙(PE High Corruption)	7.01*	0.21***	0.19**	0.15	3.69**	-293.62	0.20**	0.23**	0.71***	0.54***
	(3.62)	(0.07)	(0.08)	(0.10)	(1.66)	(242.66)	(0.08)	(0.09)	(0.18)	(0.14)
𝟙(Non-PE Low Corruption)	4.50**	0.28***	0.25***	0.28***	4.30***	-496.06***	-0.01	0.07	0.24***	-0.20**
	(2.11)	(0.05)	(0.05)	(0.05)	(0.71)	(140.43)	(0.03)	(0.07)	(0.09)	(0.09)
𝟙(Non-PE High Corruption)	-0.62	0.03	0.07	0.03	1.14***	-75.80	0.09	0.07	-0.27***	-0.31***
	(1.99)	(0.04)	(0.04)	(0.03)	(0.43)	(123.89)	(0.06)	(0.08)	(0.08)	(0.05)
Observations	40357	40357	40357	40343	40357	40357	9125	9123	2613	2613
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.94	0.96	0.91	0.92
Y-Mean	90.00	12.46	8.21	2.30	8.70	5,474.07	8.80	6.24	17.98	9.53
Pr > F PE Low Corruption=PE High Corruption	.15	.15	.52	.2	.11	.55	.02	.04	.02	0
Pr > F NonPE Low Corruption=NonPE High Corruption	.07	0	0	0	0	.02	.13	.98	0	.31

Table A.9: Heterogeneous Effects of Airport Privatization by State-Owned Flag Carriers

This table reports estimates of how airport ownership types affect airport performance depending on whether airports serve state-owned flag carriers. The estimates are from OLS regressions using Equation 1 on an airport-year level panel. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables include the indicators of PE and non-PE Private ownership, which are further separated based on whether an airport serves any state-owned flag carriers. We report two p-values on F-tests for equality of coefficients. The first compares PE State-Owned Flag Carrier to PE No State-Owned Flag Carrier and the second compares non-PE State-Owned Flag Carrier to non-PE No State-Owned Flag Carrier. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(PE State-Owned Flag Carrier)	8.96*	0.27***	0.23**	0.13	5.87**	16.80	0.12**	0.34***	0.82***	0.42***
	(4.98)	(0.08)	(0.10)	(0.15)	(2.47)	(301.66)	(0.06)	(0.11)	(0.14)	(0.15)
𝟙(PE No State-Owned Flag Carrier)	11.58***	0.29***	0.21***	0.27***	0.40	-172.61	0.09	0.08	0.14	-0.02
	(2.66)	(0.07)	(0.06)	(0.07)	(0.59)	(202.17)	(0.05)	(0.06)	(0.10)	(0.06)
𝟙(NonPE State-Owned Flag Carrier)	0.82	0.22***	0.24***	0.19***	3.98***	-266.27*	0.05	0.29***	0.33***	-0.34**
	(2.21)	(0.04)	(0.04)	(0.04)	(0.65)	(157.00)	(0.04)	(0.11)	(0.12)	(0.14)
𝟙(NonPE No State-Owned Flag Carrier)	2.95*	0.14***	0.13***	0.16***	2.22***	-321.48***	-0.01	-0.04	0.12	-0.03
	(1.76)	(0.04)	(0.04)	(0.04)	(0.50)	(107.62)	(0.03)	(0.04)	(0.14)	(0.08)
Observations	40357	40357	40357	40343	40357	40357	9125	9123	2613	2686
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.93	0.93	0.79	0.94	0.96	0.91	0.92
Y-Mean	90.00	12.46	8.21	2.30	8.70	5,474.07	8.80	6.24	17.98	9.54
Pr > F PE SOFC =PE No SOFC	.64	.89	.86	.41	.03	.59	.65	.04	0	.01
Pr > F NonPE SOFC =NonPE No SOFC	.4	.09	.01	.46	.02	.74	.22	0	.27	.06

