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

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Abstract

We study how privatization and four variants of private ownership type affect infrastructure performance, focusing on global airports over 25 years. Privatization in general does not improve performance. However, private equity (PE) ownership has strong and persistent positive effects on measures of efficiency, volume, and quality. To address selection, we use close auctions in which both PE and non-PE firms bid. The disparities across ownership types are related to fees charged to airlines, physical capacity expansion, local state capacity, and the presence of a state-owned flag carrier. Overall, PE-owned airports benefit from high-powered incentives and access to capital.

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1 Introduction

Infrastructure binds together the modern economy, underpinning economic growth and improved standards of living. Networked transportation systems such as railroads, highways, ports, and airports have historically been primarily government-owned, but today these infrastructure assets feature a mix of public and private ownership, with private equity (PE) funds playing a growing role. What ownership model leads to the most efficient operation of these crucial assets? In principle, incentives to maximize profits should lead private ownership to improve efficiency. However, since infrastructure has large positive externalities for society and private firms are incentivized to maximize private rather than public welfare, it is not obvious that private ownership will improve the quality of service.

In this paper, we examine infrastructure privatization in a modern, global context, focusing on airports. 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. We examine not only private vs. public ownership, but also the type of private ownership, and ask whether ownership changes yield improvements in service quality and financial performance. We also focus on whether improvements reflect operational changes or the new owners' talents for selecting assets that are likely to increase in value. Contrary to much of the existing literature on privatization, we do not find that privatization in general causally improves performance. We only see such evidence in the case of transitions to PE ownership. While we see improvement after acquisitions by foreign private firms, this appears to reflect targeting rather than operational changes or investment.

Airports offer 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. When the airport privatizes, a firm acquires the right to operate, invest in, and earn residual cash flows from the airport through either a sale or a concession. 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. Around the world, airports adhere to common standards that enable aggregate performance analysis. We combine many sources to paint a reasonably holistic picture of airport operations between 1996 and 2019.

We categorize private acquirers as one of four mutually exclusive ownership types: partial government, domestic private, foreign private, and PE via infrastructure funds (PE takes precedence over other private in this classification). PE is interesting because it represents a different economic model from independent

private ownership, including higher-powered incentives to maximize profits and shorter time frames for creating value. In our first empirical exercise, we ask whether PE ownership has different effects on airport outcomes than other types of private ownership after controlling for differential selection ability. This exercise informs the rest of our analysis by shedding light on whether PE should be considered separately from other types of private ownership. Airports are not randomly targeted for acquisition, and PE managers may have greater expertise in selection in addition to any subsequent operational changes they may implement (Gompers et al., 2016).

To control for differential selection ability, we restrict the sample to a subset of privatizations in which both PE and non-PE firms bid to acquire the airport in a government privatization auction. Furthermore, we require that a PE and a non-PE firm were among the finalists and there were additional bidders. In these 30 privatization deals, as substantial cost must be invested in entering a bid, both types of firms were seriously interested in acquiring the airport. In such close auctions, targeting expressed through a higher willingness to pay on the part of the PE firm does not plausibly explain the results, since the non-PE firm was very interested and willing to acquire the airport at a price higher than other bidders.

We find remarkably consistent and robust results: across all the key performance measures we consider, there are significant improvements if the PE firm wins and little if any improvement when the non-PE firm wins. First, passengers per flight are an important efficiency metric, enabling the airport to serve more customers with the same infrastructure. Under PE ownership, passengers per flight increase by 12.5, or about 13%. In contrast, this metric declines by an insignificant 0.6% under non-PE private ownership. This increase in passengers per flight for PE ownership partly reflects the induction of a larger share of jet aircraft relative to smaller planes. Overall passenger traffic and the number of flights both increase under PE ownership by more than 40%, and not at all under non-PE private ownership. The number of international routes, which are typically more profitable for the airport but also benefit passengers and the local economy, increases by substantially more under PE ownership. In a measure that is of high priority for passengers, we find that the flight cancellation rate declines by 0.6, or almost half the mean, under PE ownership, but not at all under non-PE private ownership. We also see increases in the number of low-cost carriers (i.e., discount airlines) under PE ownership; they tend to increase by about 1.5 relative to a mean of 0.85. Finally, in a rare look at the income statements of private firms, we see that net operating income increases by 66% under PE ownership, while expenditure per thousand passengers is unchanged. In contrast, expenditure increases under other private ownership.

These findings lead us to use our full sample of privatizations, including those that were not close auctions, to explore different types of ownership and focus on what might make PE different. It also leads us to examine dynamics. The auction analysis ensures that both PE and non-PE private firms selected the airport. However, it is possible that they both select airports on positive trajectories that would have experienced the improvements we see under PE ownership regardless, yet these improvements are somehow thwarted by non-PE private ownership.

Therefore, we employ a difference-in-differences design to conduct three types of tests. First, we compare average effects under PE, foreign private, domestic private, and partially government-owned ownership types. Second, we drill down on the PE findings by considering four ownership transitions: privatization events by PE and non-PE private; and post-privatization transactions, where an airport transitions from non-PE private to PE or vice-versa. Third, we use event studies to evaluate whether the PE results are driven by pre-trends. If the event studies suggest no pre-trends—i.e., the airport was not on track to the observed outcome before the acquisition—then in light of the consistent findings in the auction analysis we conclude that the result has some causal interpretation within the treated population. While our findings do not necessarily generalize to a random airport, improvements in the treated population—or lack thereof—are relevant to policy and to our understanding of the implications of ownership type, as airports have in practice transitioned to private and PE ownership across broad swathes of the world.

Overall, the results are consistent with the auction analysis. For example, PE ownership increases the number of passengers per flight while no other ownership form does so, and this is true both in PE privatizations and in PE acquisitions from a non-PE private firm. With the full sample, we expand our analysis of financials. For PE, higher revenue reflects both aeronautical (i.e., fees charged to airlines) and non-aeronautical (i.e., terminal retail) sources rather than cost-cutting via operating expenditure or employment. After transitions from PE to non-PE private ownership, there are declines in net income and revenue. Across all the PE results, we do not see evidence of pre-trends, supporting a causal interpretation.

We are interested in foreign owners because they may bring expertise or capital, and may have weaker ties to local government. Alternatively, they could be more sophisticated and better able to target high-quality assets. For some outcomes, we see that performance improves on average under foreign private ownership. However, in this case, strong pre-trends in the event studies indicate that the foreign private result likely reflects targeting (i.e., selection).

One mechanism for some of our results, especially PE's ability to encourage airlines to use larger

planes, is through adjusting the fees charged to airlines. Indeed, we see evidence of such adjustment, with higher runway fees following PE acquisitions. 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, suggesting that capital investment enables performance improvements after PE acquisitions. Third, PE ownership appears to improve airport quality. In addition to reducing the flight cancellation rate, PE ownership increases the chance of winning an award for airport excellence, which captures the passenger experience along dimensions such as store quality, waiting areas, and cleanliness.

We consider two local institutional features that could help explain why non-PE privatization has little benefit while PE ownership brings substantial improvement. This analysis draws from theoretical work on how local politics and institutions can shape the success of privatization (Boycko et al., 1996; Biais and Perotti, 2002; Che, 2009). The first is government capacity, which is likely to be important since airports are strategic national assets with high levels of state involvement. Effective regulation and monitoring can help to drive benefits from private ownership. Alternatively, if a new owner creates value by extracting rents from low-capacity states, then we might not see much improvement. We find that the absence of effects under non-PE private ownership is driven by high-corruption countries. In contrast, these owners do better in low-corruption countries. PE ownership does not exhibit this pattern.

Another mechanism for heterogeneous effects related to local government concerns the role of state-owned airlines, or “flag carriers," some of which have been privatized over time. Examples are British Airways, Russia’s Aeroflot, and Singapore Airlines. Government-owned flag carriers usually have cozy relationships with the local airport, enabling them to foreclose access to other airlines. Relative to other types of private ownership, PE owners may be more independent and more willing to breach pre-existing implicit or explicit contracts between the airport and state-owned flag carriers (Shleifer and Summers, 1988). Indeed, we find that PE ownership is associated with much larger increases in the number of airlines and low-cost carriers when the airport has a state-owned flag carrier, suggesting it creates value in part by reducing the flag carrier’s pre-existing rents.

We conduct a range of robustness tests, three of which merit mention here. First, even though the vast majority of observations in our sample are never-treated, we address potential bias from multiple treatment periods (i.e., staggered treatment) with 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). The improvements after PE acquisitions are robust to all three approaches. Second, other ownership type splits

along dimensions such as whether the private firm is publicly traded or whether the PE firm is co-located in the country of the airport do not yield similar variation. Third, we show that volume increases under PE ownership appear to reflect market expansion rather than market stealing, because there are no negative effects on traffic at competing airports.

Overall, our results suggest that when infrastructure funds acquire airports, they increase volume, 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 argument for privatization focuses on political catering at government-owned firms, which may lead to excessive employment and poor investment choices at the expense of performance (Shleifer and Vishny, 1994; Boycko et al., 1996). Another view is based on managerial incentives; the firm will not operate efficiently if incentives to maximize profit are insufficiently high-powered (Vickers and Yarrow, 1988). Overall, our evidence is more consistent with the latter view, suggesting that while government ownership is not obviously inferior to private ownership in the airport setting, the high-powered incentives and access to capital that come with investor-owned infrastructure funds add value.

Our results do not necessarily apply to PE broadly as an industry. However, PE firms tend to bring knowledge of global best practices, new managers with higher-powered compensation, and capital. We show how this leads to 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, customers are more vulnerable and face greater information frictions in settings where PE has been found to have detrimental effects, such as for-profit colleges and nursing homes (Eaton et al., 2020; Gupta et al., 2023). 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 contributes to three strands of the literature. The first is privatization, where most research has focused on economies during their transition away from communism or socialism, and finds overwhelmingly positive effects (Barberis et al., 1996; Frydman et al., 1997; Brown et al., 2006; Bai et al.,

2006; Dastidar et al., 2008; Dinc and Gupta, 2011). The work most related to ours focuses on firm-level ramifications of privatization outside of these transitions. Megginson et al. (1994) show strong firm-level positive effects of 61 privatizations via public share offerings in the 1980s. La Porta and López-de Silanes (1999) study privatization in Mexico.[1] La Porta et al. (2002) show that government ownership of banks is associated with slower development and lower economic growth.[2] However, the firm-level studies also focus on privatizations that occur alongside large-scale transformations of legal and other institutions (Estrin et al., 2009). Yet government-owned firms and assets exist across many types of economic systems, including in today's capitalist economies. We take a global approach, identifying systematic results across many regions in a post-communist period.[3] There is also little study of the corporate form of private ownership, and in particular ownership by financial intermediaries vs. independent private firms.[4] Our findings are surprising because they depart from the previous consensus that privatization improves performance; in contrast, we find only PE ownership has arguably causal effects. The essential and highly salient nature of airports may lead to decent performance under government ownership.

Second, we contribute to the literature on who should own and invest in infrastructure, which has focused 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).[5] 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.

The third area of contribution is to the literature on PE. We examine whether PE creates value for

[1]Here, the overall and very large state-owned sector was "unraveling" following a 1982 debt crisis, and privatization was undertaken en masse among firms that were under substantial strain in a transitioning economy.

[2]Other related work includes Glaeser and Scheinkman (1996) and Gupta et al. (2008), who study the sequencing of privatization. Borisova and Megginson (2011) and Borisova et al. (2015) study the relationship between government ownership and the cost of debt. Finally, Boubakri et al. (2013) study risk-taking among newly privatized firms.

[3]One exception is Lopez-de Silanes and Vishny (1997), who study the private provision of public services in the U.S., such as local governments contracting out garbage collection or parks management.

[4]To our knowledge, the only papers that consider the role of investment funds post-privatization are Claessens and Djankov (1999) and Cull et al. (2002). Both examine the Czech Republic and document strong positive effects of investment fund ownership, as blockholders of publicly traded privatized firms, on restructuring.

[5]Existing work on airport privatization has used small samples or case studies, with more descriptive methods, and finds mixed effects of privatization on efficiency. 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). There is also work on congestion in airports (Brueckner, 2002; Mayer and Sinai, 2003).

consumers in infrastructure, where PE has longer holding periods and faces more government monitoring than in other sectors. With long term, stable cash flows, privatized infrastructure has proven an attractive class to institutional investors. However, Andonov et al. (2021) show that 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).[6] 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; Fracassi et al., 2022; Bernstein and Sheen, 2016). In contrast, there is evidence of negative effects in sectors with opaque product quality, intensive subsidy, or reliance on implicit contracts (Eaton et al., 2020; Gupta et al., 2023; Phalippou, 2020; Liu, 2021; Ewens et al., 2022).[7] Andonov and Rauh (2022) document ownership changes of U.S. electric plants and find that PE charges higher prices. Our analysis helps to reconcile these findings. We find largely positive effects of PE ownership in a sector with intensive government regulation and large externalities, but where quality is salient and there are significant national security and safety issues that tend to 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.

2 Institutional Context

In this section, we provide background on airport ownership and economics.

Privatization Context 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 continue to lead airports to be closely monitored and regulated. Although most airports are owned by national or regional governments, there has been a wave of privatization over the past four decades, inaugurated in 1987 when the UK floated the British Airports Authority (BAA)–which consisted of Heathrow and six other airports–on the London

[6] A strand of the PE literature studies returns to investors, including Franzoni et al. (2012), 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).

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

Stock Exchange. The rationale for this move and subsequent early privatizations was reducing public sector inefficiencies and improving service quality (Graham, 2020). After the 2008 financial crisis, the rationale for privatization shifted towards financial gains for the public sector (i.e., reducing public debt) and accessing private capital for needed investment (Van Nieuwerburgh et al., 2015; Cruz and Sarmento, 2017).

Privatizations can occur through either concessions or sales. In either case, the private firm typically has de facto control over operations and rights to residual cash flows conditional on the local regulatory regime. In a concession (sometimes called a public-private partnership, or PPP), the government grants a private firm the rights to operate and invest in an airport for a specific period. In exchange, the firm pays fees to the government, which can be fixed or variable (e.g., as a percentage of revenue). 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. Sales are typified by very long leases of the airport (say, 100 years) to a private company. For example, in 1997 and 2002, Australia privatized four airports this way. In a sale, the private company obtains ultimate control rights over the airport.

Early private airport owners were created to run one privatized airport and later expanded, purchasing others as they privatized in turn. Over time, the composition of airport buyers shifted towards infrastructure-specific PE funds (Condie, 2015; Graham, 2020). Beyond the ownership types we consider, there are other forms of private sector involvement, such as in developing and running specific terminals. We focus on overall airport ownership because this is the most interesting unit of observation from the perspective of control rights and residual claim to profits, and because we do not observe terminal-level performance.

Airport Revenue and Cost Structure 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. Airports, however, have especially volatile revenue that depends on demand for passenger and freight transport. Airport revenue follows from two basic functions: To enable airplanes to safely take off and land; and to move passengers through terminals. Aeronautical revenue, representing about 60% of total revenue, comes from airlines and includes per-passenger charges (fees for using the terminal building) as well as per-landing and per-takeoff charges (fees for using the runways and gates). These represent 41% and 21% of aeronautical revenues, respectively. Parking charges are the third largest source of fees (12%), and the rest varies by airports, including noise and environmental charges and

government fees. The remaining non-aeronautical revenue is commercial from retail leases (28%) and ancillary passenger services such as parking garages (18%) and rental cars (ACI, 2019).

Airports are the sole gatekeepers to a key downstream sector: commercial airlines and the routes they offer. More airlines, especially low-cost carriers, bring more competition and likely lower prices. More routes benefit passenger welfare and the local economy, as access to more routes creates new economic opportunities (Bernstein et al., 2016).

Revenue and profit margins typically increase with the number of passengers and flights. 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). Adding runways or terminals is risky because demand is uncertain and typically faces high local land use or environmental hurdles. Thus, the best way to boost profits is typically to increase efficiency by accommodating more passengers per flight and more aircraft movement per runway. International flights are often especially desirable as they yield more profitable passengers.[8] Airport owners can achieve higher volume without adding space in various ways, including by negotiating with airlines for more passengers per flight, investing in technology, and making better use of existing space.[9]

Governments often regulate infrastructure revenue; one argument for doing so is that it can have natural monopoly power.[10] The price regulation regime and its capacity for change are crucial inputs to profitability. Some governments—notably in Australia—do not regulate but explicitly threaten to do so in order to deter monopoly pricing (Forsyth, 2008). From the government's perspective, there is a need to design schemes that will (a) induce 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 (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 play a role in setting prices. Airports without competition from other airports or high-speed rail, that are more congested, or that have more international traffic tend to have more market power (Basso, 2008; Bel and Fageda, 2010). While airlines have fairly low demand elasticity for airports, they also have negotiating power, which increases with their share of airport traffic (Bel and Fageda, 2010; Borenstein and Rose, 2014). The airline trade association, IATA, reports that about 11%

[8] International passengers are more likely to stay at terminals longer than domestic ones, consuming non-aeronautical services (e.g., duty free shop).

[9] Based on conversations with Gareth Kitching, Mark Lewis, and Iain Smith at RDC Aviation, as well as the ACI Airport Economics Survey (2014) of 653 international airports.

[10] At privatized airports, regulation can take the form of rate of return limits or price caps. 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).

of total airline revenue is paid to airports (IATA, 2007). Privatization has not always been well-received; IATA recently argued that "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). Airline welfare is beyond the scope of this paper, but it is worth highlighting their opposition to privatization.

Private Equity We consider PE separately because it is playing a growing role as an infrastructure owner, including in the airport sector.[11] PE is interesting because its business model is fundamentally different from other private ownership, and also because of the size of the asset class. Global infrastructure assets under management grew from about $200 billion in 2010 to over $1.1 trillion in 2022.[12]

PE funds are financial intermediaries, with capital raised from limited partners such as pension funds and endowments. The general partners, 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, 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.[13] PE is associated with particularly high-powered incentives to maximize profits both because of the large share of debt on the balance sheet and because the general partners are compensated through a call option-like share of the profits (Kaplan and Stromberg, 2009).[14] 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) identify three channels for value creation in PE: 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

[11] 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.

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

[13] 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) and Korteweg and Sorensen (2017).

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

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, averaging $2.7 billion, while the average in all other PE classes is $700 million (Preqin, 2017-2022). 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 because they believe it offers diversification benefits, with low correlation with other asset classes.[15] Andonov et al. (2021) show that in contrast to this common narrative, infrastructure funds deliver below-market returns and have similar volatility and business cycle exposure as other PE vehicles. It remains to be seen whether this misalignment in time frames leads to negative real effects.

A new model in the U.S., pioneered in New York City, employs PPPs to finance, develop, and operate new airport terminals. PE has played an active role, with for example Carlyle leading a $9.5 billion development at JFK.[16] We do not evaluate these terminal-level deals and treat the few airports in this category as government-owned.[17] 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."[18]

3 Data and Descriptive Statistics

This section describes our data sources, ownership transitions, and summary statistics.

[15] See Preqin Report.

[16] See Center for Aviation.

[17] Unfortunately, operations and financials are not typically available at the terminal level, and these terminal-specific deals are also too recent for evaluation. 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).

[18] See JFK's Terminal One.

3.1 Data Sources

Airport Ownership and Deals Data We begin with a sample from OurAirports.com of all worldwide airports with more than 10,000 passengers and 100 flights as of 2016, which comprise 2,444 international or regional airports in 217 countries. We hand-collect the ownership history of these airports from various sources. These include Preqin (for PE funds), 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 articles about airport transactions.