Table A.10: Heterogeneous Effect of Airport Privatization by Contract Form

This table reports estimates of how airport ownership types affect airport performance depending on the contract form. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1996 to 2019. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables include the indicators of PE and non-PE Private ownership, which are further separated based on whether the deal was an outright sale or a concession. We report two p-values on F-tests for equality of coefficients. The first compares PE-Sale to PE-Concession and the second compares NonPE-Sale to NonPE-Concession. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE-Sale)	15.04***	0.38***	0.27***	0.38***	2.20**	-270.19	0.05	0.09	0.29***
	(2.76)	(0.06)	(0.06)	(0.07)	(1.03)	(224.31)	(0.06)	(0.07)	(0.09)
𝟙(PE-Concession)	4.05	0.11	0.11	-0.04	0.31	76.80	0.18***	0.22**	0.00
	(3.85)	(0.09)	(0.09)	(0.08)	(0.86)	(270.94)	(0.07)	(0.10)	(.)
𝟙(NonPE-Sale)	5.49***	0.20***	0.17***	0.19***	2.98***	-485.02***	-0.03	0.05	0.26***
	(1.94)	(0.04)	(0.04)	(0.04)	(0.54)	(120.17)	(0.03)	(0.09)	(0.09)
𝟙(NonPE-Concession)	-2.19	0.13**	0.17***	0.14***	2.66***	-55.17	0.07*	0.10*	-0.33***
	(2.05)	(0.05)	(0.06)	(0.04)	(0.74)	(150.83)	(0.04)	(0.05)	(0.06)
Observations	40357	40357	40357	40343	40357	40357	9125	9123	2613
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.94	0.96	0.91
Y-Mean	90.00	12.46	8.21	2.30	8.70	5,474.07	8.80	6.24	17.98
Pr > F PE Sale=PE Con	.02	.02	.13	0	.15	.32	.15	.27	0
Pr > F NonPE Sale=NonPE Con	0	.24	.97	.36	.72	.02	.06	.64	0

Table A.11: Heterogeneous Effects of Airport Privatization by Competition

This table estimates how the effects of PE and non-PE private ownership on the main outcome variables are mediated by having competing airports nearby. The estimates are from OLS regressions using Equation 1 on an airport-year level panel. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables are the indicator variables for PE and non-PE Private ownership and they are further separated based on whether airports have a competing airport nearby within a radius of 200 km. We report two p-values on F-tests for equality of coefficients. The first compares PE with Airports Nearby to PE without Airports Nearby and the second compares NonPE-Private with Airports Nearby to NonPE-Private without Airports Nearby. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE with Airports Nearby)	11.16***	0.34***	0.26***	0.31***	2.01**	-267.81	0.06	0.02	0.29***
	(2.67)	(0.06)	(0.06)	(0.07)	(0.92)	(178.01)	(0.04)	(0.04)	(0.10)
𝟙(PE without Airports Nearby)	10.68**	0.11	0.06	-0.02	0.00	324.03	0.52***	0.86**	-0.40
	(5.05)	(0.10)	(0.13)	(0.08)	(1.05)	(508.25)	(0.15)	(0.39)	(0.57)
𝟙(NonPE-Private with Airports Nearby)	3.23*	0.20***	0.19***	0.21***	3.31***	-419.48***	0.01	-0.03	0.22**
	(1.88)	(0.04)	(0.04)	(0.04)	(0.59)	(118.00)	(0.03)	(0.04)	(0.11)
𝟙(NonPE-Private without Airports Nearby)	0.06	0.10*	0.11**	0.08*	1.84***	-54.69	0.01	0.27**	0.24
	(2.37)	(0.06)	(0.06)	(0.04)	(0.66)	(163.79)	(0.05)	(0.12)	(0.16)
Observations	40357	40357	40357	40343	40357	40357	9125	9123	2613
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.94	0.96	0.91
Y-Mean	90.00	12.46	8.21	2.30	8.70	5,474.07	8.80	6.24	17.98
Pr > F PE w Comp=PE wo Comp	.93	.05	.15	0	.15	.27	0	.03	.25
Pr > F NonPE Private w Comp=NonPE Private wo Comp	.29	.16	.27	.02	.1	.07	.96	.02	.93