We focus on three major ownership types, representing a continuum from wholly public to high-powered private incentives: (i) Public: Government owns and manages the airport; (ii) Non-PE Private: A private firm owns the majority of the airport and its management rights; (iii) PE: A PE fund owns the majority of the airport and its management rights. We identify a deal as PE when the PE firm leads the transaction and has the single largest stake among the acquiring syndicate. Based on the identity of majority owners, we further segment non-PE Private into (i) Foreign Private, (ii) Domestic Private, and (iii) Partially Government-owned Private firms. We do not include other types of investors, including sovereign wealth funds, insurance companies, and pension funds. When they have direct stakes in airports, they tend to be smaller minority stakes and passive. Overall, we identify 437 privatized airports. Once privatized, airports almost always stay that way; there are just four cases in which airports returned to government ownership.

Airport Performance Data We collect a rich array of information on many dimensions of airport performance from various sources, the most important of which are the International Civil Aviation Organization (ICAO) and the Official Aviation Guide of the Airways (OAG). Here, we briefly summarize the sources. We describe them in detail and provide variable definitions in Appendix B. We obtain annual information on passenger and flight traffic (separately for international and domestic flights), as well as the number of airlines and routes served, from 1996 to 2019. To assess quality, we gather data on the share of flights that are canceled and awards. We hand collect airport financial statements, allowing us to examine revenues, operating expenditure, and profitability.

We also collect data on the fees that airports charge to airlines, which are on a per-aircraft-event basis (i.e. takeoff and landing). The primary fees are per-passenger and per-runway use, both of which depend on the length of route and aircraft size. To explore investment in capacity expansion, 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. Then, we measure the terminal size using a ruler tool and the number of runways as a proxy for airport capacity.[19] Figure A.1 presents an example of such a satellite image, which represents Adelaide Airport in Australia the year before and three years following its acquisition by Whitehelm Capital and IFM Investors.

Regulation and Governance Data Some countries regulate airport earnings under private ownership. We obtain regulatory regime histories from David Gillen at the University of British Columbia. The data cover 79 major airports from 1990 to 2018, of which 24 were at one time owned by PE and 30 by non-PE private firms. We also employ a measure of government corruption from Transparency International called the Corruption Perceptions Index (CPI). These data span 1995-2021 and cover 181 countries, which account for 1,839 airports.[20]

3.2 Descriptive Statistics

The maps in Figure 1 illustrate the incidence of worldwide airport privatization by type of owner. Figure 2 characterizes privatization over time within our analysis sample. The number of active airports each year, around 1,400, has grown only slightly (Panel A), but the number of privately owned airports rose from just a handful in the late 1980s to over 400 in 2019 (Panel B). Panels C and D show the PE share of airports and passenger volume; the latter increased from about 2.5% to nearly 20%. In these figures and our main analyses, we exclude airports in U.S. and China because they have no privatized airports, as is clear from Figure 1. The U.S. has not privatized its airports because of unique federal government incentives to remain publicly owned and operated.[21] The same plots including them are in Figure A.2, and it shows a similar pattern, though of course with smaller magnitude.

Out of the 2,444 airports that appear in our sample, 437 (21%) were privatized. Of these, 102 have been owned by an infrastructure fund, with 36 PE privatizations and 84 PE acquisitions of previously privatized airports. We describe the number of transactions and percent ownership stake in Table 1 Panel A. The

[19] Google satellite images are publicly accessible using Google Earth App.

[20] The CPI measures how corrupt each country's public sector is perceived to be according to experts and business people. The measure is on a zero to 100 scale. The data are available at Transparency International.

[21] 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. See Annual Privatization Report by Reason Foundation. 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 Westchester County Airport and Chicago Midway Airport, local opposition to expansion or to privatization has derailed the efforts.

distribution of the airport transactions highlights that we observe deals in all categories of privatization and post-privatization ownership transitions, and that most acquirers obtain 100% of the ownership. The average duration of an acquisition agreement is about 35 years. The use of concessions and leases, where ultimately the asset would eventually devolve back to the government, makes airports different from the conventional companies that PE acquires in other sectors. In Table A.1 we separate the deals into concessions in Panel A and sales in Panel B. Table A.2 presents statistics on the number of privatizations in each decade for each country. For the main analysis, we have excluded airports with missing control variables. Excluding those in the US and China, there are 2,090 airports in total. Among these, 91 are PE airports, and 333 are Non-PE airports. As a result, our main analysis involves a total of 359 airports. Table 1 Panel B shows in the left-hand columns the share of each of the four ownership types in our main airport-year sample. Almost 90% of observations are under government ownership, while 5.3% are domestic private and 2.5% are PE. The right-hand columns show the transitions into and out of PE ownership.

We describe the profiles of PE airport owners in Table A.3. Panel A lists the top five PE acquirers out of a total of 49 unique PE firms in our data. Panel B presents fund characteristics. The mean (median) holding period in our data is 8.3 (7) years conditional on exit, but 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. These are longer than the traditional standard in LBOs of 3-5 years.

The non-PE private firms are a diverse group of companies in terms of their origin and size. Some originate in a single privatized airport, while others are purpose-built airport holding companies These holding companies are almost all focused exclusively on airports. Table A.4 lists the top non-PE private firms and their largest shareholders. The largest is Aeropuertos Argentina 2000, which has purchased 33 airports, and is categorized as partially government-owned. The second largest is Vinci Airports of France, which has purchased 29 airports, and is categorized as either domestic or foreign private depending on the country of the airports it operates.

Table 2 presents summary statistics on the variables used in our main analysis, broken down by public and private ownership. Since coverage varies across the datasets, the samples are not the same for each analysis, though we show our main results are robust to using an overlapping sample. Relative to government-owned airports, privatized airports are on average larger and more efficient, with a higher number of passengers per flight, more flights and passengers, more international routes, and more low-cost carriers (i.e., discount airlines). They also charge higher fees to airlines. The same statistics are shown for

the auction sample in Table A.5, and across the four types of private ownership in Table A.6. In analysis, we winsorize outcomes at 2.5% to avoid outliers.

Finally, we evaluate the factors that predict airport privatization. We estimate univariate regressions of privatization dummy variables on airport characteristics, dropping airport-year observations following privatizations. We estimate these equations separately for each type of acquirer: PE, Foreign Private, Domestic Private, and Partial Government. The coefficients should therefore be interpreted as relative to all other forms of ownership. The results are plotted in Figure A.3. The estimates indicate that PE firms target airports in countries that are richer and have more trade, while foreign private firms tend to target airports without a competing airport nearby. On other dimensions, such as measures of airport size, we do not see significant differences. This analysis suggests that there may be systematic targeting on the part of airport acquirers, which highlights the importance of controlling for selection in our analysis.

4 Empirical Strategy

From a policy perspective, the desirability of privatizing airports depends in part on whether they lead to improvements in airport operations. Furthermore, it is of theoretical and practical interest to understand what type of private ownership performs best. To address these questions, we conduct three empirical tests.

The first compares PE and non-PE private buyers in government privatization auctions in which both types of firms bid. This test offers a tight control for differential selection among PE and non-PE private firms. That is, it ensures that any different effects do not reflect better selection capability among one type of firm. This analysis also documents average effects in a subsample of privatizations. With these results in hand, we determine that it is important to consider PE separately, and we turn in the second test to the full sample, where we disaggregate ownership types further and examine post-privatization transitions in a standard differences-in-differences model. The third strategy considers dynamics. We look for pre-trends to assess whether average effects reflect airports being on track to experience improvements. Importantly, in the first analysis using auction data, if we find average effects for both PE and non-PE private, then we must rely on evidence from pre-trends to assess whether selection is at play. However, if we find that only one of the two ownership types has an average effect, then the only way that selection could explain it is if the type without an effect is somehow exerting a negative impact and thwarting the expected improvement. We will discuss this possibility and how it is ruled out further below.

Addressing Selection with Auction Data. We begin by exploiting auction data to address what has been the biggest challenge for the literature in assessing the real effects of PE buyouts: Selection. We start with this analysis because it offers the most causal interpretation and because it directs how we model ownership in the subsequent broader differences-in-differences models. In this approach, we restrict our analysis to a subset of deals where both PE and non-PE firms show serious interest: airports for which both types of firms bid in a government-sponsored auction. It is costly to submit a bid, requiring extensive diligence and planning, and thus firms would not plausibly bid if they did not have an interest in acquiring the airport.

Specifically, we gather data on auction participation from government press releases, news articles, airport websites, and other online sources. Of the 120 PE deals, we identified 90 with auction bidder information, and of the 419 airport acquisitions by non-PE private firms, we identified 110. Note that not all countries hold auctions. The top countries by number of deals with auction data are the UK (16), Australia (14), Japan (12), India (10), and France (8). On average an auction has 8.2 bidders. We then restrict the analysis to those airports where PE and non-PE firms were among the finalist bidders and there were additional bidders who were not finalists.[22] This ensures that they both had high willingness-to-pay, by revealed preference of being willing to pay more than other bidders. Unfortunately, data on prices are not generally available, so price information is not included in the analysis.

Table 3 Panel A presents summary data about the auctions. PE wins most of the time, consistent with PE paying a premium because of its greater ability to create value and the tax benefits of debt. Specifically, of the 70 airports in which PE and non-PE both bid, PE won in 54. There are also 20 auctions where only PE bid and 40 where only non-PE bid. Therefore, PE and non-PE firms target the same airports more often than they target different airports.

We estimate the effects of these acquisitions in which both PE and non-PE firms were finalist bidders using Equation 1, where observations are at the airport-year level. In the estimation sample, we also include all airports that are always government-owned. These serve as a large control group, so that pre-treatment observations for the 70 privatized airports in the sample are a small fraction. For this reason staggered treatment bias is unlikely to affect the results, though we conduct robustness tests on this below.

$$Y_{i,t} = \beta_1 \mathbb{1}(\text{PE})_{\text{i,t}} + \beta_2 \mathbb{1}(\text{Non-PE Private})_{\text{i,t}} + X'_{i,t-1}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t}. \tag{1}$$

[22] We gather this information from press releases and news articles, so it is possible that we miss deals where there was a finalist group but it was not publicized.

Here, the first independent variable of interest is an indicator that is one after an airport transitions from government to PE ownership and zero otherwise ($\mathbb{1}(\text{PE})_{\text{i,t}}$). The second variable is defined similarly but for non-PE privatizations. We report the p-value from an F-test for equality of these coefficients. To control for macroeconomic growth, airport size, and country governance indices related to the demand for air transportation, we include in the vector $X_{i,t-1}$ log GDP per capita, log trade volume, share of international passengers, government size, and five governance measures (ease of doing business, corruption, open markets, judicial effectiveness, and government integrity; See Appendix B for sources and variable explanations). These may evolve differently at control vs. treated airports. All models also include airport and year fixed effects. The results are robust to alternative control specifications and to using deal fixed effects. Standard errors are clustered by airport.

Ownership Analysis in the Full Sample. Our second model, in Equation 2, follows a standard difference-in-differences structure but with four treatment variables for the four types of ownership.

$$\begin{aligned} Y_{i,t} = \beta_1 \mathbb{1}(\text{PE})_{\text{i,t}} + \beta_2 \mathbb{1}(\text{Foreign Private})_{\text{i,t}} + \beta_3 \mathbb{1}(\text{Domestic Private})_{\text{i,t}} \\ + \beta_4 \mathbb{1}(\text{Partially Gov't Owned Private})_{\text{i,t}} + X'_{i,t-1}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t}. \end{aligned} \tag{2}$$

Here, government ownership is the base group, and the remaining independent variables of interest are the other three ownership types. $\mathbb{1}(\text{PE})_{\text{i,t}}$ is one after an airport transitions from government to PE ownership and zero otherwise. $\mathbb{1}(\text{Foreign Private})_{\text{i,t}}$, $\mathbb{1}(\text{Domestic Private})_{\text{i,t}}$, and $\mathbb{1}(\text{Partially Gov't Owned Private})_{\text{i,t}}$ are defined analogously. We report two p-values on F-tests for equality of coefficients. The first compares the coefficients of PE and foreign private, which are the most independent from the local government. The second compares domestic private and partially government-owned private. The model is otherwise the same as in Equation 1.

We also focus on different effects in privatization vs. post-privatization transactions, and whether the effects we see for PE appear in both. It is especially interesting to explore whether PE exits lead to a reversion in effects. We observe exits in transactions when non-PE acquires from PE. To our knowledge, examining the effect of exits is new to the literature on the real effects of PE on firm outcomes.

$$\begin{aligned} Y_{i,t} = \beta_1 \mathbb{1}(\text{Privatization by PE})_{\text{i,t}} + \beta_2 \mathbb{1}(\text{Privatization by Non-PE})_{\text{i,t}} \\ + \beta_3 \mathbb{1}(\text{Post-Priv Non-PE to PE})_{\text{i,t}} + \beta_4 \mathbb{1}(\text{Post-Priv PE to Non-PE})_{\text{i,t}} + X'_{i,t-1}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t}. \end{aligned} \tag{3}$$

In Equation 3, the independent variables of interest are again relative to government ownership. $\mathbb{1}(\text{Privatization by PE})_{i,t}$ is one after an airport transitions from government to PE ownership and zero otherwise. Similarly, $\mathbb{1}(\text{Privatization by Non-PE})_{i,t}$ is one after an airport transitions from government to Non-PE private ownership. $\mathbb{1}(\text{Post-Priv Non-PE to PE})_{i,t}$ is one after an airport that is already privatized by a non-PE firm transitions to PE ownership, while $\mathbb{1}(\text{Post-Priv PE to Non-PE})_{i,t}$ is the reverse. Table A.1 shows that we observe sufficient transactions in all these categories for estimation, though the most common pattern is for airports to privatize with a non-PE owner. 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. The model is otherwise the same as in Equation 2.

A potential concern with this empirical approach is the staggered nature of the transactions (Goodman-Bacon, 2021; De Chaisemartin and d'Haultfoeuille, 2020; Roth et al., 2023). Since airports are acquired at different dates, and thus the control group depends on the year and may include not-yet-treated airports, dynamic treatment effects could lead to bias. This concern is less likely in our context because the vast majority of observations in the data are for non-treated airports. Nonetheless, following the recent literature on resolving bias in two-way fixed effects models with multiple treatment periods, we estimate several estimators that have been proposed to address the treatment effect heterogeneity. 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).

Exploring Dynamics. Our final estimation approach examines dynamics using fully saturated difference-in-differences event study models. The event studies tell us whether the airport was on track to experience the effects that we see post-acquisition. We present them for PE and foreign private deals, because these are

the types where we see effects from estimates of Equation 2. We use Equation 4 below for PE.

$$Y_{i,t} = \sum_{s \neq 0} \beta_s \text{PE Deal Year}_{\text{i,s}} + X'_{i,t-1}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t}. \tag{4}$$

The model includes coefficients for each year around the transaction year, and otherwise is the same as in Equation 3. If we observe no pre-trends in the plotted coefficients, we interpret the results as representing a degree of casual impact on the treated. However, we cannot fully rule out the possibility that targeted airports were already on track to the changes we observe. Also, since airports are not randomly assigned to ownership types, the results may not generalize to all airports. However, given the pace of privatization and the rise of PE ownership, we believe that the treated population is economically relevant.

5 Ownership Type and Airport Performance

This section examines how privatization and ownership type affect airport performance. We begin by comparing PE and non-PE privatization using close auctions (Section 5.1), and then shift to our whole sample to analyze all the ownership transitions and dynamics (Section 5.2).

5.1 Effect of Privatizations with Auction Data

We present estimates of Equation 1 in Panel B of Table 3. Recall that this analysis looks for average effects of PE and non-PE privatization on airport performance, among airports for which both PE and non-PE firms bid and were among the finalists. Always-government-owned airports are the baseline and compose most of the sample. We consider nine outcomes that capture key dimensions of performance. We find remarkably consistent and robust results: across all the measures, there are significant improvements if the PE firm wins and little if any improvement when the non-PE firm wins.

The number of passengers per flight into and out of an airport is a key performance metric; all else equal, increasing it leads to more commercial revenue in terminals and per-passenger aeronautical fees from airlines. 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. More passengers per flight enables the airport to serve more customers with the same infrastructure. Under PE ownership, passengers per flight increase by 12.5, or about 13% (column 1

of Table 3). In contrast, this metric declines by an insignificant 0.6 under non-PE private ownership.

Increasing traffic creates value for an airport. Table 3 columns 2-3 show that the total number of passengers increases after PE acquisitions by about 47%, while the number of flights increases by 41%. Note that when outcome variables are logged, we exponentiate coefficients for interpretation as percent changes. Again, there is no significant change under non-PE private ownership, though the coefficients are positive.

An airport's value to the economy depends not only on the total number of passengers, but also on the choices of routes and airlines. The number of locations with nonstop flight access 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 area.[23] The number of international routes increases by substantially more under PE ownership, with an effect of almost 23, significant at the .01 level, relative to an insignificant 12 under non-PE privatizations (column 4). These are, however, both large in magnitude relative to a mean of about 10 international routes. (Recall that the sample mean is dominated by government-owned airports.)

There are two additional measures that are directly relevant to passenger welfare. First, flight cancellations are perhaps the largest nuisance to passengers and also disrupt airport operations. We find that under PE ownership, the flight cancellation rate declines by 0.59, which is about one-third of the mean of 1.53%, but in fact increases on average under non-PE private ownership (column 5). Second, when more airlines serve an airport, passengers benefit from more options for subsequent connections and lower prices resulting from increased competition. This is especially true for low-cost carriers, rather than the flag carriers and mainline carriers which tend to operate regional hubs with some degree of monopoly power or benefit from government subsidies. In column 6 we show that after PE privatizations the number of low-cost carriers increases by 1.5, or almost twice the sample mean. There is a smaller and statistically insignificant positive effect for non-PE privatizations.[24]

Larger aircraft are preferable for the airport because they bring more passengers and higher per-takeoff and per-landing fees with essentially the same use of runway and gate capacity. The airport has some control

[23] Source: Private conversations with deal participants.

[24] One of the important dimensions of consumer welfare for airport users is flight ticket prices. It is reasonable to expect that after airports impose higher fees on airlines, airlines can pass on the increased fees to passengers by adjusting the ticket price. Unfortunately, airline ticket price data are available for the routes within the U.S., and only a few airports in the U.S. have been privatized, as explained in Section 2. Thus, we cannot examine the effect of privatization on ticket prices.

over aircraft size through its negotiations with airlines. Column 7 of Table 3 shows that the share of large jet aircraft (as opposed to small and regional aircraft) arriving at the airport increases by 0.09, relative to a mean of 0.42 in the overall sample. Larger aircraft appear to be one reason for the earlier results on passengers per flight and overall volume.

Our final key measures are related to financial performance, which we expand upon below. While it is well-known that PE managers have high-powered incentives to increase cash flows (e.g. see Gompers et al. (2016) and Sorensen and Yasuda (2023)), it is rare to observe income statements for privately owned firms. For this reason, 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. In columns 8-9 of Table 3, we see that net operating income increases by 66% under PE ownership, while expenditure per thousand passengers is unchanged. In contrast, non-PE private ownership has no significant effects on the net income but rather increases operational expenditure.

Table A.7 repeats this analysis in the slightly bigger sample of all 70 airports where PE and non-PE firms both bid, but where the two types are not necessarily finalists among the bidders. The results are very similar to those in Table 3.

In sum, this auction-based analysis has established a sharp difference between the average impact of PE and non-PE private owners. In contrast with results from other subsidized and highly regulated industries where PE has been found to affect consumers negatively, in the case of airports we see clear positive impacts on measures of airport performance that are directly relevant to passenger welfare. This does not reflect only a selection channel because in this sample, a non-PE firm also sought to purchase the airport. One remaining possibility related to selection is that both non-PE and PE firms could target airports on track to improvements, but somehow non-PE thwarts these improvements. Further, the auction analysis relies on a subsample of airports. In the next analysis, we assess whether the results hold in the full sample and look for pre-trends in the PE impacts.

5.2 Full Sample Analysis of Ownership Type and Post-Privatization Transactions

We next use the full sample to explore the disaggregated effects of non-PE private ownership, whether impacts change in post-privatization deals, and pre-trends. These analyses employ Equations 2, 3, and 4, respectively.

Airport Performance Table 4 Panel A reports results on traffic-related outcomes. For passengers per flight in column 1, there are no effects for the non-PE ownership types. After PE acquisitions, the number of passengers per flight increases by 11, which is 11.3% of the mean of 97 passengers (column 1, row 1). This change is close to the 13% estimated increase from the auction data. The *p*-value at the bottom of the table shows that the effect of PE is significantly larger than the effect of foreign private. Column 2 breaks down the PE and Non-PE ownership by transition type. In PE privatizations, passengers per flight increase by 15%, and in non-PE to PE transactions, they increase by 9.7% (column 2, rows 1 and 3). The event study results for passengers per flight are plotted in Figure 3 Panel A, and are consistent with the average results from Table 4. Following the acquisition (year 0), for PE we see an increase, with no evidence pre-trends.

In the Appendix, we provide four sets of results for passengers per flight and all subsequent outcomes. First, we show raw mean changes for all outcomes in Table A.8. For example, the number of passengers per flight increases by 13% on average after PE privatizations and 6% in non-PE to PE transactions. For non-PE private, these figures are -1.2% and -6%, respectively. Second, we report regression results using only PE as an independent covariate, which offers the average diff-in-diff analogue to the event studies (Table A.9 Panel A). Third, we report models with both PE and all non-PE private as covariates, which is the full sample version of the auction analysis (Table A.9 Panel B). Fourth, we present event studies for foreign private acquisitions specifically in Figures A.4-A.7, which corresponds to Figures 3-6 of the PE results. We focus on foreign private because, as we will see below, for some outcomes we see average positive impacts in this group and we are thus interested in assessing pre-trends. Broadly speaking, the impacts of PE are consistent across the various approaches, suggesting that there is not something spurious about the main specification driving the results.

For the remaining outcomes, we present the results in the same way as for passengers per flight, but are more parsimonious in our discussion. Additional results in Table 4 Panel A show that the total number of passengers increases after both PE and foreign private acquisitions, by 21% and 28% respectively (column

3, rows 1-2). For PE, this result reflects both initial privatizations and secondary transactions (column 4, rows 1 and 3). The number of flights increases by about 13% after PE acquisitions, and 39% after foreign private acquisitions (column 5, rows 1-2). The event studies in Figure 3 Panels B and C indicate that after PE acquisitions, the number of passengers and flights increase, again with no evidence of pre-trends. After foreign private acquisitions, however, Figure A.4 Panels B and C reveal pre-trends, suggesting the average effects in the table likely to reflect selection rather than operational changes.[25]

Table 4 column 7 shows that the number of international routes increase after PE acquisitions by 7.6, a 68% increase relative to the mean (row 1). The event study again points to a discontinuous increase for PE (Figure 3 Panel D). Column 8 suggests that this is driven more by non-PE to PE ownership transitions, though the coefficient is also large and positive for PE privatizations. Foreign private ownership is also associated with a large increase of 104% of the sample mean (column 8, row 2), but here again we see evidence of a targeting mechanism (Figure A.4 Panel D). There is no effect for domestic private or partially government owned airports.

A key measure of airport quality from the passenger perspective is the flight cancellation rate. Table 4 Panel B column 1 shows that PE acquisitions lead to a 24% decline in the percent of flights canceled declines relative to the mean of 1.48 (column 1 row 1). Foreign private and domestic private also have negative coefficients, but they are not significantly different from zero. The event studies indicate a decline for both PE and foreign private (Panel A of Figures 4 and A.5). We observe a reversion after PE exits in column 2, where a transition to PE ownership is associated with lower cancellation rates (row 3), but when PE sells to non-PE, there is a significant increase of 29% relative to the mean of 1.48 (row 4). Remarkably, partially government-owned private ownership leads to an *increase* in cancellation rates, indicating that wholly government-owned airports perform better on this measure.

There are many aspects of the passenger's airport experience that are difficult to quantify. These include the security wait times, the cleanliness of the restrooms, and the quality of the stores and lounges. We assess subjective airport quality using ACI ASQ awards data. These prizes are offered to airports whose passengers report the most positive and smooth experiences in surveys. While we do not find that privatizations in general affect the likelihood of an award, we do see that for subsequent acquisitions, PE ownership increases the chances of winning an award (Table 4 Panel B column 4, row 3). The effects on awards in the auction

[25] All the traffic outcomes are split by foreign and domestic in Table A.10. We do not find significant effects for freight traffic (not reported).

analysis are insignificant, likely because the low mean rate of awards, and we do not report them there. We also do not see significant results in event studies, which appears to reflect PE awards occurring 4-5 years after the acquisition, which is past our event study sample period.

The number of low-cost carriers increase under all private ownership types besides partially government-owned (Table 4 Panel B column 5). Figure 4 Panel B shows a discontinuous increase for PE, while a pretrend in Figure A.5 Panel B again suggests that the effect for foreign private reflects selection. These results generally suggest that government-owned airports do not recruit low-cost carriers, possibly because of their connection to state-owned flag carriers. We explore this in Section 6. The final two columns of Table 4 Panel B show that PE increases the share of large aircrafts by 23% (also see Figure 4 Panel C).

Financial Outcomes The estimates in Table 5 indicate that there are substantial financial changes following privatization. Net income increases by 42% following PE acquisitions and 63% following foreign private acquisitions (column 1, rows 1-2). The event studies support these results from Table 5, showing that net operating income and total operating revenue increase for both types of ownership (Figures 5 and A.6 Panels A-B). Furthermore, we see in the bottom row of columns 2 and 4 that net income and revenue decrease significantly after transitions from PE to non-PE. This reversion after PE exits further confirms that PE ownership specifically adds value, as opposed to selecting airports on track to higher cash flows. To our knowledge, no previous study in PE has looked at the impact of PE exits on firm outcomes.

There is some variation in the source of revenue. For PE, both aeronautical (fees to airlines) and non-aeronautical (retail and parking) revenues increase (columns 5 and 7). We do not see any evidence of cost-cutting, as expenditure per thousand passengers is unaffected (column 9). For foreign private, the revenue increase is driven by the aeronautical side, and the coefficient on expenditure is larger and negative albeit insignificant. Remarkably, income and revenue decrease after acquisitions by partially government-owned firms (columns 1, 3, 5, and 7, row 4), consistent with the results above showing possible quality declines in these acquisitions.

5.3 Robustness

We next conduct robustness tests that address possible concerns with the main results.

Staggered Bias Tests. As explained in Section 4, we conduct three tests to address possible bias from a staggered difference-in-differences model. In all cases, we employ for parsimony the key outcome variables that contain the key findings. Our first approach retains the main empirical model of Equations 1-3, 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 Table A.11 Panels A-C. 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 Table A.12 Panels A-B. We see significant effects on the key productivity outcomes, such as passengers per flight, number of passengers and international routes (columns 1, 2 and 4). Possibly due to the much smaller sample, the effects on income and expenditure are somewhat different here, with a negative effect on expenditure per thousand passengers (columns 8-9).

The third strategy is a matching estimator, which is also helpful for addressing selection concerns in the full-sample model. We match each privatized airport one-to-one with never-privatized, government-owned non-target airports using Coarsened Exact Matching (Iacus et al., 2012). To identify control airports, we match each targeted airport to a government-owned airport on region, the log GDP per capita, share of international passengers, judicial effectiveness, corruption score, financial freedom, and the number of passengers per flight two years before the privatization event.[26] In the estimation, we include airport and year fixed effects but the results are similar using match cohort and year fixed effects. The matched dataset includes 684 airports. Of these, PE acquires 90 and non-PE private acquires 324. The results are in Table A.13 Panels A-C. The effects are similar to the main findings. One downside of matching is that it eliminates many airports from the sample, which makes heterogeneity tests less interesting. Our main analysis therefore uses the whole data with controls.

[26]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. We find similar results when we match on alternative variables, such as alternative governance measures.

Other Ownership Categories. We consider three alternative ownership type splits. The first is publicly traded firms, which do not have systematically better performance relative to government-owned firms except on the international routes, low-cost carriers and net income (Table A.14). Second, we split the PE firms by whether the firm is headquartered in the same country with targeted airports or not. We do not find that this distinction matters for the performance of PE, except that foreign PE firms increase international routes and number of airlines much more while domestic PE firms increase number of passengers and passengers per flight (Table A.15).

Omitting Largest Deal. There could be a concern that our results are spuriously driven by one especially large deal with many airports. In Table A.16, we omit the largest deal in terms of the number of passengers 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 1. 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 Table A.17. The results are again quite similar to our main findings.

Together, the consistent results from all of these tests offer comforting support for the basic findings. In further unreported tests we find similar results using our main models with various permutations of the controls, deal fixed effects, and alternative approaches to clustering standard errors.

6 Mechanisms

The results from Section 5 document that PE-owned airports consistently improve performance across volume, efficiency, and passenger experience measures. Meanwhile, there is little evidence that privatization alone causes improvement; for non-PE acquisitions, 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. We will document that PE owners expand physical capacity to accommodate more flights and passengers, consistent with the idea that there were financial constraints facing previous owners. PE owners also adjust their fee structure 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 and rigorous competition leading to improved outcomes for the airport rather than 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 global practices, since 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 can negotiate more favorable revenue-sharing agreements.[27]

Capacity Expansion We document above that PE ownership brings larger planes to the airport, which helps to explain the increase in passengers per flight and passenger volume. However, this cannot explain the large increases in volume and overall flights. Here, we look for evidence of capital investment in capacity. As explained in Section 3.1, we measure terminal square footage and number of runways using satellite imagery data, which we capture for privatized airports at three points in time ($t-1$, $t+3$, and $t+5$). Summary statistics about these data are in Table A.18 Panel A.

We present size-weighted percent increases in Table A.18 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 privatizations, though it is smaller. Post-privatization, terminal size increases in non-PE to PE deals by 22%. Next, we estimate regressions with airport and year fixed effects, using pre-privatization airports as the base group (we did not collect data for never-privatized airports). The results, in Table 6 columns 1-2, show an increase of about 12% in terminal size after PE and no effect of any other ownership type. There is also an increase in the number of runways after PE privatization of 0.04, which is 3% relative to the mean of 1.32 (column 3). This analysis suggests that PE

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

helps to relieve pre-existing financial constraints.

Employment Another mechanism for the higher net income of PE and potentially the lower expenditure of non-PE is changes in employment. We are able to observe airport employment for the subset of airports with financial data. In columns 5-6 of Table 6, we see that perhaps surprisingly, PE ownership does not lead to a decline in employees per thousand passengers. Instead, we see evidence of employment cuts among foreign private owners. On average, foreign private owners cut employment per passenger by 12% (column 5, row 2). This stems from privatization events (column 6, row 2).

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. As discussed in Section 2, airports and infrastructure generally have many unique characteristics, so the effects of PE here do not necessarily generalize to other sectors.

Price Adjustment: Fees Charged to Airlines and Regulation During our sample period, fees that airports charge to airlines account for about 60% of airport revenue. Adjusting these fees could help drive the higher traffic and revenue documented above. The two main charges are runway fees, which are for takeoffs and landings, and passenger fees, which are for processing passengers in terminals. In Table 7, we estimate the impact of private ownership on these fees. First, consistent with the airline industry's complaints (see Section 2), total fees increase following foreign private acquisition (column 1, row 2). In contrast, total fees do not change following PE acquisition (column 1, row 1). Note, however, that again the foreign private result seems to reflect selection, as there are strong pre-trends before the foreign private acquisitions (Figure A.7 Panels A-B), pointing away from a causal result. Shifting back to Table 7, we see an increase in total fees for both PE and non-PE privatization (column 2, rows 1-2). However, the PE privatization result is driven by only a few deals because fee data are available only from 2010 to 2020, a period in which most PE transactions are non-PE to PE.

We disaggregate the fees in columns 3-6. After PE acquisitions, passenger fees (which dominate total fees) do not change while runway fees increase (columns 3 and 5). The event study results in Figure 6 support these results. They show that the runway fee increases (Panel C), but if anything the passenger fee decreases (Panel B), and there is no effect on total fee (Panel A). 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.

When airports are privatized, governments sometimes regulate airport prices, since airports have a degree of market power. Price regulation limits 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. PE may target airports in countries on track to deregulate or may lobby the local government to deregulate post-acquisition. We study the relation between airport ownership changes and regulation using an indicator for no price regulation in the airport-year as the dependent variable. Since regulatory regimes rarely change and are no doubt connected to drivers of privatization, this model has no causal interpretation. That said, after PE acquisitions, we see a higher chance of deregulation (Table 7 column 7 row 1). This is driven by non-PE to PE transitions, where the relationship is about 130% of the mean. This deregulation may promote incentives for the performance improvements that we see in the previous analysis.

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, creating an explicit threat of regulation. This is akin 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 opposing regulation, noting that the "light-handed regulatory regime encourages commercial outcomes, incentivises innovation and allows investors to earn appropriate risk-adjusted returns...[A]irport owners take the threat of regulation seriously."[28] While this example does not necessarily apply elsewhere, it shows that investor lobbying can yield regulatory changes.

State Capacity: Less Corruption and Better Performance A somewhat surprising finding is that there do not appear to be efficiency improvements on average following non-PE privatizations. One possible explanation is that some non-PE firms acquire the airports through government connections, potentially at below market prices. This could be associated with dampened value creation incentives. If this is the case, we expect non-PE deals to lead to more improvement in countries with better governance, where deals are more likely motivated by potential efficiency gains. PE firms and their investors (i.e., limited partners) may

[28] Australian Airports Investor Group Submission to the "Productivity Commission Review of the Economic Regulation of Airports," September 2018. Available here: here.

be more bound by standards such as the U.S. Foreign Corrupt Practices Act.[29]

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 our more positive ones is that airport regulators are relatively empowered to monitor effectively. 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.

In sum, good governance creates scope for performance improvement, while poor governance creates scope for "tunneling"-type deals. To explore this, we estimate Equation 5 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.

$$\begin{aligned} Y_{i,t} = \beta_1 \mathbb{1}(\text{PE x HighCorrupt})_{\text{i,t}} + \beta_2 \mathbb{1}(\text{PE x LowCorrupt})_{\text{i,t}} \\ +\beta_3 \mathbb{1}(\text{NonPE x HighCorrupt})_{\text{i,t}} + \beta_4 \mathbb{1}(\text{NonPE x LowCorrupt})_{\text{i,t}} + X'_{i,t-1}\,\gamma + \delta_i + \theta_t + \varepsilon_{i,t} \end{aligned} \tag{5}$$

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 presented parsimoniously in Figure 7 Panel A for three outcomes, where each marker represents a coefficient. The first two outcomes are key performance measures from the perspective of the local economy: total passengers and number of low-cost carriers. In high corruption countries, the coefficients on non-PE privatization (light triangles) is near-zero for all outcomes. Conversely, the coefficients in low-corruption countries are statistically significantly higher and positive in both 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.[30] In contrast with non-PE private, PE if anything has more positive effects in more corrupt countries. The final variable is income; we see a similar pattern

[29] 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.

[30] For readability, each key outcome variable is transformed to fit into one scale. Since we combine privatization and post-privatization deals, results should be compared to the average effects in Table A.9, rather than results with four explanatory variables using Equation 5. Log Total Passengers is multiplied by 5, and Log net income by 2.5. For example, the overall effect of non-PE private acquisitions on the log number of passengers is 0.06 (Table A.9 Panel B column 2). The results in Figure 7 Panel A show that the effect is about 0.16 in low-corruption countries (dark triangle) and about -0.08 in high-corruption countries (light triangle).

here, where non-PE experiences much more positive effects in low-corruption countries, while the reverse is true for PE. We report a broader set of results for the nine main outcomes in Table A.19. The number of passengers, flights and international routes also increase substantially under non-PE ownership in low-corruption countries, but not in high-corruption ones.[31] In sum, these results are consistent with returns to privatization coming in part from rent extraction in more corrupt countries (Hoffman, 2011). PE funds are seemingly immune to this mechanism. In more corrupt countries, they have more positive effects on airport performance.

Pre-Existing Relationships: The Role of State-Owned Flag Carriers Related to the role of state capacity is the presence of government-owned airlines, or "flag carriers," which may have cozy relationships with the local airport. Over time, some flag carriers have been privatized. Examples are the 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 define a carrier as state-owned if it is majority or wholly owned by the local government in that year.[32] Summary statistics about this variable are in Table 2; about 36% 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 5, replacing the corruption variable with an indicator for the airport-year having a state-owned flag carrier. The results are in Figure 7 Panel B. The effect of PE ownership on the number of low-cost carriers is larger when there is a state-owned flag carrier (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. The last model shows that net income increases 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.[33]

[31] 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.

[32] We collected data on flag carriers from Wikipedia, supplemented with manual search. The data can be obtained from: https://en.wikipedia.org/wiki/Flag_carrier.

[33] We present the regression results in tabular form for nine main outcomes in Table A.20. Non-PE acquisitions are associated

Market Stealing It may be that the expansion after PE acquisitions comes at the expense of competing airports, which has a less positive interpretation from a social perspective. To assess whether this may be at play, we focus on airports with competitors nearby. We identify airports as having a competitor if there is a non-targeted airport within 200 km. About 70% and 64% of PE owned and non-PE privately owned airports, respectively, have a competing airport nearby. We ask whether the competing airport loses traffic after the acquisition in Table A.21. There are no significant effects for PE, though the coefficient is positive for the number of passengers. This indicates that the main results do not reflect market-stealing. For non-PE privatization, there is in fact a significant positive effect of about 7% on the number of flights. This is consistent with targeting explaining the non-PE regression results, since it indicates that the local area is generally experiencing volume growth. Since this test is restricted to competing airports that are government-owned, it also suggests that the local government may be able to focus more on improving operations at the remaining airport.

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 PE 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 represent an important class of infrastructure that has undergone significant privatization in recent decades. We show that privatization alone does not have a meaningful or causal impact on performance. However, transitions to PE ownership lead to greater airport efficiency, volume, and quality. We identify a number of mechanisms for these results, including expanding capacity, negotiating more aggressively with airlines, providing better service and amenities, offering passengers nonstop flights to more locations, and reducing cancellation rates. One explanation for the lack of improvement after non-PE privatizations is that non-PE private firms tend to

with significantly more passengers, flights, and international routes at airports with state-owned flag carriers. For PE, there are also somewhat more flights and low-cost carriers at airports with state-owned flag carriers. However, we do not see significant differences in the efficiency 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.

benefit from rent extraction from airports in countries with high corruption levels, yet only produce improvements in countries with low corruption levels.

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

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Figure 1: World Map of Privatized Airports

This figure shows the world map of privatized airports as of 1984 (A) and 2019 (B). Privatized airports are broken down by buyer types. Airports bought by Domestic Private, Foreign Private, Partially Gov't Owned Private, and PE are denoted as yellow diamond, green star, blue triangle, and red circle, respectively.