Table A.12: The Effect of Airport Privatization on Volume of Passengers and Traffic of Competing Airports

This table estimates how airport privatization affects traffic of the competing airports nearby. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1996 to 2019. The sample is restricted to the government-owned airports. The dependent variables are the logged number of passengers (column 1) and the logged number of flights (column 2). The independent variables capture four ownership type changes of the nearby airports within a radius of 200 km. 𝟙(Privatization by PE Nearby) is one after any nearby airport' transition from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE Nearby) is one after any nearby airports transition from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE Nearby) is one after any nearby airports that are already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE Nearby) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two coefficients for privatization by PE and by non-PE Private. The second compares the two coefficients for post-privatization by PE and by non-PE Private. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Log(Number of Passengers) (1)	Log(Number of Flights) (2)
𝟙(Privatization by PE Nearby)	0.09	0.11
	(0.13)	(0.11)
𝟙(Privatization by Non-PE Nearby)	0.15***	0.17***
	(0.03)	(0.03)
𝟙(Post-Priv Non-PE to PE Nearby)	0.07	0.06
	(0.06)	(0.05)
𝟙(Post-Priv PE to Non-PE Nearby)	0.09	-0.07
	(0.11)	(0.14)
Observations	36801	36801
Airport FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes
R^2	0.96	0.94
Y-Mean	12.42	8.18
Pr > F Priv PE=Priv Non-PE	.62	.57
Pr > F Non-PE to PE=PE to Non-PE	.88	.38

Table A.13: Airport Privatization: Ownership vs. Control

This table reports estimates of how changes in airport performance outcome are varied by the ownership or control stakes. The estimates are from OLS regressions using Equation 1 on an airport-year level panel. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables include the interaction terms of PE and non-PE Private indicators with ownership stake and control stake. We report two p-values on F-tests for equality of coefficients. The first compares the coefficients of 𝟙(PE)*Ownership Stake to 𝟙(PE)*Control Stake and the second compares 𝟙(NonPE)*Ownership Stake to 𝟙(NonPE)*Control Stake. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(PE)*Ownership Stake	7.74	0.27*	0.23**	0.50***	2.30	-211.87	0.00	0.01	2.45**	1.23
	(6.36)	(0.14)	(0.11)	(0.12)	(1.51)	(441.12)	(0.10)	(0.13)	(1.21)	(0.87)
𝟙(PE)*Control Stake	6.28	0.23*	0.20**	-0.07	0.50	47.65	0.11*	0.17**	-1.72*	-0.95
	(5.65)	(0.13)	(0.10)	(0.10)	(1.00)	(350.76)	(0.06)	(0.07)	(1.02)	(0.73)
𝟙(Non-PE)*Ownership Stake	4.40**	0.21***	0.19***	0.15***	2.84***	-350.01**	-0.00	0.09	0.38*	-0.14
	(1.96)	(0.04)	(0.04)	(0.04)	(0.57)	(141.89)	(0.05)	(0.10)	(0.21)	(0.18)
𝟙(Non-PE)*Control Stake	-2.70	0.12**	0.16***	0.10**	2.63***	54.95	0.05	0.08	-0.38***	-0.22**
	(2.06)	(0.06)	(0.06)	(0.04)	(0.79)	(149.94)	(0.05)	(0.06)	(0.09)	(0.11)
Observations	40320	40320	40320	40306	40320	40320	9105	9103	2613	2686
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.94	0.96	0.87	0.84
Y-Mean	89.99	12.46	8.21	2.30	8.71	5,474.43	8.81	6.23	17.82	9.45
Pr > F PE Ownership=PE Control	.9	.87	.87	.01	.42	.73	.48	.38	.06	.17
Pr > F NonPE Private Ownership=NonPE Private Control	.01	.16	.68	.37	.83	.04	.44	.94	0	.70