(A) Privatized airports as of 1984

(B) Privatized airports as of 2019

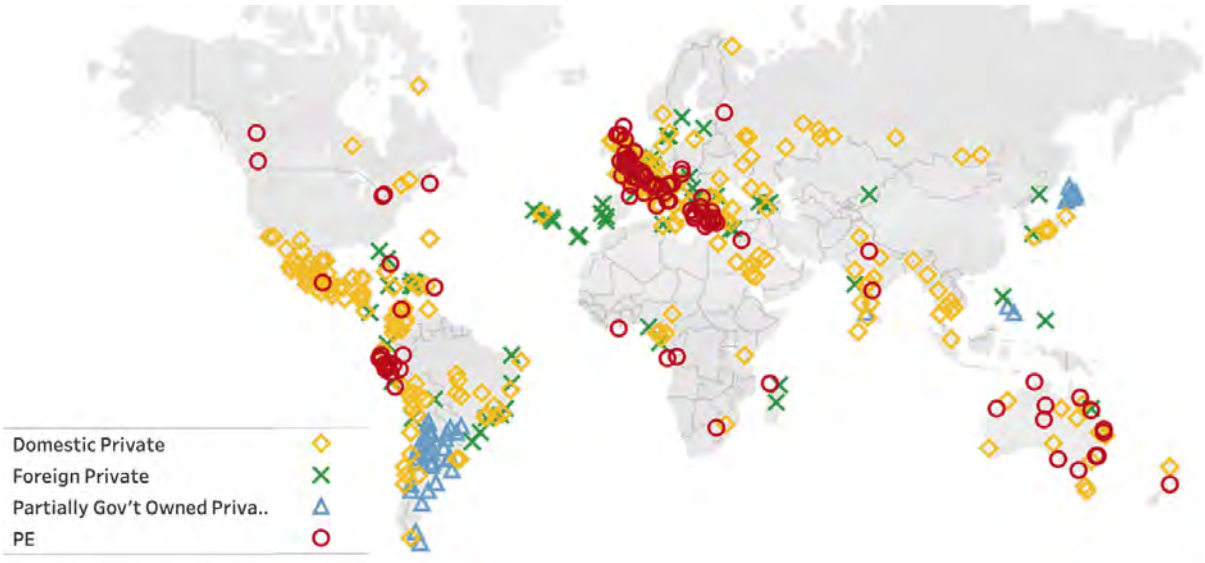
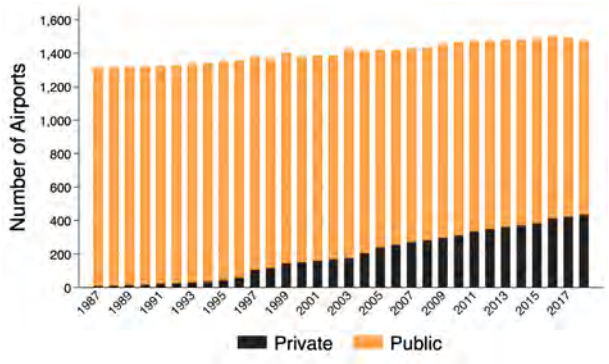


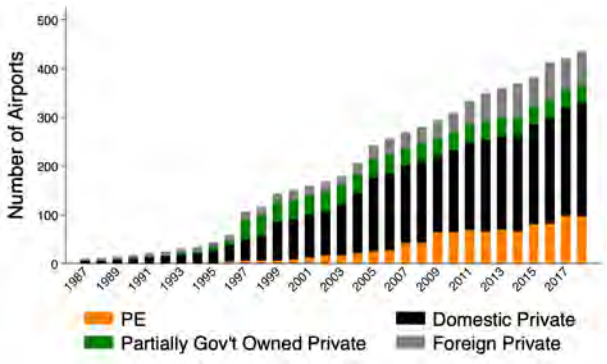
Figure 2: Airport Ownership Dynamics (1987–2019)

This figure shows airport ownership dynamics over time. (A) presents the breakdowns of airport ownership (Public and Private) from 1987 to 2019. (B) presents the breakdowns of privately-owned airport ownership. (C) and (D) present the trends of PE ownership of airports since 1997 when PE started actively purchasing airports. Panel C presents the number of airports owned by PE (right-axis) and its share of all airports (left-axis). (D) presents the share of airport owned by PE in terms of the number of passengers and flights. The airports in the U.S. and China and those newly built during the sample period are excluded.

(A) Airport Ownership (1987–2019)



(B) Private Ownership of Airports (1987–2019)



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

(D) PE Volume Shares (1997–2019)

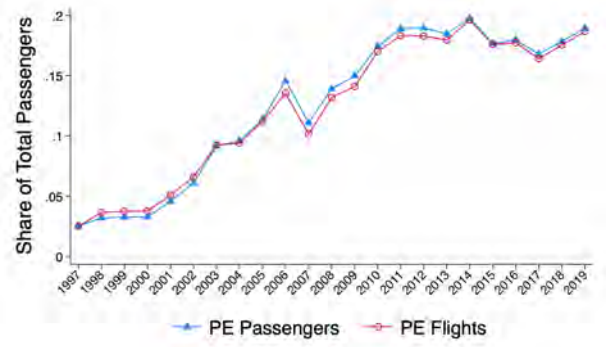


Figure 3: Event Studies on the Effect of PE Ownership: Airport Traffic

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to PE. The outcome variables are the number of passengers per flight (A), the log of the number of passengers (B), the log of the number of flights (C), and the number of international routes (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.

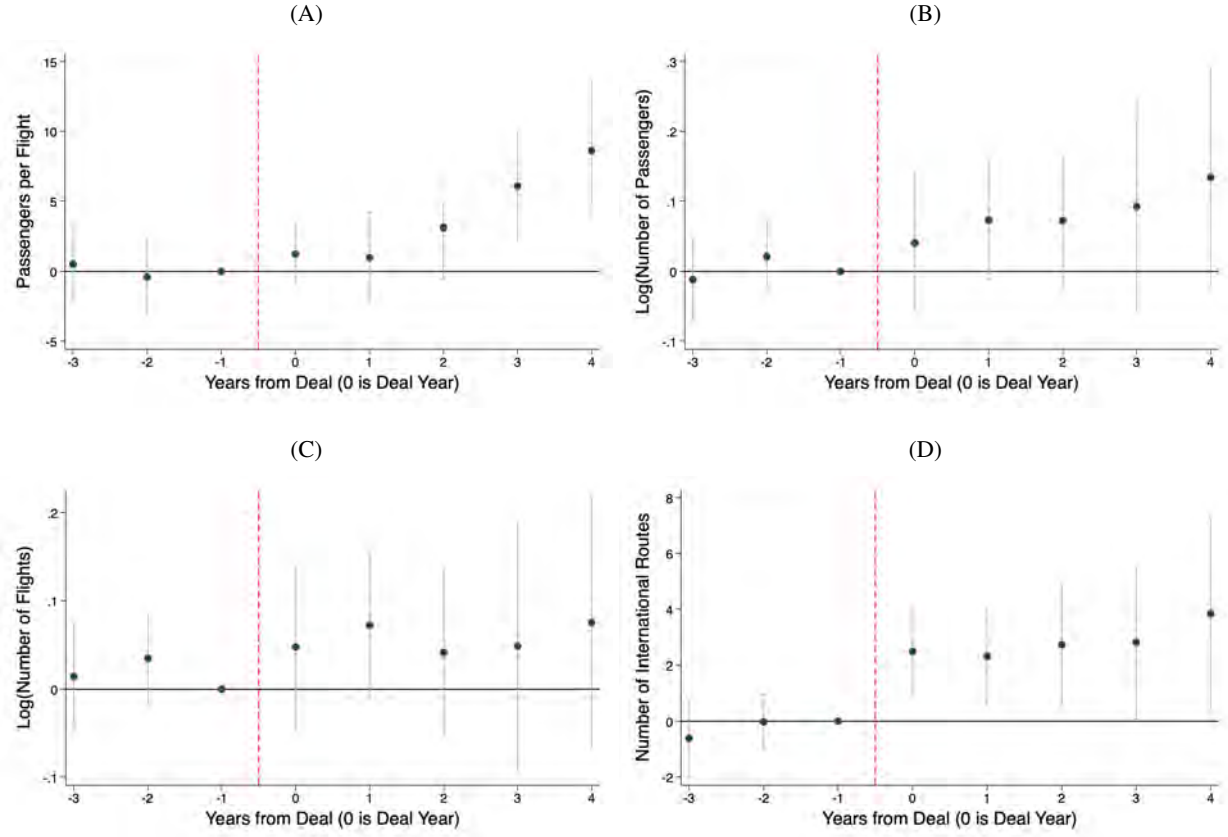


Figure 4: Event Studies on the Effect of PE Ownership: Downstream Performance

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to PE. The outcome variables are the flight cancellation rates (A), the number of low cost carriers (B), and the share of large aircraft jets relative to small/regional planes (C). 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.

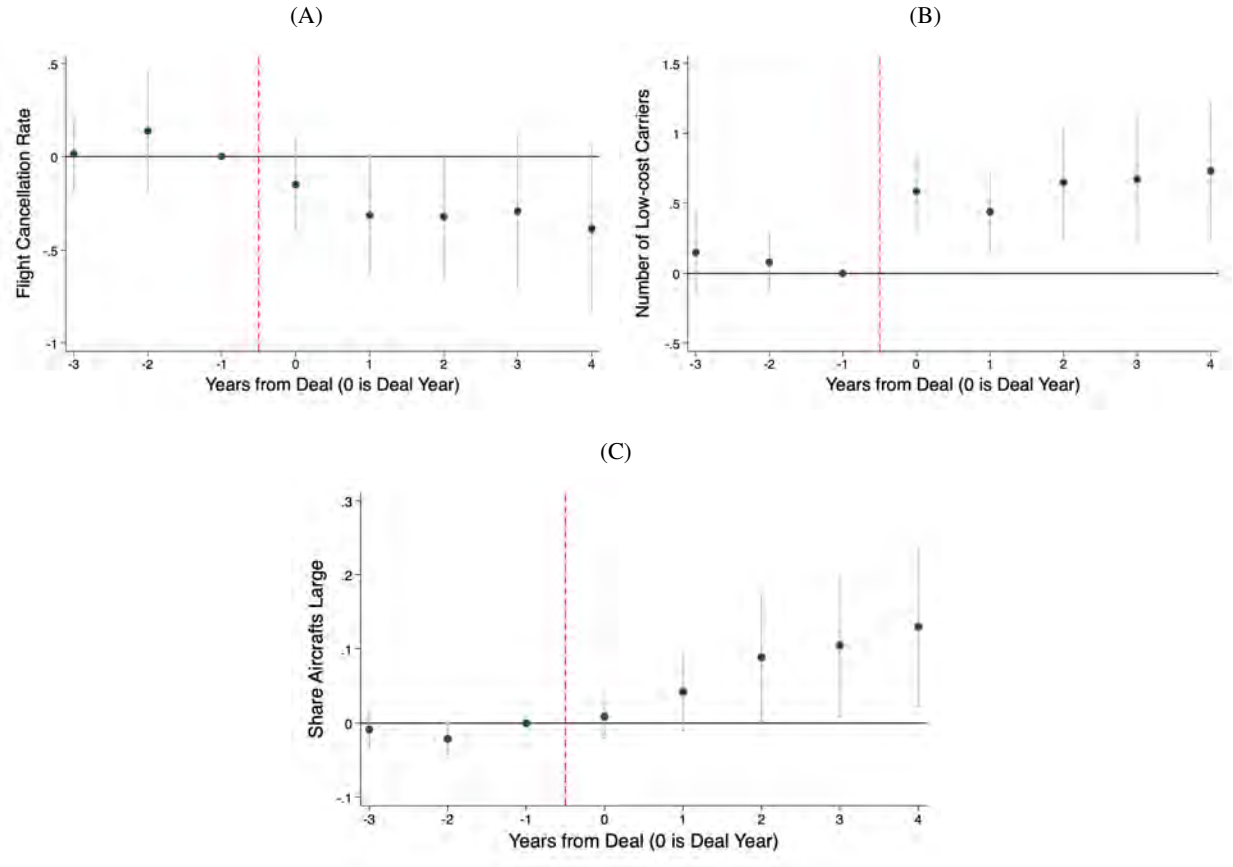


Figure 5: Event Studies on the Effect of PE: Financial Outcomes

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to PE. The outcome variables are the log of operating net income (A), the log of operating revenue (B), the log of aeronautical revenue (C), the log of non-aeronautical revenue (D), and the log of operating expenditure per 1000 passengers (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.

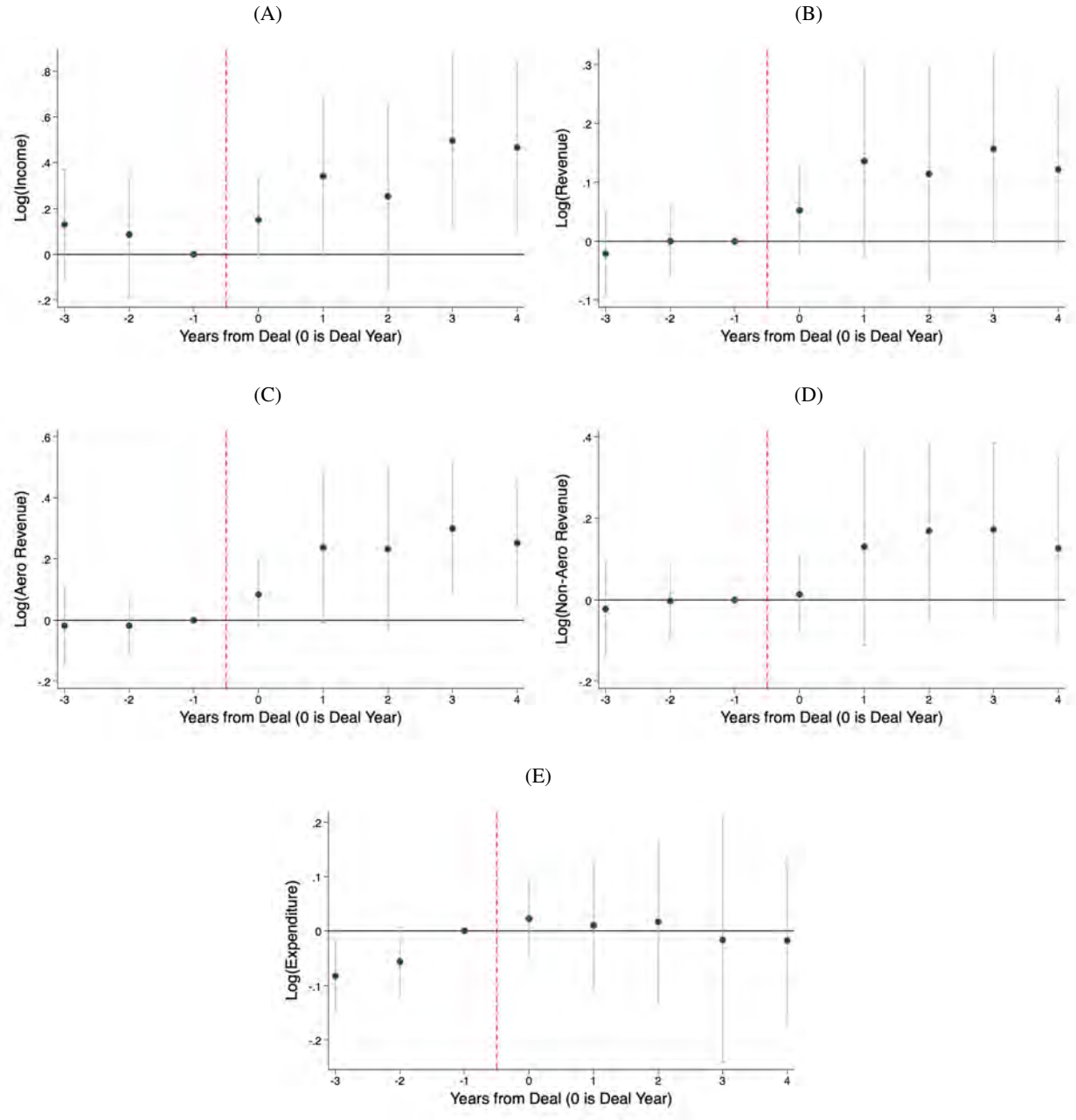


Figure 6: Event Studies on the Effect of PE: Fees Charged to Airlines

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to PE. The outcome variables are the log of total fee (A), the log of passenger fee (B), and the log of runway fee (C). 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.

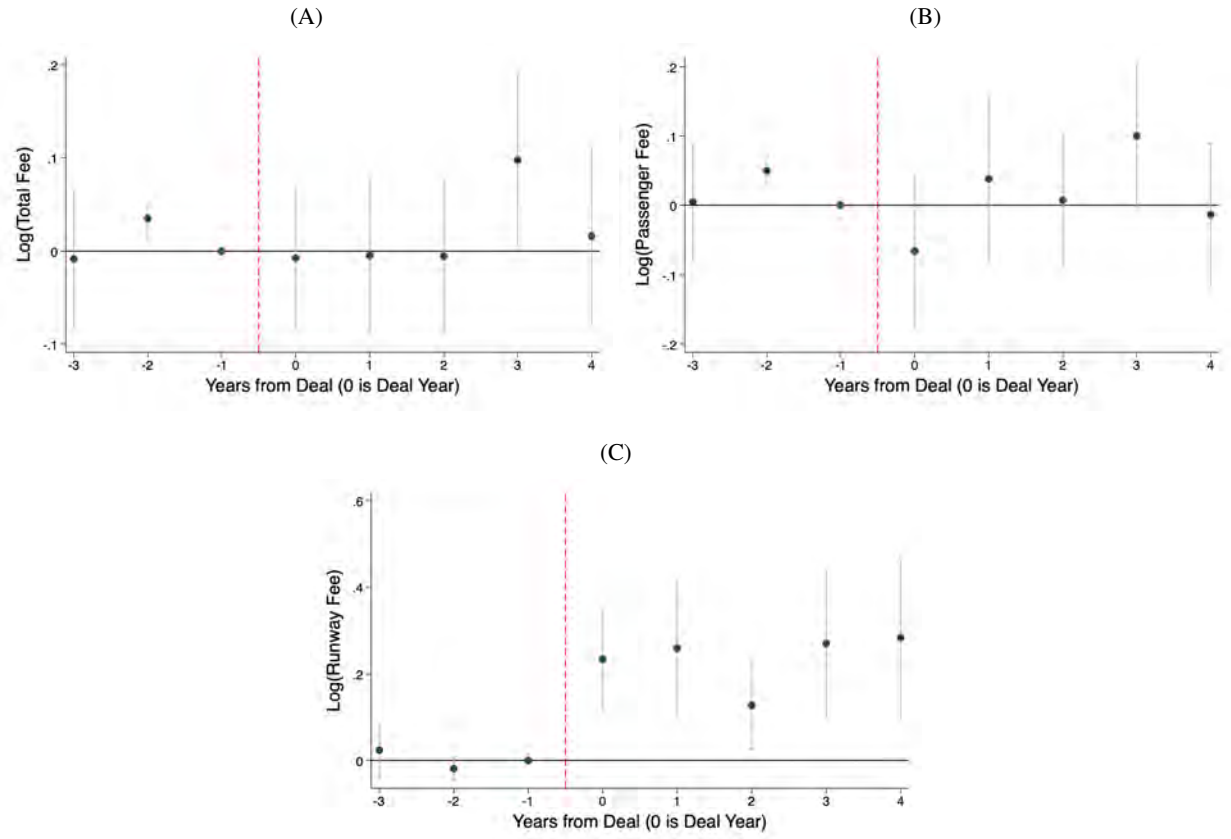
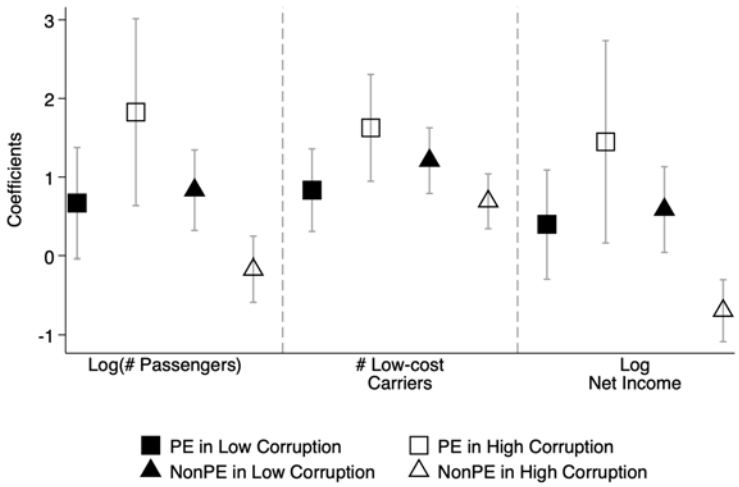


Figure 7: Heterogeneous Effects of Airport Privatization: Domestic Governance and State-owned Flag Carriers

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 (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). The outcome variables are the log of total passengers, the number of international routes, and the log of operating net income. In (B), the binary characteristic divides acquisitions according to whether the airport has (black) or does not serve (white) a state-owned flag carrier. The outcome variables are the log of the number of passengers, the number of low-cost carriers and the log of operating net income.