Table A.14: Airport Privatization: Majority vs. Minority Stake

This table reports estimates of the extent to which changes in airport performance outcomes are driven by acquisition of ownership stakes or control stakes and by contract form. The estimates are from OLS regressions using Equation 1 on an airport-year level panel. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables capture two ownership type changes with the variation in ownership and control stake. 𝟙(PE-Sale) is an indicator variable of airport outright sales to PE. 𝟙(PE-Concession) is an indicator variable of airport concession deal by PE. 𝟙(NonPE-Sale) is an indicator variable of airport sales to Non-PE Private. 𝟙(NonPE-Concession) is an indicator variable of airport concession deal by Non-PE Private. The ownership and contract form indicators are further separated into majority and minority stake acquisition, where the acquisition of more than 50% of ownership or control is considered as majority and as minority otherwise. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(PE-Sale-Majority)	15.83***	0.47***	0.36***	0.42***	2.91***	-135.45	0.27**	0.30***	0.78**	0.25
	(2.78)	(0.08)	(0.08)	(0.07)	(1.11)	(272.72)	(0.11)	(0.11)	(0.37)	(0.25)
𝟙(PE-Sale-Minority)	9.25**	0.58***	0.55***	0.39***	7.89***	-585.91***	1.13***	0.97***	2.77**	1.95*
	(4.06)	(0.10)	(0.09)	(0.08)	(1.59)	(147.24)	(0.24)	(0.21)	(1.37)	(1.16)
𝟙(PE-Concession-Majority)	4.23	0.21**	0.19**	-0.07	0.66	88.13	0.13**	0.18***	-0.28*	-0.15
	(4.85)	(0.10)	(0.09)	(0.09)	(0.97)	(298.35)	(0.06)	(0.07)	(0.16)	(0.12)
𝟙(PE-Concession-Minority)	6.21	0.24	0.27	0.11	1.47	164.45	0.38***	0.47**	0.00	0.00
	(5.77)	(0.23)	(0.23)	(0.17)	(1.91)	(406.11)	(0.11)	(0.21)	(.)	(.)
𝟙(NonPE-Sale-Majority)	4.38**	0.19***	0.16***	0.14***	2.81***	-351.57***	0.17**	0.21**	0.30*	-0.17
	(1.76)	(0.04)	(0.04)	(0.04)	(0.50)	(123.00)	(0.08)	(0.10)	(0.17)	(0.14)
𝟙(NonPE-Sale-Minority)	14.08**	0.52***	0.42***	0.40***	3.93	-107.06	0.60**	0.53**	2.37**	1.58*
	(5.72)	(0.17)	(0.16)	(0.13)	(2.46)	(395.97)	(0.27)	(0.23)	(1.13)	(0.88)
𝟙(NonPE-Concession-Majority)	-16.49***	-0.40**	-0.26	-0.29**	-1.20	161.22	-0.51*	-0.40*	-2.75**	-1.80**
	(6.02)	(0.18)	(0.16)	(0.13)	(2.57)	(418.02)	(0.27)	(0.23)	(1.15)	(0.91)
𝟙(NonPE-Concession-Minority)	-13.20*	-0.15	-0.12	0.03	-5.55*	589.17	0.00	0.00	0.00	0.00
	(6.90)	(0.33)	(0.34)	(0.24)	(2.96)	(847.10)	(.)	(.)	(.)	(.)
Observations	40320	40320	40320	40306	40320	40320	9105	9103	2613	2686
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.95	0.96	0.87	0.84
Y-Mean	89.99	12.46	8.21	2.30	8.71	5,474.43	8.81	6.23	17.82	9.45