(A) Low vs. High Corruption



(B) State-Owned Flag Carriers

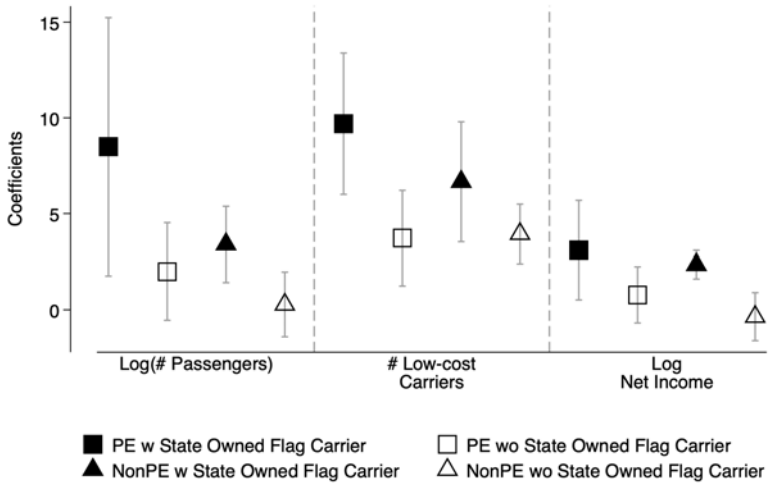


Table 1: Distribution of Transactions and Statistics on Control Stake and Duration by Ownership Transition Type

This table reports two panels that show the number of transactions and summary statistics on the control stake and duration, and transition rates by ownership and transition types. Panel A shows the distribution of the number of transactions by privatization form and the summary statistics on the ownership and control stakes by each ownership transition type. Panel B presents the percentage of observations by each ownership and transition type.

Panel A. Airport Acquisition Ownership Types and Control Stake

	Number of Transactions				Percent Stake					Duration (Years)	
	Total	Con-cessions	Outright Sales	Long-term Leases	Mean	Median	SD	Min	Max	Mean	Median
Privatization											
Total	437	186	129	122	90.24	100	17.45	36	100	34.46	30
Govt to non-PE Private	401	178	110	113	91.89	100	15.9	34	100	34	30
Govt to PE	36	8	19	9	72.05	68	22.94	36	100	38.88	35
Post-Privatization											
Total	102	50	45	7	78.52	100	26.68	14	100	20.85	15
Non-PE Private to PE	73	36	30	7	77.03	100	28.3	10	100	23.26	17
PE to non-PE Private	18	11	7	0	89.78	100	22.28	28	100	12.18	15
PE to PE	11	3	8	0	65.16	63	19.46	45	100	19	23

Panel B. Ownership and Transition Rates (Airport-Year Panel Data, 1996-2019)

Ownership Rates		PE Transition Rates	
PE	2.5%	Privatization to PE	12%
Foreign Private	1.6%	Privatization to Non-PE	84%
Domestic Private	5.3%	Secondary PE to Non-PE	0.4%
Partially Government-Owned Private	1.8%	Secondary Non-PE to PE	11.5%
Government Owned	88.8%		
N	29,902	N	3,248

Table 2: Summary Statistics

This table reports summary statistics of the main variables used in analyses at the airport-year level separately for government owned and privately owned airports. The sources and time spans of datasets and variable definitions are described in Section 3 and Appendix B.

	Government Owned				Privately Owned			
	N	Mean	Median	SD	N	Mean	Median	SD
Country-Level Economic Characteristics								
GDP per Capita (Th)	25,748	$ 19.44	$ 10.90	$ 20.15	3,016	$ 18.65	$ 10.24	$ 16.94
Trade Volume (B)	25,748	$ 355.55	$ 179.49	$ 421.98	3,016	$ 431.07	$ 262.69	$ 466.23
Corruption	25,748	53.03	43.00	22.94	3,016	49.28	38.00	20.13
Airport-Level Performance								
Traffic and Downstream Performance								
Passengers per Flight	25,748	98.82	99.89	49.70	3,016	121.16	123.32	39.70
Int'l Passengers per Flight	16,345	137.04	144.56	56.54	2,571	145.33	148.00	52.09
Dom Passengers per Flight	25,376	90.99	85.62	49.74	3,003	111.46	113.97	45.44
Number of Passengers (M)	25,748	1.16	0.20	2.56	3,016	2.69	0.82	3.84
Number of Int'l Passengers (M)	16,345	1.14	0.10	3.67	2,571	2.21	0.36	5.26
Number of Dom Passengers (M)	25,376	0.68	0.13	2.01	3,003	1.58	0.47	3.06
Number of Flights (Th)	25,748	10.06	2.58	24.03	3,016	23.48	7.73	39.00
Number of Int'l Flights (Th)	16,345	6.97	0.87	20.08	2,571	13.00	2.52	29.35
Number of Dom Flights (Th)	25,376	5.71	1.86	12.42	3,003	12.46	4.53	20.83
Number of Int'l Routes	25,748	10.99	2.00	21.35	3,016	22.79	9.00	29.45
Flight Cancellation Rate (%)	2,257	1.50	1.02	1.54	725	1.33	0.95	1.19
I(Award)	16,361	0.02	0.00	0.15	2,520	0.06	0.00	0.24
Number of Low Cost Carriers	25,748	0.98	0.00	1.86	3,016	2.34	1.00	2.61
Share Aircrafts Large	25,748	0.45	0.45	0.38	3,016	0.62	0.68	0.31
I(State-Owned Flag Carrier)	25,748	0.36	0.00	0.48	3,016	0.36	0.00	0.48
Financials								
Operational Net Income (M)	905	$ 171.51	$ 88.82	$ 195.08	323	$ 203.09	$ 152.83	$ 186.91
Operational Revenue(M)	905	$ 404.52	$ 269.16	$ 429.50	323	$ 413.68	$ 258.24	$ 400.75
Aero Revenue (M)	905	$ 195.43	$ 132.92	$ 197.25	323	$ 189.26	$ 105.68	$ 170.94
Non-Aero Revenue (M)	905	$ 203.74	$ 107.99	$ 245.20	323	$ 212.20	$ 125.38	$ 227.38
Operational Expenditure per 1000 psg (Th)	905	$ 0.33	$ 0.00	$ 2.66	323	$ 0.05	$ 0.00	$ 0.65
Airport Capacity								
Terminal Size (Th)	2,155	19.17	10.72	25.60	1,861	19.76	11.02	25.87
Number of Runways	2,155	1.29	1.00	0.49	1,861	1.34	1.00	0.60
Employees per 1000 psg	1,038	1.25	1.08	0.55	348	1.24	1.09	0.62
Fees Charged to Airlines								
Total Fees (Th)	6,941	$ 3.05	$ 2.44	$ 1.98	1,545	$ 4.43	$ 4.32	$ 2.12
Passenger Fees (Th)	6,941	$ 2.48	$ 1.95	$ 1.89	1,545	$ 3.85	$ 3.80	$ 2.07
Runway Fees (Th)	6,941	$ 0.56	$ 0.43	$ 0.36	1,545	$ 0.55	$ 0.43	$ 0.38
Price Regulation								
I(No Regulation)	1,035	0.10	0.00	0.30	444	0.27	0.00	0.44

Table 3: Key Outcomes using a Sample of Airports in Close Auctions

This table reports estimates of the main outcome variables using a sample of airports privatized through auctions where both PE and non-PE firms were finalist bidders. 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 how two private ownership types affect airport performance when the sample is restricted to the 30 airports for which PE and NonPE closely bid. The estimates are from OLS regressions using Equation 1 on an airport-year level panel from 1996 to 2019. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variables capture two ownership transition types, with government ownership as the base group. $\mathbb{1}$(PE) is one after an airport transitions to PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Non-PE Private) is one after an airport transitions to Non-PE private ownership. We report a p-value on F-tests to compare the coefficients on PE and Non-PE. 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
Both PE & NonPE Finalists	30	21	9
Only PE Bid	20	20	0
Only Non-PE Bid	40	0	40

Panel B. Ownership Type and Airport Outcomes After Auctions in which Both PE & Non-PE Bid

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}$(PE)	12.49***	0.39*	0.35*	22.64***	-0.59***	1.50***	0.09***	0.51***	-0.09
	(4.26)	(0.20)	(0.19)	(5.79)	(0.10)	(0.36)	(0.03)	(0.17)	(0.13)
$\mathbb{1}$(Non-PE Private)	-0.62	0.10	0.14	12.08	0.14*	0.86	-0.02	0.09	0.22*
	(6.41)	(0.13)	(0.14)	(7.63)	(0.07)	(0.60)	(0.04)	(0.14)	(0.12)
Observations	21042	21042	21042	21042	2176	21042	21042	853	853
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	0.90	0.96	0.94	0.93	0.83	0.76	0.85	0.95	0.95
Y-Mean	94.73	12.24	7.89	9.82	1.53	0.85	0.42	18.15	9.76
Pr > F PE = Non-PE Private	0.03	0.13	0.24	0.22	0.00	0.25	0.01	0.03	0.06

Table 4: Airport Ownership Type and Airport Traffic and Downstream Performance

The tables report two sets of result per outcome variable: Estimates on how four private ownership types and how private ownership transition types affect airport traffic and downstream performance. The estimates are from OLS regressions using Equations 2 and 3 on an airport-year level panel from 1996 to 2019. In Panel A, dependent variables include the number of passengers per flight in columns 1-2, the log of the number of passengers in columns 3-4, the log of the number of flights in columns 5-6, and the number of international routes in columns 7-8. In panel B, dependent variables include flight cancellation rates in columns 1-2, the probability of winning the service quality award in columns 3-4, the number of low cost carriers in columns 5-6, and the share of large aircraft jets relative to small/regional planes in columns 7-8. Columns 1, 3, 5, and 7 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. $\mathbb{1}$(PE) is one if an airport is owned by PE and zero otherwise. $\mathbb{1}$(Foreign Private) is one if an airport is owned by foreign non-PE private. $\mathbb{1}$(Domestic Private) is one if an airport is owned by domestic non-PE private. $\mathbb{1}$(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, 6, and 8 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. Airport Ownership Type and Airport Traffic

Dependent Variable:	Passengers per Flight		Log(# Passengers)		Log(# Flights)		# Int'l Routes	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}$(PE)	11.06***		0.19***		0.12**		7.58***	
	(2.38)		(0.07)		(0.06)		(2.12)	
$\mathbb{1}$(Foreign Private)	-1.35		0.25***		0.33***		11.75***	
	(3.43)		(0.08)		(0.08)		(3.31)	
$\mathbb{1}$(Domestic Private)	-1.24		-0.01		-0.01		1.27	
	(1.89)		(0.05)		(0.04)		(1.19)	
$\mathbb{1}$(Partially Gov't Owned Private)	-0.39		-0.11		-0.09		-2.30	
	(5.71)		(0.12)		(0.10)		(4.78)	
$\mathbb{1}$(Privatization by PE)		14.64***		0.24*		0.17		6.33*
		(4.10)		(0.15)		(0.13)		(3.53)
$\mathbb{1}$(Privatization by Non-PE)		-0.96		0.07*		0.08**		3.71***
		(1.57)		(0.04)		(0.04)		(1.09)
$\mathbb{1}$(Post-Priv Non-PE to PE)		9.44***		0.14**		0.07		7.10**
		(2.87)		(0.07)		(0.06)		(2.83)
$\mathbb{1}$(Post-Priv PE to Non-PE)		-0.41		-0.11		-0.03		-5.18***
		(8.60)		(0.24)		(0.22)		(1.82)
Observations	28679	28679	28679	28679	28679	28679	28679	28679
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	0.89	0.89	0.96	0.96	0.94	0.94	0.92	0.92
Y-Mean	97.58	97.58	12.43	12.43	8.03	8.03	11.24	11.24
Pr > F Row 1 = Row 2	0.00	0.00	0.52	0.25	0.03	0.55	0.29	0.48
Pr > F Row 3 = Row 4	0.89	0.28	0.44	0.32	0.49	0.64	0.46	0.00

Panel B. Airport Ownership Type and Downstream Performance

Dependent Variable:	Flight Cancellation Rate		𝟙(Award)		# Low-cost Carriers		Share Aircrafts Large	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
𝟙(PE)	-0.35***		0.04*		0.93***		0.10***	
	(0.09)		(0.02)		(0.21)		(0.03)	
𝟙(Foreign Private)	-0.64		0.02		1.83***		0.01	
	(0.51)		(0.03)		(0.34)		(0.03)	
𝟙(Domestic Private)	-0.26		-0.01		0.63***		-0.03	
	(0.28)		(0.01)		(0.16)		(0.02)	
𝟙(Partially Gov't Owned Private)	0.90*		-0.02		0.38		-0.02	
	(0.52)		(0.02)		(0.48)		(0.04)	
𝟙(Privatization by PE)		-0.10		-0.02		1.45***		0.13***
		(0.08)		(0.05)		(0.40)		(0.04)
𝟙(Privatization by Non-PE)		-0.23		-0.02*		0.98***		-0.01
		(0.18)		(0.01)		(0.15)		(0.02)
𝟙(Post-Priv Non-PE to PE)		-0.34***		0.06**		0.30		0.09***
		(0.11)		(0.02)		(0.23)		(0.03)
𝟙(Post-Priv PE to Non-PE)		0.43*		0.01		0.06		0.11**
		(0.23)		(0.03)		(0.57)		(0.04)
Observations	4051	4051	18781	18781	28679	28679	28679	28679
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	0.82	0.82	0.49	0.49	0.73	0.72	0.83	0.83
Y-Mean	1.48	1.48	0.03	0.03	0.98	0.98	0.44	0.44
Pr > F Row 1 = Row 2	0.57	0.49	0.53	0.99	0.03	0.26	0.02	0.00
Pr > F Row 3 = Row 4	0.06	0.00	0.74	0.24	0.62	0.69	0.97	0.77

Table 5: Airport Ownership Type and Financial Outcomes

This table reports two sets of result per outcome variable: Estimates on how four private ownership types and how private ownership transition types affect financial outcomes. The estimates are from OLS regressions using Equations 2 and 3 on an airport-year level panel from 2001 to 2017. Dependent variables include the log of net operating income in columns 1-2, the log of operating revenue in columns 3-4, the log of aeronautical revenue in columns 5-6, the log of non-aeronautical revenue in columns 7-8, and the log of operating expenditure per 1000 passengers in columns 9-10. Columns 1, 3, 5, 7, and 9 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, 6, 8, and 10 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Log(Income)		Log(Revenue)		Log(Aero Revenue)		Log(Non-Aero Revenue)		Log(Expenditure)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
𝟙(PE)	0.35**		0.24**		0.25**		0.30**		-0.05	
	(0.15)		(0.11)		(0.12)		(0.13)		(0.11)	
𝟙(Foreign Private)	0.49***		0.19***		0.27***		0.11		-0.12	
	(0.08)		(0.07)		(0.09)		(0.08)		(0.09)	
𝟙(Domestic Private)	0.03		0.19		0.29*		0.40		0.18**	
	(0.21)		(0.12)		(0.16)		(0.30)		(0.08)	
𝟙(Partially Gov't Owned Private)	-0.88***		-0.55***		-1.05***		-0.97***		0.14	
	(0.19)		(0.09)		(0.17)		(0.17)		(0.13)	
𝟙(Privatization by PE)		0.53*		0.40*		0.40*		0.52**		-0.09
		(0.27)		(0.20)		(0.23)		(0.22)		(0.21)
𝟙(Privatization by Non-PE)		0.23		0.09		0.07		-0.01		-0.01
		(0.14)		(0.08)		(0.14)		(0.14)		(0.08)
𝟙(Post-Priv Non-PE to PE)		0.18*		0.09**		0.11		0.10		-0.00
		(0.11)		(0.04)		(0.09)		(0.10)		(0.09)
𝟙(Post-Priv PE to Non-PE)		-0.45**		-0.23***		-0.39		-0.44		0.18
		(0.21)		(0.06)		(0.35)		(0.37)		(0.34)
Observations	1226	1226	1226	1226	1226	1226	1226	1226	1226	1226
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	0.95	0.95	0.98	0.98	0.94	0.94	0.96	0.96	0.96	0.96
Y-Mean	18.27	18.27	19.19	19.19	18.50	18.50	18.43	18.43	9.81	9.81
Pr > F Row 1 = Row 2	0.43	0.34	0.73	0.18	0.88	0.27	0.26	0.07	0.66	0.76
Pr > F Row 3 = Row 4	0.01	0.00	0.00	0.00	0.00	0.15	0.00	0.15	0.79	0.59

Table 6: Mechanisms: Capacity

This table reports two sets of result per outcome variable: Estimates on how four private ownership types and how private ownership transition types affect aircraft and airport capacity. The estimates are from OLS regressions using Equations 2 and 3 on an airport-year level panel. Dependent variables include terminal size in columns 1-2, the number of runways in columns 3-4, and the log of the number of employees per 1000 passengers in columns 5-6. Terminal size and number of runways are collected from the historical satellite images of airports provided by Google Earth. The sample of capital expenditure in columns 1 to 4 spans 1996-2019 and includes observations of the privatized airports one year before and three years and five years after the transactions. The sample of employees in columns 5-6 spans 2001-2017. Columns 1, 3, and 5 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, and 6 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Capex					
	Log(Terminal Size)		# Runways		Log(Employees)	
	(1)	(2)	(3)	(4)	(5)	(6)
𝟙(PE)	0.11**		0.04*		-0.03	
	(0.05)		(0.02)		(0.02)	
𝟙(Foreign Private)	-0.04		-0.03*		-0.11**	
	(0.07)		(0.01)		(0.05)	
𝟙(Domestic Private)	0.02		-0.01		-0.02	
	(0.03)		(0.02)		(0.02)	
𝟙(Partially Gov't Owned Private)	0.03		0.01		0.06	
	(0.08)		(0.02)		(0.05)	
𝟙(Privatization by PE)		0.15**		0.07		-0.06
		(0.07)		(0.05)		(0.04)
𝟙(Privatization by Non-PE)		0.03		-0.01		-0.07**
		(0.02)		(0.01)		(0.03)
𝟙(Post-Priv Non-PE to PE)		0.10		0.02		0.01
		(0.07)		(0.02)		(0.02)
𝟙(Post-Priv PE to Non-PE)		0.06		-0.02		0.12
		(0.11)		(0.03)		(0.16)
Observations	4255	4255	4255	4255	1405	1405
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	0.97	0.97	0.97	0.97	0.92	0.92
Y-Mean	9.28	9.28	1.32	1.32	0.17	0.17
Pr > F Row 1 = Row 2	0.08	0.13	0.02	0.13	0.16	0.78
Pr > F Row 3 = Row 4	0.85	0.79	0.65	0.14	0.14	0.51

Table 7: Mechanisms: Fees Charged to Airlines and Regulation

This table reports two sets of result per outcome variable: Estimates on how four private ownership types and how private ownership transition types affect fees charged to airlines and price regulation regimes. The estimates are from OLS regressions using Equations 2 and 3 on an airport-year level panel. The dependent variables include the log of total fee in columns 1-2, the log of passenger fee in columns 3-4, the log of runway fee in columns 5-6, and the government regulatory regime in columns 7-8. 𝟙(No Regulation) indicates whether an airport has no price regulations at the transaction year. The sample of fees spans 2010-2020 in columns 1-6 and that of airport regulations spans 1990-2018 in columns 7-8. Columns 1, 3, 5, and 7 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, 6, and 8 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. 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)		𝟙(No Regulation)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
𝟙(PE)	0.06		0.04		0.11*		0.15*	
	(0.04)		(0.04)		(0.07)		(0.08)	
𝟙(Foreign Private)	0.25**		0.29***		-0.02		0.14	
	(0.10)		(0.11)		(0.08)		(0.14)	
𝟙(Domestic Private)	0.06		0.15*		-0.01		-0.09	
	(0.05)		(0.09)		(0.03)		(0.08)	
𝟙(Partially Gov't Owned Private)	-0.07		-0.04		-0.02		0.02	
	(0.12)		(0.14)		(0.18)		(0.09)	
𝟙(Privatization by PE)		0.14***		0.13**		0.12*		0.02
		(0.04)		(0.05)		(0.07)		(0.07)
𝟙(Privatization by Non-PE)		0.13***		0.20***		-0.02		-0.00
		(0.04)		(0.06)		(0.04)		(0.06)
𝟙(Post-Priv Non-PE to PE)		0.03		0.01		0.11		0.22*
		(0.06)		(0.05)		(0.09)		(0.12)
𝟙(Post-Priv PE to Non-PE)		-0.07***		-0.08***		-0.03		0.01
		(0.02)		(0.02)		(0.04)		(0.04)
Observations	9464	9464	9464	9464	9464	9464	1973	1973
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	0.92	0.92	0.93	0.93	0.95	0.95	0.68	0.68
Y-Mean	7.91	7.91	7.59	7.59	6.10	6.10	0.17	0.17
Pr > F Row 1 = Row 2	0.08	0.88	0.03	0.38	0.21	0.09	0.96	0.83
Pr > F Row 3 = Row 4	0.33	0.11	0.27	0.10	0.94	0.18	0.51	0.08

APPENDIX

(For Online Publication)

Figure A.1: 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. (A) shows the airport in 2001 (year t-1) and (B) shows the airport in 2005 (year t+3)

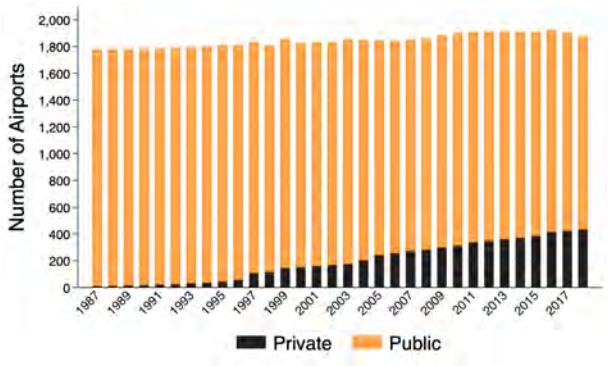
(A) Year t-1

(B) Year t+3

Figure A.2: Airport Ownership Dynamics Including Airports in US and China (1987–2019)

This figure shows airport ownership dynamics over time. Statistics are calculated including airports in the U.S. and China. (A) presents the breakdowns of airport ownership (Public and Private) from 1987 to 2019. (B) and (C) present the trends of PE ownership of airports since 1997 when PE started actively purchasing airports. (B) presents the number of airports owned by PE (right-axis) and its share of all airports (left-axis). (C) presents the share of airport owned by PE in terms of the number of passengers and flights. The airports newly built during the sample period are not included.