Table A.15: Main Outcomes of Airport Privatization Using the Stacked Regression

This table estimates the main effects in a stacked regression estimator. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. Prob > F is the F-test probability that tests the likelihood of Non-PE Private and PE coefficients being different from each other. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(Privatization by PE)	17.99***	0.61***	0.49***	0.37**	1.28	288.66	-0.02**	-0.05***	2.38**	1.66**
	(5.55)	(0.18)	(0.17)	(0.16)	(1.13)	(353.12)	(0.01)	(0.01)	(1.02)	(0.71)
𝟙(Privatization by Non-PE)	1.37***	0.17***	0.18***	0.13***	3.11***	-248.87***	0.29***	0.31***	0.23***	-0.28***
	(0.32)	(0.01)	(0.01)	(0.01)	(0.11)	(22.94)	(0.02)	(0.02)	(0.03)	(0.03)
𝟙(Post-Priv Non-PE to PE)	8.87***	0.17**	0.13*	0.19***	-0.32	156.69	0.17**	0.19**	0.09	0.04
	(2.94)	(0.07)	(0.07)	(0.07)	(0.78)	(223.41)	(0.07)	(0.08)	(0.13)	(0.10)
𝟙(Post-Priv PE to Non-PE)	2.73	0.02	-0.00	0.23**	1.07	-465.53	0.04	0.06	-1.71***	-1.35*
	(7.45)	(0.17)	(0.16)	(0.09)	(1.59)	(392.71)	(0.06)	(0.05)	(0.54)	(0.72)
Observations	827727	827727	827727	827727	827727	827727	184378	184336	47731	49024
Airport-Group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.95	0.96	0.89	0.92
Y-Mean	89.37	12.42	8.18	2.27	8.42	5,514.71	8.80	6.20	17.98	9.51
Pr > F Priv PE=Priv Non-PE	0	.01	.06	.15	.11	.13	0	0	.04	.01
Pr > F Non-PE to PE=PE to Non-PE	.44	.4	.47	.68	.43	.17	.18	.18	0	.06

Table A.16: Main Outcomes of Airport Privatization Using the Callaway Sant'Anna Estimator

This table estimates the main effects using the Callaway Sant'Anna estimator. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. 𝟙(PE),the indicator for PE ownership, is the main independent variable. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(PE)	7.71*	0.23***	0.18**	0.16**	-0.09	315.17*	0.11	0.11	-0.12	-0.22
	(4.41)	(0.09)	(0.08)	(0.07)	(0.61)	(177.38)	(0.08)	(0.08)	(0.19)	(0.27)
Observations	40622	40622	40622	40622	40622	40622	9239	9237	2641	2714
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A.17: Main Outcomes of Airport Privatization Using the Matched Sample

This table estimates the main effects in a matched sample. We match each privatized airport with never-privatized, government-owned non-target airports using the observations two years before privatization using CEM, on passengers per flight, total number of passengers, total number of routes, GDP per capita, trade volume, the share of international passengers, judicial effectiveness, and financial freedom. The ratio of treated to control is 1:1. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(Privatization by PE)	16.45**	0.62***	0.54**	0.45***	0.97	300.57	-0.01	-0.10***	2.39*	1.73**
	(7.22)	(0.24)	(0.22)	(0.17)	(1.24)	(455.34)	(0.02)	(0.03)	(1.28)	(0.85)
𝟙(Privatization by Non-PE)	-0.86	0.14***	0.18***	0.14***	2.40***	-206.24*	0.20***	0.26***	0.13	-0.24
	(1.60)	(0.04)	(0.04)	(0.03)	(0.50)	(112.63)	(0.06)	(0.08)	(0.21)	(0.19)
𝟙(Post-Priv Non-PE to PE)	5.19*	0.06	0.05	0.10*	-0.73	202.14	0.18**	0.17**	0.36	0.26
	(2.88)	(0.06)	(0.07)	(0.05)	(0.79)	(242.53)	(0.08)	(0.08)	(0.22)	(0.17)
𝟙(Post-Priv PE to Non-PE)	4.16	-0.75	-0.76	-0.13***	-2.59	-1,027.44	-0.08***	-0.16***	0.00	0.00
	(13.43)	(1.07)	(0.95)	(0.05)	(1.82)	(1,872.89)	(0.03)	(0.05)	(.)	(.)
Observations	12520	12520	12520	12518	12520	12520	3429	3429	1094	1127
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.90	0.96	0.94	0.93	0.94	0.80	0.90	0.95	0.90	0.87
Y-Mean	101.80	12.99	8.54	2.61	11.62	4,761.46	8.98	6.32	17.41	9.64
Pr > F Priv PE=Priv Non-PE	.02	.05	.1	.07	.28	.28	0	0	.09	.03
Pr > F Non-PE to PE=PE to Non-PE	.94	.45	.4	0	.35	.51	0	0	.11	.12