(A) Airport Ownership (1987–2019)



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

(C) PE Volume Shares (1997–2019)

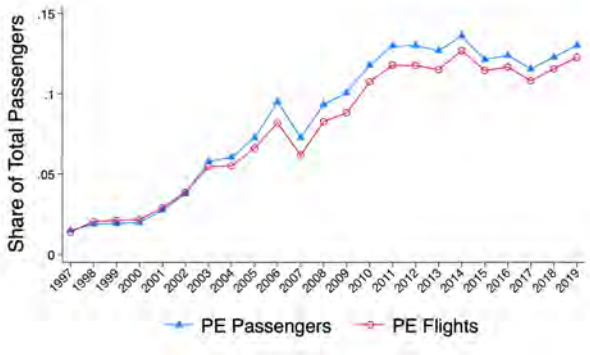


Figure A.3: Predictors of Airport Privatization

This figure shows predictors of airport acquisition by private ownership type, relative to the base group of government ownership. The four private ownership types are PE infrastructure fund (PE), foreign private firm (Foreign Priv), domestic private firm (Domestic Priv), and partially government-owned private firm (Partial Gov't Priv). The graph shows the coefficients and confidence intervals of predictors estimated from an OLS model, where the dependent variable is an indicator for airport acquisition by each ownership type. The sample is the airport-year panel spanning from 1996 to 2019 with years post-acquisition dropped. The ownership type indicator is multiplied by 100 for readability and predictor variables are lagged by year. All regressions include year and region (Africa, Asia, Europe, North America, Oceania, and South America) fixed effects. Standard errors are clustered by airport. All variables are described in Section 3 and Appendix B.

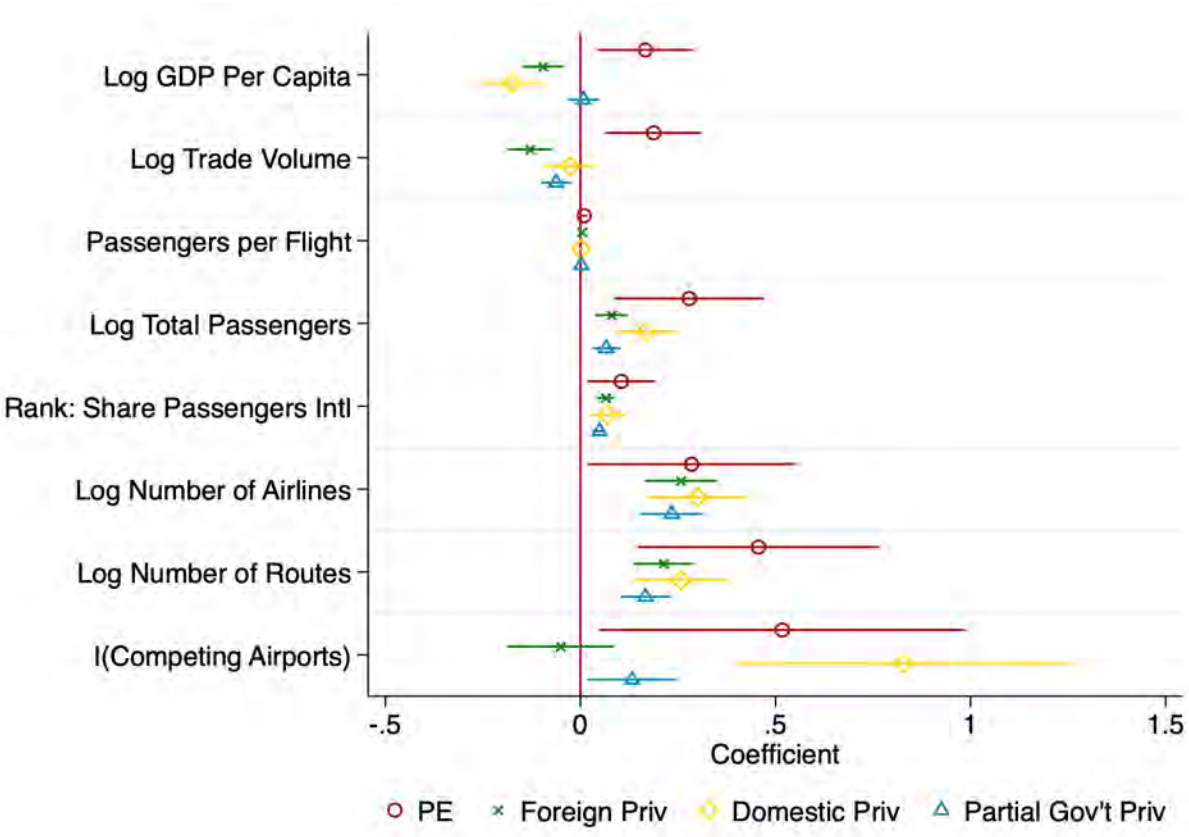


Figure A.4: Event Studies on the Effect of Foreign Private Ownership: Airport Traffic

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to Foreign Private. The outcome variables are the number of passengers per flight (A), the log of the number of passengers (B), the log of the number of flights (C), and the number of international routes (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.

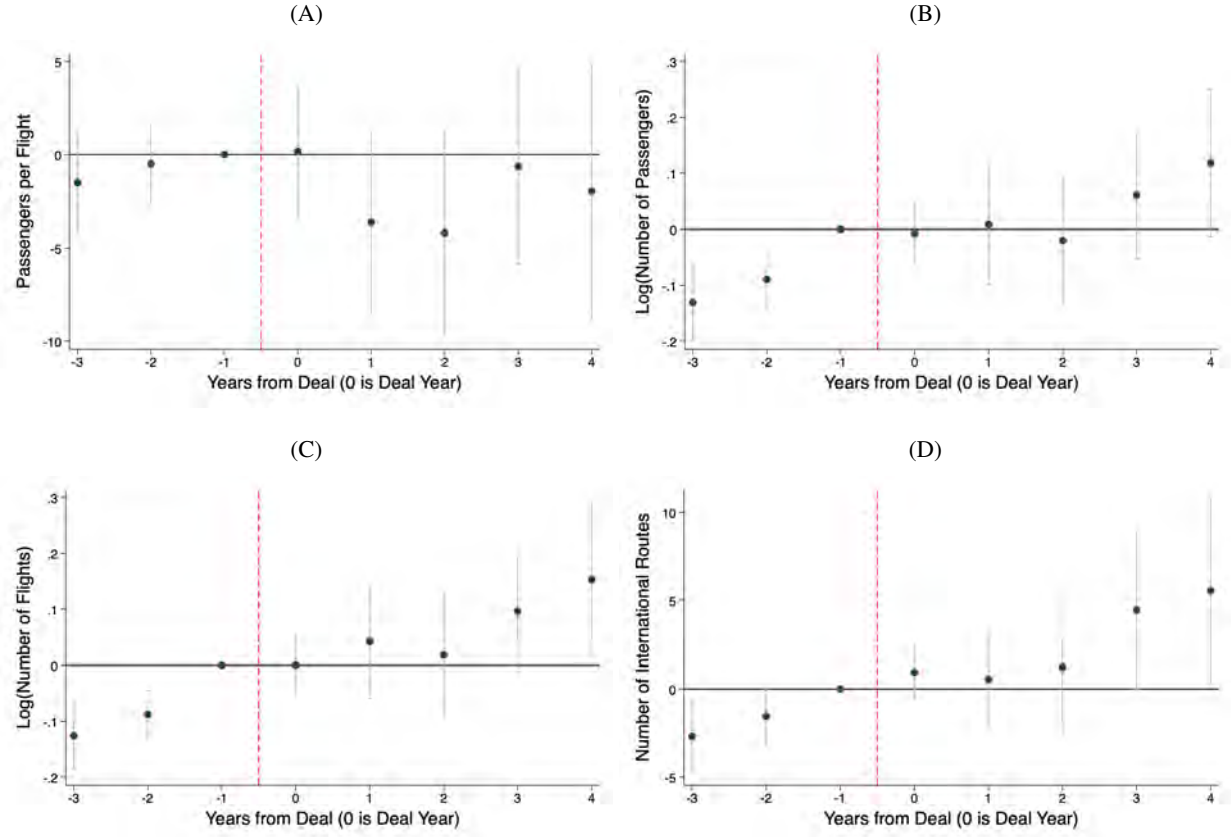


Figure A.5: Event Studies on the Effect of Foreign Private Ownership: Downstream Performance

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to Foreign Private. The outcome variables are the flight cancellation rates (A), the number of low-cost carriers (B), and the share of large aircraft jets relative to small/regional planes (C). 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.

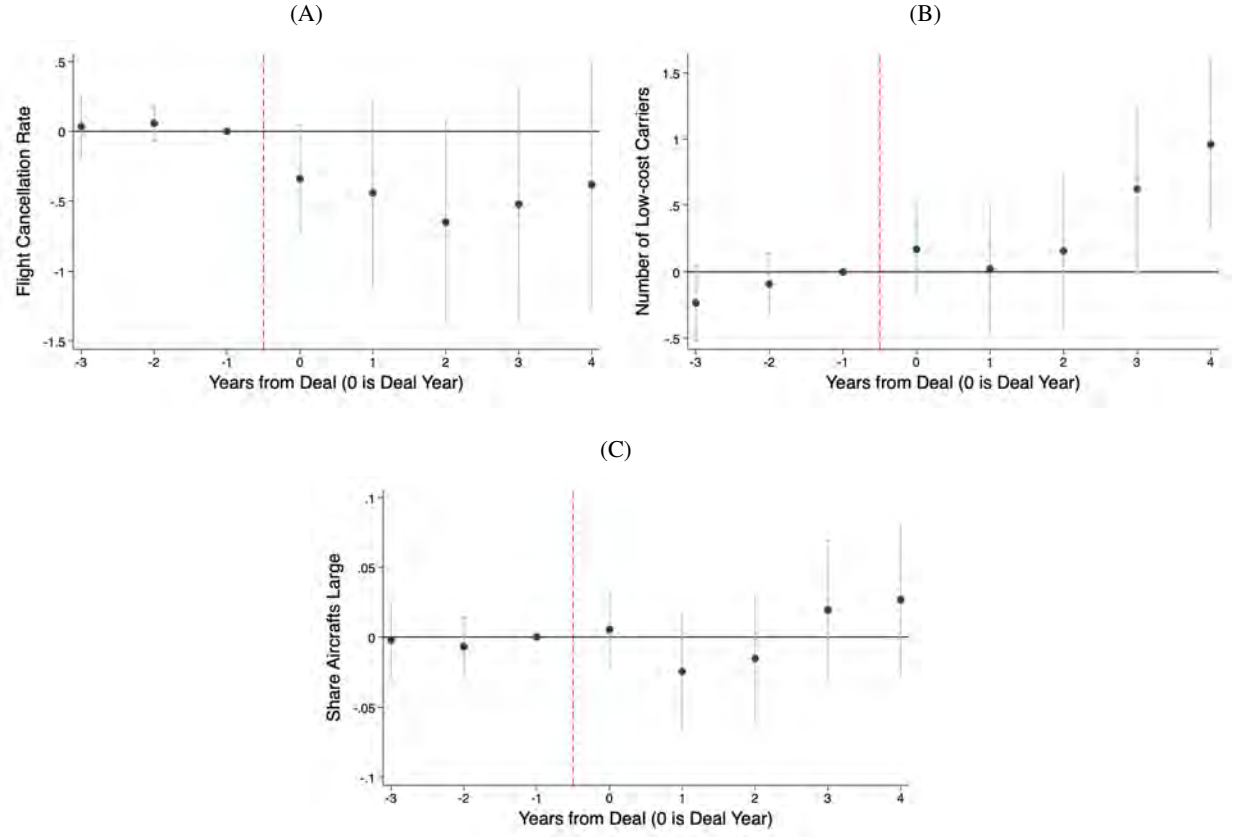


Figure A.6: Event Studies on the Effect of Foreign Private Ownership: Financial Outcomes

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to PE and to Foreign Private.The outcome variables are the log of operating net income (A), the log of operating revenue (B), the log of aeronautical revenue (C), the log of non-aeronautical revenue (D), and the log of operating expenditure per 1000 passengers (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.

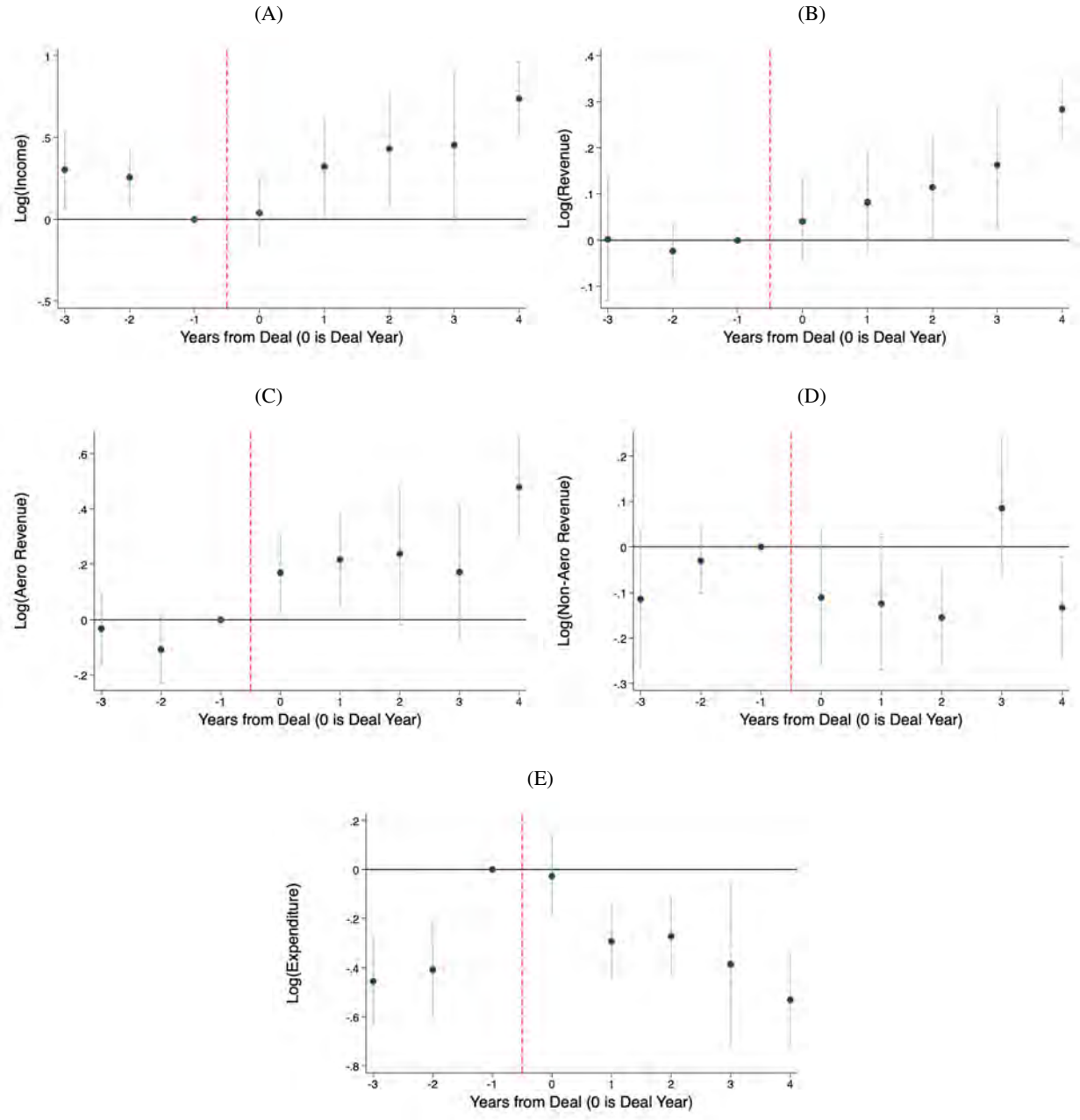


Figure A.7: Event Studies on the Effect of Foreign Private Ownership: Fees Charged to Airlines

This figure presents the dynamic difference-in-differences event studies around the airport ownership transition to Foreign Private. The outcome variables are the log of total fee (A), the log of passenger fee (B), and the log of runway fee (C). 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.

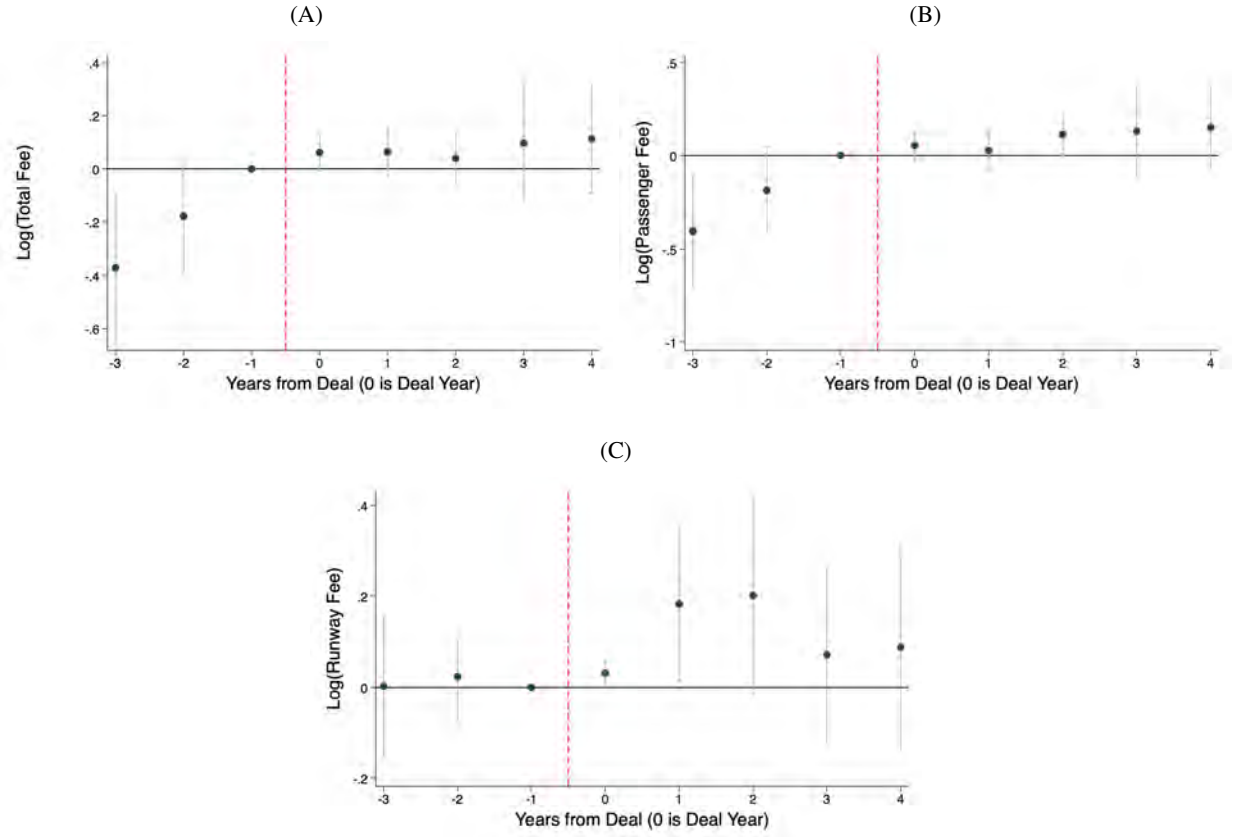


Table A.1: Distribution of Transactions and Statistics on Control Stake and Duration by Ownership Transition Type: Concessions and Sales

This table shows the number of transactions and summary statistics on the control stake and duration by ownership transition 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 concession deals and the summary statistics on control stake (%) and concession years by ownership transition type. Panel B presents the number of outright sales deals and the summary statistics on ownership stake acquired (%) and concession years of long-term leases by ownership transition type. 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)	
		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	52	45	7	70.67	66	25.93	10	100	59.14	46
Non-PE Private to PE	37	30	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 A.2: 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 located in 217 countries that served more than 10,000 passengers and 100 flights as of 2016. There are 437 airports in 75 countries 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.3: Top PE Firms and Statistics for 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 PE 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. Years to Exit (with > 10) shows the number of years to exit, including deals not exited by year 10.

Panel A. Top 5 PE Firms by Number of Airport Acquisitions

PE Firm	Number of Airports	Country
Ciclad	16	France
Macquarie	11	Australia
Advent International	7	US
IFM Investors	6	Australia
F2i	5	Italy

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			
Europe	41.3%		46
North America	23.91%		46
Oceania	17.39%		46
Asia	6.52%		46
South America	6.52%		46
Africa	4.35%		46
Same Region as Airport	76.74%		43

Table A.4: Top Non-PE Private Firms and Government Ownership

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	Canada	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.5: Summary Statistics–Sample of Airports where both PE and Non-PE Bid

This table reports summary statistics of the main variables used in analyses at the airport-year level separately for PE and non-PE Private firm acquisitions, using a sample of airports where both PE and Non-PE bid. The sources and time spans of datasets and variable definitions are described in Section 3 and Appendix B.

	PE				Non-PE Private			
	N	Mean	Median	SD	N	Mean	Median	SD
Country-Level Characteristics								
GDP per Capita (Th)	192	$ 20.72	$ 19.98	$ 15.62	242	$ 33.07	$ 37.82	$ 18.59
Trade Volume (B)	192	$ 426.97	$ 325.30	$ 430.86	242	$ 752.90	$ 822.01	$ 447.62
Corruption	192	52.69	48.00	19.80	242	60.36	63.00	21.55
Airport-Level Performance								
Traffic and Downstream Performance								
Passengers per Flight	192	137.40	143.68	36.71	242	136.10	135.90	32.66
Int'l Passengers per Flight	192	152.24	158.57	52.73	230	150.15	157.23	45.22
Dom Passengers per Flight	192	126.53	128.37	37.35	242	123.19	121.02	35.79
Number of Passengers (M)	192	3.34	1.49	4.04	242	4.39	2.21	4.61
Number of Int'l Passengers (M)	192	2.03	0.53	3.36	230	3.53	1.37	5.47
Number of Dom Passengers (M)	192	2.28	0.51	4.47	242	2.48	1.02	4.74
Number of Flights (Th)	192	26.58	11.29	36.99	242	39.10	17.68	47.75
Number of Int'l Flights (Th)	192	11.27	3.59	18.36	230	21.65	9.72	33.51
Number of Dom Flights (Th)	192	15.31	3.58	27.18	242	18.52	9.16	29.04
Number of Int'l Routes	192	32.12	18.00	32.29	242	39.33	21.50	37.54
Flight Cancellation Rate (%)	49	0.96	0.74	0.81	73	0.98	0.88	0.56
I(Award)	163	0.18	0.00	0.39	231	0.13	0.00	0.34
Number of Low Cost Carriers	192	3.52	3.00	3.08	242	3.81	3.00	2.74
Share Aircrafts Large	192	0.69	0.74	0.29	242	0.68	0.69	0.24
I(State-Owned Flag Carrier)	192	0.46	0.00	0.50	242	0.27	0.00	0.44
Financials								
Operational Net Income (M)	14	$ 181.42	$ 36.62	$ 239.53	73	$ 163.75	$ 106.51	$ 149.31
Operational Revenue (M)	14	$ 430.86	$ 104.09	$ 538.09	73	$ 341.19	$ 174.23	$ 298.41
Aero Revenue (M)	14	$ 170.02	$ 53.71	$ 243.80	73	$ 162.86	$ 104.59	$ 139.35
Non-Aero Revenue (M)	14	$ 207.28	$ 54.75	$ 320.63	73	$ 178.22	$ 96.28	$ 154.26
Operational Expenditure per 1000 psg (Th)	14	$ 0.00	$ 0.00	$ 0.00	73	$ 0.00	$ 0.00	$ 0.00
Airport Capacity								
Terminal Size (Th)	116	32.34	18.00	33.86	234	26.53	12.30	32.49
Number of Runways	116	1.60	2.00	0.54	234	1.56	1.00	0.70
Employees per 1000 psg	21	1.45	1.07	1.18	88	1.22	1.10	0.60
Fees Charged to Airlines								
Total Fees (Th)	118	$ 3.83	$ 3.79	$ 2.27	168	$ 3.85	$ 3.32	$ 1.97
Passenger Fees (Th)	118	$ 3.30	$ 3.21	$ 2.22	168	$ 3.15	$ 2.80	$ 1.66
Runway Fees (Th)	118	$ 0.51	$ 0.43	$ 0.35	168	$ 0.64	$ 0.52	$ 0.44
Price Regulation								
I(No Regulation)	29	0.00	0.00	0.00	89	0.33	0.00	0.47

Table A.6: Summary Statistics–Privately Owned Airports

This table reports summary statistics of the main variables used in analyses at the airport-year level by four airport ownership types. The sources and time spans of datasets and variable definitions are described in Section 3 and Appendix B.

	PE				Foreign				Domestic				Partially Gov't Owned			
	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD	N	Mean	Median	SD
Country-Level Characteristics																
GDP per Capita (Th)	689	$ 31.74	$ 35.52	$ 18.09	434	$ 15.07	$ 9.07	$ 16.36	1,484	$ 15.56	$ 9.64	$ 14.95	499	$ 11.33	$ 8.29	$ 9.27
Trade Volume (B)	689	$ 562.95	$ 495.12	$ 434.55	434	$ 300.96	$ 80.42	$ 518.27	1,484	$ 491.70	$ 442.45	$ 466.19	499	$ 209.08	$ 86.47	$ 443.07
Corruption	689	62.81	74.00	21.22	434	50.30	46.00	15.48	1,484	46.02	36.00	19.12	499	39.71	35.00	11.15
Airport-Level Performance																
Traffic and Downstream Performance																
Passengers per Flight	689	137.75	140.79	35.77	434	146.34	149.21	28.36	1,484	110.41	110.00	41.82	499	126.02	123.97	33.61
Int'l Passengers per Flight	607	167.31	165.90	54.20	433	166.62	166.78	36.06	1,290	132.43	133.01	52.57	348	152.33	155.01	43.50
Dom Passengers per Flight	689	129.01	129.60	50.39	428	124.74	129.30	43.26	1,477	102.92	104.53	44.90	493	117.27	121.50	31.29
Number of Passengers (M)	689	4.64	2.50	4.88	434	4.38	2.48	4.43	1,484	2.03	0.63	3.21	499	2.31	0.51	3.61
Number of Int'l Passengers (M)	607	4.31	1.75	7.71	433	2.99	1.21	4.15	1,290	1.32	0.17	4.21	348	1.93	0.45	2.80
Number of Dom Passengers (M)	689	2.86	0.74	4.58	428	2.18	0.70	3.63	1,477	1.39	0.44	2.64	493	1.33	0.22	3.08
Number of Flights (Th)	689	43.10	18.64	54.16	434	33.61	17.43	37.95	1,484	17.77	6.87	32.89	499	17.79	3.94	30.44
Number of Int'l Flights (Th)	607	24.01	10.58	40.70	433	18.65	7.30	27.45	1,290	7.77	1.46	23.74	348	11.85	3.14	17.96
Number of Dom Flights (Th)	689	21.95	6.70	31.31	428	15.21	6.56	22.37	1,477	11.07	4.65	17.27	493	9.65	2.10	19.68
Number of Int'l Routes	689	36.06	24.00	35.55	434	44.48	36.00	31.91	1,484	15.88	6.00	23.11	499	18.72	2.00	27.37
Flight Cancellation Rate (%)	201	1.14	0.96	0.74	140	1.23	0.82	1.29	370	1.33	0.91	1.30	83	1.60	1.22	1.06
I(Award)	618	0.09	0.00	0.29	393	0.13	0.00	0.34	1,277	0.05	0.00	0.22	354	0.05	0.00	0.21
Number of Low Cost Carriers	689	3.14	2.00	2.76	434	4.10	4.00	2.87	1,484	2.14	1.00	2.38	499	1.67	0.00	2.66
Share Aircrafts Large	689	0.70	0.76	0.26	434	0.77	0.82	0.21	1,484	0.54	0.55	0.34	499	0.70	0.76	0.30
I(State-Owned Flag Carrier)	689	0.23	0.00	0.42	434	0.58	1.00	0.49	1,484	0.24	0.00	0.43	499	0.86	1.00	0.34
Financials																
Operational Net Income (M)	195	$ 186.76	$ 99.78	$ 185.40	64	$ 274.59	$ 233.33	$ 165.36	59	$ 190.11	$ 127.63	$ 203.14	25	$ 129.34	$ 159.55	$ 91.83
Operational Revenue (M)	195	$ 325.65	$ 193.16	$ 290.94	64	$ 572.25	$ 572.66	$ 296.52	59	$ 553.32	$ 218.79	$ 658.98	25	$ 339.92	$ 472.59	$ 239.05
Aero Revenue (M)	195	$ 144.91	$ 104.59	$ 124.51	64	$ 304.86	$ 351.13	$ 147.68	59	$ 217.28	$ 98.40	$ 252.93	25	$ 211.64	$ 286.15	$ 154.59
Non-Aero Revenue (M)	195	$ 175.43	$ 96.28	$ 154.18	64	$ 233.47	$ 202.92	$ 151.42	59	$ 323.64	$ 107.26	$ 403.66	25	$ 127.34	$ 177.05	$ 86.65
Operational Expenditure per 1000 psg (Th)	195	$ 0.01	$ 0.00	$ 0.03	64	$ 0.24	$ 0.00	$ 1.45	59	$ 0.01	$ 0.00	$ 0.01	25	$ 0.01	$ 0.00	$ 0.01
Airport Capacity																
Terminal Size (Th)	622	28.19	13.41	34.55	240	24.46	18.73	19.85	822	13.79	7.17	19.11	155	21.99	17.15	17.89
Number of Runways	622	1.53	1.00	0.74	240	1.15	1.00	0.35	822	1.28	1.00	0.54	155	1.19	1.00	0.40
Employees per 1000 psg	213	1.17	1.08	0.55	70	1.54	1.18	0.95	63	1.17	1.07	0.19	30	1.20	1.17	0.13
Fees Charged to Airlines																
Total Fees (Th)	426	$ 4.29	$ 4.20	$ 2.12	270	$ 3.75	$ 3.34	$ 1.89	728	$ 4.05	$ 4.26	$ 1.85	253	$ 5.74	$ 6.60	$ 2.27
Passenger Fees (Th)	426	$ 3.61	$ 3.29	$ 1.97	270	$ 3.14	$ 2.74	$ 1.84	728	$ 3.57	$ 3.80	$ 1.87	253	$ 5.13	$ 6.11	$ 2.20
Runway Fees (Th)	426	$ 0.64	$ 0.43	$ 0.48	270	$ 0.59	$ 0.52	$ 0.28	728	$ 0.47	$ 0.35	$ 0.37	253	$ 0.55	$ 0.55	$ 0.18
Price Regulation																
I(No Regulation)	264	0.23	0.00	0.42	56	0.32	0.00	0.47	76	0.53	1.00	0.50	41	0.15	0.00	0.36

Table A.7: 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 where both PE and non-PE firms bid in the auction. The table reports how PE and non-PE private 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 from 1996 to 2019. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variables capture two ownership types, with government ownership as the base group. $\mathbb{1}$(PE) is one after PE ownership and zero otherwise. Similarly, $\mathbb{1}$(Non-PE Private) is one after Non-PE private ownership. We report two p-values on F-tests for equality of coefficients, which compares the estimates on PE and non-PE private. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}$(PE)	9.26***	0.23*	0.22*	12.48***	-0.73***	1.47***	0.07***	0.38**	-0.02
	(3.00)	(0.14)	(0.13)	(4.14)	(0.15)	(0.36)	(0.02)	(0.17)	(0.11)
$\mathbb{1}$(Non-PE Private)	-2.41	-0.02	0.08	8.41	-0.03	1.51***	-0.02	-0.06	0.34*
	(4.70)	(0.12)	(0.12)	(5.71)	(0.08)	(0.49)	(0.03)	(0.22)	(0.17)
Observations	21257	21257	21257	21257	2208	21257	21257	870	870
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	0.90	0.96	0.94	0.93	0.84	0.76	0.85	0.95	0.95
Y-Mean	95.04	12.25	7.90	9.91	1.52	0.87	0.42	18.18	9.76
Pr > F PE = Non-PE Private	0.01	0.10	0.36	0.54	0.00	0.95	0.01	0.07	0.15

Table A.8: Percentage Changes in Key Outcomes Pre and Post Transactions by Ownership Transition

This table reports changes in the main outcome variables from Pre-transaction to Post-transaction. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft. Pre and Post are the mean of each outcome variable for each ownership transition type three years before and four years after the transactions, respectively. % Change is the % change from Pre-transaction to Post-transaction.

		Ownership Type			
		Priv to PE	Priv to NonPE	Post Priv NonPE to PE	Post Priv PE to NonPE
Passengers per Flight	Pre	124.3	117.2	123.6	136.1
	Post	140.4	115.8	130.9	128.0
	% Change	13.0	-1.2	5.9	-6.0
Number of Passengers (T)	Pre	6.6	1.9	2.1	6.2
	Post	8.3	2.2	3.3	6.2
	% Change	25.8	15.8	57.1	0.0
Number of Flights (M)	Pre	46.1	14.4	16.6	43.1
	Post	54.4	16.7	23.6	40.8
	% Change	18.0	16.0	42.2	-5.3
Number of Int'l Routes	Pre	32.7	17.6	32.5	32.7
	Post	42.1	20.1	35.1	30.3
	% Change	28.7	14.2	8.0	-7.3
Flight Cancellation Rate	Pre	0.6	1.4	1.0	0.8
	Post	0.7	1.1	0.8	1.4
	% Change	16.7	-21.4	-20.0	75.0
Number of LCC	Pre	1.5	1.5	3.2	3.0
	Post	3.1	2.0	3.5	3.2
	% Change	106.7	33.3	9.4	6.7
Share Aircrafts Large	Pre	0.6	0.6	0.6	0.8
	Post	0.7	0.6	0.6	0.7
	% Change	16.7	0.0	0.0	-12.5
Op. Net Income (M)	Pre	92.0	117.0	82.8	362.4
	Post	114.6	154.2	111.0	284.3
	% Change	24.6	31.8	34.1	-21.6
Op. Ex per 1000 psg (M)	Pre	116.1	198.5	148.7	287.5
	Post	132.8	196.0	123.2	382.2
	% Change	14.4	-1.3	-17.1	32.9

Table A.9: Full Sample Analysis with Focus on PE

This table estimates the main effects of PE and Non-PE Private ownership, grouping privatization and post-privatization transactions together. The sample includes all privatization and post-privatization events with government-owned airports as a base group. 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. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. Panel A shows the effect of PE ownership only and Panel B shows the effect of PE and non-PE Private ownership types. We report p-values on F-tests for equality of the two ownership coefficients in Panel B. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. Main Outcomes with Only PE

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	8.90***	0.18***	0.14**	6.43***	-0.28***	0.73***	0.09***	0.32**	-0.05
	(2.07)	(0.07)	(0.06)	(1.94)	(0.11)	(0.19)	(0.03)	(0.14)	(0.11)
Observations	25454	25454	25454	25454	2879	25454	25454	1188	1188
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	0.90	0.96	0.94	0.93	0.83	0.76	0.85	0.95	0.96
Y-Mean	98.21	12.43	8.03	11.24	1.48	0.98	0.44	18.27	9.81

Panel B. Ownership Type and Airport Outcomes Using Close Auctions in which Both PE & Non-PE Bid

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	8.92***	0.19***	0.16***	7.42***	-0.31**	0.94***	0.09***	0.34**	-0.05
	(2.11)	(0.07)	(0.06)	(1.99)	(0.14)	(0.20)	(0.03)	(0.14)	(0.10)
𝟙(Non-PE Private)	0.07	0.06*	0.08**	4.17***	-0.06	0.88***	-0.00	0.15	0.01
	(1.43)	(0.04)	(0.03)	(1.05)	(0.16)	(0.14)	(0.01)	(0.13)	(0.07)
Observations	25454	25454	25454	25454	2879	25454	25454	1188	1188
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	0.90	0.96	0.94	0.93	0.83	0.77	0.85	0.95	0.96
Y-Mean	98.21	12.43	8.03	11.24	1.48	0.98	0.44	18.27	9.81
Pr > F PE = Non-PE Private	0.00	0.05	0.17	0.13	0.05	0.79	0.00	0.25	0.66

Table A.10: Airport Ownership Type and Airport Traffic: International vs. Domestic