Table A.18: Main Outcomes of Airport Privatization Using the Overlapping Sample

This table re-estimates the main effects in Tables 4, 5 and 9 using the sample that overlaps across all data sets except for the financials and punctuality. The independent variables capture four ownership type changes, with government ownership as the base group. 𝟙(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, 𝟙(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. 𝟙(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. 𝟙(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	# of Passengers	# of Flights	# of Routes	# of Airlines	Airline HHI	Int'l Fee	Domestic Fee
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
𝟙(Privatization by PE)	20.51***	0.06***	-0.04***	6.93***	1.26***	153.09***	0.07***	0.06***
	(0.48)	(0.01)	(0.01)	(0.45)	(0.18)	(44.64)	(0.01)	(0.02)
𝟙(Privatization by Non-PE)	-2.31*	-0.01	-0.01	-1.61*	0.03	1.16	0.72***	0.51***
	(1.18)	(0.03)	(0.02)	(0.88)	(0.61)	(63.97)	(0.21)	(0.16)
𝟙(Post-Priv Non-PE to PE)	2.76***	0.03***	0.02**	12.77***	1.52	-76.29	0.06	-0.32
	(0.56)	(0.01)	(0.01)	(0.70)	(3.38)	(157.41)	(0.04)	(0.26)
𝟙(Post-Priv PE to Non-PE)	-16.97***	-0.08***	0.08*	0.34	-0.48	-150.11	0.01	0.09***
	(3.47)	(0.01)	(0.04)	(0.73)	(0.60)	(91.88)	(0.01)	(0.02)
Observations	2763	2763	2763	2763	2763	2763	2763	2763
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.99	1.00	1.00	0.99	0.99	0.97	0.96	0.97
Y-Mean	136.07	14.45	9.59	3.41	19.70	3,195.96	8.82	6.39
Pr > F Priv PE=Priv Non-PE	0	.02	.2	0	.05	.04	0	.01
Pr > F Non-PE to PE=PE to Non-PE	0	0	.22	0	.56	.68	.18	.12

Table A.19: Main Outcomes of Airport Privatization Without The Biggest Deal

This table estimates the main effects excluding the biggest deal in each transaction type. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables capture four ownership type changes, with government ownership as the base group. $\mathbb{1}$(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}$(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. $\mathbb{1}$(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbb{1}$(Privatization by PE)	18.91***	0.64***	0.50***	0.36**	0.86	396.35	0.00	0.00	0.79**	0.35**
	(5.90)	(0.19)	(0.18)	(0.17)	(1.15)	(364.53)	(.)	(.)	(0.36)	(0.16)
$\mathbb{1}$(Privatization by Non-PE)	1.59	0.17***	0.18***	0.14***	3.08***	-248.80**	0.28***	0.32***	0.30***	-0.24**
	(1.46)	(0.04)	(0.04)	(0.03)	(0.48)	(101.50)	(0.08)	(0.08)	(0.10)	(0.11)
$\mathbb{1}$(Post-Priv Non-PE to PE)	8.04***	0.16**	0.12*	0.18***	-0.33	148.60	0.17**	0.18**	0.06	-0.03
	(2.95)	(0.08)	(0.07)	(0.07)	(0.80)	(231.37)	(0.07)	(0.08)	(0.09)	(0.05)
$\mathbb{1}$(Post-Priv PE to Non-PE)	-5.33	0.00	0.02	0.14	-1.28*	-227.74	0.03	0.05	-0.31***	-0.82***
	(6.10)	(0.23)	(0.22)	(0.10)	(0.67)	(508.90)	(0.07)	(0.05)	(0.10)	(0.06)
Observations	40272	40272	40272	40258	40272	40272	9089	9087	2570	2643
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.95	0.96	0.91	0.92
Y-Mean	89.91	12.45	8.20	2.29	8.65	5,480.95	8.80	6.23	17.97	9.55
Pr > F Priv Non-PE=Priv PE	0	.02	.08	.21	.07	.09	0	0	.18	0
Pr > F Non-PE to PE=PE to Non-PE	.05	.52	.65	.78	.36	.5	.19	.18	0	0

Table A.20: Main Outcomes of Airport Privatization With Region Fixed Effect

This table estimates the main effects including regional fixed effects. The dependent variables are the main outcome variables used in Tables 4, 5, 7 and 9, including airport traffic, routes, fees charged to airlines and financial performance. The independent variables capture four ownership type changes, with government ownership as the base group. $\mathbb{1}$(Privatization by PE) is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Privatization by Non-PE) is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}$(Post-Priv Non-PE to PE) is one after an airport that is already privatized by a non-PE firm transitions to PE ownership. $\mathbb{1}$(Post-Priv PE to Non-PE) is the reverse. We report two p-values on F-tests for equality of coefficients. The first compares the two privatization coefficients and the second compares the post-privatization coefficients. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(Number of Passengers)	Log(Number of Flights)	Log(Number of Routes)	Number of Airlines	Airline HHI	Log(Int'l Fee)	Log(Domestic Fee)	Log(Op. Net Income)	Log(OpEx per 1000 psg)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbb{1}$(Privatization by PE)	17.87***	0.61***	0.48***	0.36**	1.24	290.93	-0.02**	-0.05***	0.73**	0.34**
	(5.56)	(0.18)	(0.17)	(0.16)	(1.13)	(353.24)	(0.01)	(0.01)	(0.35)	(0.15)
$\mathbb{1}$(Privatization by Non-PE)	1.61	0.17***	0.18***	0.14***	3.05***	-246.40**	0.28***	0.31***	0.30***	-0.25**
	(1.45)	(0.04)	(0.04)	(0.03)	(0.48)	(101.12)	(0.08)	(0.08)	(0.10)	(0.11)
$\mathbb{1}$(Post-Priv Non-PE to PE)	8.72***	0.16**	0.12*	0.17***	-0.32	154.59	0.17**	0.18**	0.03	-0.01
	(2.94)	(0.07)	(0.07)	(0.07)	(0.78)	(225.11)	(0.07)	(0.08)	(0.08)	(0.04)
$\mathbb{1}$(Post-Priv PE to Non-PE)	2.69	0.02	-0.01	0.23**	1.07	-464.44	0.03	0.05	-0.54***	-0.42*
	(7.40)	(0.17)	(0.16)	(0.09)	(1.59)	(393.36)	(0.07)	(0.05)	(0.15)	(0.23)
Observations	40357	40357	40357	40343	40357	40357	9125	9123	2613	2686
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.91	0.96	0.94	0.94	0.93	0.79	0.95	0.96	0.91	0.92
Y-Mean	90.00	12.46	8.21	2.30	8.70	5,474.07	8.80	6.24	17.98	9.54
Pr > F Priv Non-PE=Priv PE	0	.02	.08	.17	.14	.14	0	0	.23	0
Pr > F Non-PE to PE=PE to Non-PE	.45	.42	.46	.62	.43	.17	.19	.18	0	.08

B. Variable Definitions

Downstream Performance Measures

- Number of Airlines: Number of airlines that are operated in the airport.
- Number of Low Cost Carriers: Number of low cost carriers that are operated in the airport.
- Airline HHI: Herfindahl-Hirschman Index created using the share of airlines.
- Share of Largest Airline: The share of the airline with the largest share.
- Competing Airports: An indicator variable that is one if an airport has airports nearby with comparable sizes within a radius of 200 km.

Price Regulation Variables

All regulation variables are provided by David Gillen at University of British Columbia and are only observed for major airports in Asia, Europe, and Oceania. For details please see: Gillen, D., Niemeier, H. M. (2008). The European Union: evolution of privatization, regulation, and slot reform.

- No Regulation: Indicator variable of 1 if there is no regulation in that airport-year and 0 if there is a regulation.
- Cost Based: Cost based regulation charges the same price that would ideally prevail in a perfectly competitive market, equal to the efficient costs of production, plus a market-determined rate of return on capital. It is an indicator variable of 1 if there is a cost based regulation and 0 if not.
- Revenue Cap: Revenue Cap regulation sets an overall limit in the allowed average price increase. This differs from cost based regulation which seeks to regulate individual prices. Revenue Cap can be regarded as a form of incentive regulation, though the strength of the incentives varies. The Revenue Cap can be under a single or dual till regime; under a single till all revenues are considered when setting the Revenue Cap while in a dual till only revenues derivative from aviation operations (landing, passenger and parking charges) are considered.

Safety Measures

- Number of Accidents: The number of accidents is from over 23,000 airliner (aircraft originally certified to carry 12 or more passengers), military transport category aircraft, and corporate jet aircraft accidents dating back to 1919. The information is primarily derived from official governmental agencies, such as air accident investigation boards and civil aviation authorities.
- Number of Fatalities: The number of fatalities within an accident. It is a per flight measure aggregated at an airport-year level.

- Award: An indicator variable that is one if an airport received an award for its service that year.

Airport Charge Variables

- Int'l Fee: International Fee is the sum of international passenger and runway charges. They are charged per aircraft movement.
- Dom Fee: Domestic Fee is the sum of domestic passenger and runway charges. They are charged per aircraft movement.
- Int'l Passenger Fee: International Passenger Fee is levied for processing passengers and includes security costs for an international flight. They are charged per aircraft movement.
- Domestic Passenger Fee: Domestic Passenger Fee is levied for processing passengers and includes security costs for a domestic flight. They are charged per aircraft movement.
- Int'l Runway Fee: International Runway Fee is levied for using the runway infrastructure of the airport for an international flight. They are charged per aircraft movement.
- Dom Runway Fee: Domestic Runway Fee is levied for using the runway infrastructure of the airport for a domestic. They are charged per aircraft movement.

Airport Financial Variables

- Total Operating Revenue: Total operating revenue is the total amount of money coming into airport from both aeronautical and non-aeronautical activities.
- Total Operating Expenditure per 1000 passengers : Total operating expense is total expense an airport incurs through its normal operations/Number of Passengers $\times$ 1000.
- Net Operating Income: Total operating revenue minus total operating expenditure.
- Total Aeronautical Revenue: Total aeronautical revenue is the total amount of revenue coming into airport from aeronautical activities.
- Total Non-Aeronautical Revenue: Total Non-aeronautical revenue is the total amount of revenue coming into airport from non-aeronautical activities such as retail food and beverages, shopping, car parking, and property and real estate services.
- Number of Employees per 1000 passengers: Number of Employees/Number of Passengers $\times$ 1000

Airport On Time Performance Variables

- Flight Cancellation Rate: Number of flights cancelled/Total number of flights * 100.
- On-Time Departure Rate: Number of flights that departed on-time/Total number of flights * 100.