This table considers the effect of airport ownership on traffic separately for international and domestic flights. The estimates are from OLS regressions using Equations 2 and 3 on an airport-year level panel from 1996 to 2019. Dependent variables are per flight passengers in columns 1-4 and the log number of passengers in columns 5-8, and the log number of flights in columns 9-12, which are measured separately for international and domestic flights. The data on international flight statistics span 1996-2019. Columns 1, 3, 5, 7, 9 and 11 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, 6, 8 10 and 12 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight				Log(# Passengers)				Log(# Flights)			
	International		Domestic		International		Domestic		International		Domestic	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
𝟙(PE)	-3.31		17.30***		0.10		0.24**		0.15*		0.10	
	(4.07)		(4.63)		(0.08)		(0.10)		(0.08)		(0.08)	
𝟙(Foreign Private)	-7.84*		1.31		0.26**		0.06		0.35***		0.05	
	(4.21)		(3.82)		(0.10)		(0.14)		(0.11)		(0.14)	
𝟙(Domestic Private)	-3.36		-0.04		-0.07		-0.00		-0.04		0.01	
	(3.69)		(2.08)		(0.08)		(0.06)		(0.07)		(0.07)	
𝟙(Partially Gov't Owned Private)	-3.73		-3.87		-0.21		-0.26		-0.19		-0.19	
	(6.88)		(6.92)		(0.15)		(0.22)		(0.15)		(0.19)	
𝟙(Privatization by PE)		-6.02		19.53***		-0.01		0.40*		0.04		0.22
		(7.97)		(7.03)		(0.17)		(0.23)		(0.17)		(0.16)
𝟙(Privatization by Non-PE)		-6.02**		0.89		0.00		0.01		0.06		0.01
		(2.63)		(1.81)		(0.06)		(0.05)		(0.06)		(0.05)
𝟙(Post-Priv Non-PE to PE)		0.05		16.15***		0.17**		0.16**		0.20***		0.04
		(4.23)		(5.98)		(0.07)		(0.08)		(0.07)		(0.10)
𝟙(Post-Priv PE to Non-PE)		2.39		-14.19**		-0.10		-0.35		-0.12		-0.22
		(9.86)		(5.93)		(0.31)		(0.41)		(0.30)		(0.39)
Observations	18845	18845	28295	28295	18845	18845	28295	28295	18845	18845	28295	28295
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.79	0.79	0.84	0.84	0.93	0.93	0.91	0.91	0.92	0.92	0.88	0.88
Y-Mean	132.80	132.80	11.46	89.31	11.46	11.46	11.86	11.86	6.72	6.72	6.72	7.57
Pr > F Row 1 = Row 2	0.43	1.00	0.01	0.01	0.21	0.92	0.28	0.10	0.14	0.91	0.75	0.22
Pr > F Row 3 = Row 4	0.96	0.83	0.59	0.00	0.42	0.38	0.25	0.22	0.40	0.28	0.32	0.51

Table A.11: Main Outcomes of Airport Privatization Using the Stacked Regression

The tables estimate the main effects in a stacked regression estimator. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. All regressions include airport-group and year-group fixed effects. Panel A uses a close auction sample, as utilized in Table 3. Panel B employs the full sample to examine the effects of various airport private ownership types. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Panel C uses the full sample to investigate the effects of different airport ownership transition types. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. Close Auction Sample

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	11.65***	0.38*	0.35*	23.81***	-0.61***	1.49***	0.08***	0.52**	-0.08
	(3.91)	(0.20)	(0.18)	(5.93)	(0.06)	(0.35)	(0.03)	(0.22)	(0.14)
𝟙(Non-PE Private)	0.64	0.10**	0.13**	19.94***	0.14*	1.25***	-0.02	0.13***	0.31***
	(3.01)	(0.04)	(0.05)	(2.97)	(0.07)	(0.21)	(0.02)	(0.04)	(0.03)
Observations	249380	249380	249380	249380	25540	249380	249380	9257	9257
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	0.90	0.96	0.94	0.94	0.83	0.76	0.86	0.96	0.96
Y-Mean	94.36	12.21	7.87	9.44	1.54	0.83	0.41	18.17	9.77
Pr > F Row 1 = Row2	0.01	0.15	0.22	0.56	0.00	0.54	0.00	0.07	0.01

Main Outcomes of Airport Privatization Using the Stacked Regression (Continued)

Panel B. Full Sample, Private Ownership Types

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	12.52***	0.20***	0.14**	8.43***	-0.33***	1.01***	0.11***	0.40**	-0.06
	(2.32)	(0.07)	(0.06)	(2.23)	(0.08)	(0.21)	(0.03)	(0.16)	(0.11)
𝟙(Foreign Private)	-1.04	0.25***	0.33***	11.79***	-0.62***	1.85***	0.01	0.51***	-0.15***
	(0.73)	(0.02)	(0.02)	(0.73)	(0.11)	(0.07)	(0.01)	(0.02)	(0.02)
𝟙(Domestic Private)	-0.56	-0.01	-0.01	1.60***	-0.25***	0.67***	-0.02***	-0.00	0.17***
	(0.42)	(0.01)	(0.01)	(0.26)	(0.06)	(0.04)	(0.00)	(0.04)	(0.02)
𝟙(Partially Gov't Owned Private)	0.04	-0.10***	-0.09***	-1.98*	0.88***	0.40***	-0.02**	-0.82***	0.12***
	(1.23)	(0.03)	(0.02)	(1.06)	(0.11)	(0.11)	(0.01)	(0.04)	(0.03)
Observations	570879	570879	570879	570879	79071	570879	570879	20949	20949
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	0.89	0.95	0.94	0.92	0.82	0.72	0.84	0.95	0.97
Y-Mean	96.97	12.36	7.97	10.34	1.51	0.91	0.43	18.24	9.88
Pr > F Row 1 = Row 2	0.00	0.46	0.00	0.15	0.04	0.00	0.00	0.48	0.44
Pr > F Row 3 = Row 4	0.64	0.00	0.00	0.00	0.00	0.01	0.90	0.00	0.20

Panel C. Full Sample, Ownership Transition Types

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(Privatization by PE)	16.51***	0.26*	0.17	7.12**	-0.09	1.53***	0.13***	0.66**	-0.09
	(3.94)	(0.15)	(0.13)	(3.57)	(0.07)	(0.41)	(0.04)	(0.30)	(0.22)
𝟙(Privatization by Non-PE)	-0.79**	0.04***	0.07***	4.05***	-0.24***	1.01***	-0.02***	0.25***	-0.04**
	(0.34)	(0.01)	(0.01)	(0.25)	(0.05)	(0.03)	(0.00)	(0.03)	(0.02)
𝟙(Post-Priv Non-PE to PE)	9.15***	0.14**	0.08	7.56***	-0.30***	0.29	0.09***	0.12	0.00
	(2.65)	(0.07)	(0.05)	(2.74)	(0.10)	(0.21)	(0.03)	(0.09)	(0.08)
𝟙(Post-Priv PE to Non-PE)	-1.89	-0.13	-0.04	-6.31***	0.44**	-0.05	0.10**	-0.41***	-0.15***
	(8.74)	(0.24)	(0.21)	(1.57)	(0.22)	(0.55)	(0.05)	(0.12)	(0.06)
Observations	570879	570879	570879	570879	79071	570879	570879	20949	20949
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	0.90	0.95	0.94	0.93	0.82	0.72	0.84	0.95	0.97
Y-Mean	96.97	12.36	7.97	10.34	1.51	0.91	0.43	18.24	9.88
Pr > F Row 1 = Row 2	0.00	0.15	0.42	0.39	0.08	0.20	0.00	0.18	0.83
Pr > F Row 3 = Row 4	0.23	0.29	0.58	0.00	0.00	0.57	0.92	0.00	0.12

Table A.12: Main Outcomes of Airport Privatization Using the Callaway Sant'Anna Estimator

This table estimates the main effects using the Callaway Sant'Anna estimator. Panel A uses a close auction sample, as utilized in Table 3. Panel B employs the full sample. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variable, $\mathbb{1}$(PE), captures PE ownership. All regressions include airport and year fixed effects. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. Close Auction Sample

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# of Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}$(PE)	14.79**	0.56**	0.46*	21.42***	-1.41***	0.73	0.11*	0.52	-0.37**
	(6.02)	(0.27)	(0.27)	(7.21)	(0.16)	(0.94)	(0.06)	(0.42)	(0.18)
Observations	16556	16556	16556	16556	1697	16556	16556	800	800
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

Panel B. Full Sample

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}$(PE)	11.42**	0.26**	0.17*	11.32***	-0.37***	0.53*	0.14***	0.23	-0.11
	(4.93)	(0.11)	(0.1)	(3.99)	(0.14)	(0.31)	(0.04)	(0.29)	(0.26)
Observations	25176	25176	25176	25176	2665	25176	25176	1222	1222
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

Table A.13: Main Outcomes of Airport Privatization Using a Matched Sample

This table estimates the main effects of airport private ownership in a matched sample. For each targeted privatized airport, we match it to a government-owned airport on region, the log GDP per capita, share of international passengers, judicial effectiveness, corruption score, financial freedom, and the number of passengers per flight two years before the privatization event. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. Panel A uses a close auction sample, as utilized in Table 3. Panel B employs the full sample to examine the effects of various airport private ownership types. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Panel C uses the full sample to investigate the effects of different airport ownership transition types. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A. Close Auction Sample

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	18.25***	0.26	0.15	19.05***	-1.45***	2.11***	0.13***	0.68***	0.34***
	(5.36)	(0.17)	(0.16)	(6.19)	(0.43)	(0.67)	(0.04)	(0.14)	(0.11)
𝟙(Non-PE Private)	-0.93	0.05	0.09	10.10*	-0.61**	0.70	-0.00	0.46*	-0.13
	(6.40)	(0.10)	(0.12)	(5.56)	(0.24)	(0.55)	(0.05)	(0.24)	(0.18)
Observations	7200	7200	7200	7200	643	7200	7200	405	405
Airport-group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.89	0.95	0.93	0.93	0.45	0.72	0.84	0.88	0.90
Y-Mean	97.43	12.42	8.03	11.98	1.93	1.06	0.44	18.05	9.83
Pr > F PE = Non-PE Private	0.00	0.20	0.68	0.26	0.09	0.02	0.00	0.42	0.05

Main Outcomes of Airport Privatization Using a Matched Sample (Continued)

Panel B. Full Sample, Private Ownership Types

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	10.17***	0.14***	0.10**	6.62***	-0.33***	0.87***	0.09***	0.48***	-0.10
	(2.34)	(0.05)	(0.04)	(1.63)	(0.10)	(0.21)	(0.03)	(0.12)	(0.14)
𝟙(Foreign Private)	-0.83	0.22**	0.31***	12.48***	-0.56	1.92***	0.02	0.59***	-0.40***
	(3.63)	(0.09)	(0.09)	(3.05)	(0.52)	(0.34)	(0.03)	(0.13)	(0.09)
𝟙(Domestic Private)	-0.99	-0.02	-0.00	2.14	-0.36	0.72***	-0.01	0.08	0.08
	(2.37)	(0.05)	(0.05)	(1.30)	(0.33)	(0.19)	(0.02)	(0.18)	(0.13)
𝟙(Partially Gov't Owned Private)	-0.05	-0.09	-0.08	-3.78	0.74	0.19	-0.01	-0.56*	0.39
	(5.56)	(0.12)	(0.11)	(4.26)	(0.52)	(0.49)	(0.04)	(0.28)	(0.24)
Observations	12793	12793	12793	12793	1934	12793	12793	564	564
Airport-group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.89	0.96	0.95	0.92	0.87	0.75	0.82	0.97	0.98
Y-Mean	106.29	12.85	8.34	14.57	1.40	1.29	0.51	18.37	9.89
Pr > F Row 1 = Row 2	0.01	0.41	0.02	0.09	0.67	0.01	0.07	0.49	0.02
Pr > F Row 3 = Row 4	0.88	0.56	0.56	0.19	0.08	0.31	0.93	0.12	0.36

Panel C. Full Sample, Ownership Transition Types

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(Privatization by PE)	12.02***	0.10	0.08	4.71	-0.05	1.47***	0.09***	0.42**	0.08
	(4.28)	(0.08)	(0.07)	(3.34)	(0.11)	(0.45)	(0.03)	(0.21)	(0.13)
𝟙(Privatization by Non-PE)	0.02	0.09**	0.11***	3.99***	-0.23	1.04***	0.01	0.42***	-0.21**
	(2.01)	(0.04)	(0.04)	(1.13)	(0.17)	(0.16)	(0.02)	(0.13)	(0.10)
𝟙(Post-Priv Non-PE to PE)	9.77***	0.13**	0.07	5.51***	-0.29**	0.26	0.09***	0.59***	-0.22
	(2.55)	(0.06)	(0.05)	(2.02)	(0.12)	(0.21)	(0.03)	(0.17)	(0.14)
𝟙(Post-Priv PE to Non-PE)	13.24*	-0.48	-0.35	-4.31***	0.07	0.74	0.10**	-0.02	-0.53
	(7.67)	(0.32)	(0.29)	(1.65)	(0.11)	(0.58)	(0.05)	(0.20)	(0.33)
Observations	12793	12793	12793	12793	1934	12793	12793	564	564
Airport-group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.89	0.96	0.95	0.91	0.87	0.75	0.82	0.97	0.98
Y-Mean	106.29	12.85	8.34	14.57	1.40	1.29	0.51	18.37	9.89
Pr > F Row 1 = Row 2	0.01	0.93	0.61	0.83	0.26	0.35	0.02	0.97	0.03
Pr > F Row 3 = Row 4	0.66	0.06	0.15	0.00	0.02	0.43	0.90	0.02	0.32

Table A.14: The Effect of Airport Ownership Considering Publicly Traded Private Firms

This table estimates the main effects of airport private ownership, considering the listing status of non-PE firms. The estimates are from OLS regressions on an airport-year level panel from 1996 to 2019. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variables capture three ownership types, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Publicly Traded Private) is one if an airport is owned by non-PE private firms that are publicly traded. 𝟙(Not Publicly Traded Private) is one if an airport is owned by non-PE private firms that are not publicly listed. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE)	12.80***	0.25***	0.18***	9.26***	-0.34**	1.15***	0.12***	0.35**	-0.04
	(2.42)	(0.07)	(0.06)	(2.25)	(0.15)	(0.22)	(0.03)	(0.16)	(0.10)
𝟙(Publicly Traded Private)	-2.53	-0.01	0.04	4.54***	-0.03	1.36***	-0.05**	0.33**	-0.10
	(2.09)	(0.05)	(0.05)	(1.69)	(0.21)	(0.21)	(0.02)	(0.15)	(0.08)
𝟙(Not Publicly Traded Private)	2.61	0.14***	0.13***	3.86***	-0.10	0.62***	0.04**	-0.06	0.10
	(2.02)	(0.05)	(0.04)	(1.21)	(0.22)	(0.18)	(0.02)	(0.19)	(0.13)
Observations	30820	30820	30820	30820	2943	30820	30820	1226	1226
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	0.89	0.95	0.94	0.92	0.82	0.72	0.84	0.95	0.96
Y-Mean	98.21	12.43	8.03	11.24	1.48	0.98	0.44	18.27	9.81

Table A.15: The Effect of Airport Ownership: Foreign vs. Domestic PE

This table estimates the main effects of airport private ownership, considering the location of PE firms. The estimates are from OLS regressions on an airport-year level panel from 1996 to 2019. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variables capture five ownership types, with government ownership as the base group. 𝟙(Foreign PE) is one if an airport is owned by PE from a foreign country of the airport and zero otherwise. 𝟙(Domestic PE) is one if an airport is owned by PE located in the same country of the airport and zero otherwise. Similarly, 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(Foreign PE)	6.63***	0.09*	0.08*	7.10***	-0.35***	0.96***	0.06***	0.30**	-0.04
	(2.31)	(0.05)	(0.05)	(2.33)	(0.10)	(0.25)	(0.02)	(0.13)	(0.08)
𝟙(Domestic PE)	16.13***	0.28**	0.16	5.58*	-0.30**	0.74**	0.12**	0.51*	-0.25
	(3.63)	(0.13)	(0.12)	(3.09)	(0.13)	(0.32)	(0.05)	(0.28)	(0.32)
𝟙(Foreign Private)	-1.17	0.25***	0.33***	11.48***	-0.70	1.83***	0.01	0.49***	-0.12
	(3.38)	(0.08)	(0.08)	(3.20)	(0.58)	(0.34)	(0.03)	(0.08)	(0.09)
𝟙(Domestic Private)	-1.08	-0.02	-0.02	1.26	-0.26	0.61***	-0.03	0.03	0.18**
	(1.92)	(0.05)	(0.04)	(1.15)	(0.28)	(0.17)	(0.02)	(0.21)	(0.08)
𝟙(Partially Gov't Owned Private)	-0.53	-0.12	-0.10	-2.63	1.00*	0.36	-0.02	-0.87***	0.13
	(5.73)	(0.12)	(0.11)	(4.64)	(0.59)	(0.49)	(0.04)	(0.19)	(0.13)
Observations	28679	28679	28679	28679	2879	28679	28679	1226	1226
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	0.89	0.96	0.94	0.92	0.83	0.73	0.83	0.95	0.96
Y-Mean	98.21	12.43	8.03	11.24	1.48	0.98	0.44	18.27	9.81

Table A.16: Main Outcomes of Airport Privatization without the Biggest Deals

This table estimates the main effects of airport privatization, excluding the biggest deal in terms of the number of passengers in each transaction type. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. Columns 1, 3, 5, 7, 9, 11, 13, 15 and 17 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, 6, 8, 10, 12, 14, 16 and 18 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight		Log(# Passengers)		Log(# Flights)		# Int'l Routes		Flight Cancellation Rate		# Low-cost Carriers		Share Aircrafts Large		Log(Income)		Log(Expenditure)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
𝟙(PE)	12.57***		0.19***		0.12**		7.75***		-0.33***		0.85***		0.11***		0.35**		-0.05	
	(2.38)		(0.07)		(0.06)		(2.18)		(0.09)		(0.21)		(0.03)		(0.15)		(0.11)	
𝟙(Foreign Private)	-1.16		0.25***		0.33***		11.77***		-0.65		1.84***		0.01		0.49***		-0.12	
	(3.38)		(0.08)		(0.08)		(3.31)		(0.52)		(0.34)		(0.03)		(0.08)		(0.09)	
𝟙(Domestic Private)	-1.05		-0.02		-0.02		1.27		-0.28		0.59***		-0.02		0.04		0.18**	
	(1.94)		(0.05)		(0.04)		(1.21)		(0.30)		(0.17)		(0.02)		(0.21)		(0.08)	
𝟙(Partially Gov't Owned Private)	-0.50		-0.12		-0.10		-2.29		0.95*		0.37		-0.02		-0.87***		0.14	
	(5.73)		(0.12)		(0.11)		(4.78)		(0.53)		(0.49)		(0.04)		(0.19)		(0.13)	
𝟙(Privatization by PE)		18.81***		0.30*		0.19		6.67*		-0.10		1.30***		0.15***		0.53*		-0.09
		(3.74)		(0.16)		(0.15)		(3.89)		(0.08)		(0.39)		(0.04)		(0.27)		(0.21)
𝟙(Privatization by Non-PE)		-0.77		0.06		0.08**		3.76***		-0.24		0.95***		-0.01		0.23		-0.01
		(1.60)		(0.04)		(0.04)		(1.11)		(0.18)		(0.15)		(0.02)		(0.14)		(0.08)
𝟙(Post-Priv Non-PE to PE)		9.84***		0.12*		0.06		7.10**		-0.31***		0.30		0.09***		0.18		-0.00
		(2.88)		(0.07)		(0.06)		(2.81)		(0.11)		(0.23)		(0.03)		(0.11)		(0.09)
𝟙(Post-Priv PE to Non-PE)		-1.82		-0.13		-0.04		-5.30***		0.43*		0.13		0.10**		-0.45**		0.18
		(8.72)		(0.24)		(0.22)		(1.91)		(0.23)		(0.55)		(0.04)		(0.20)		(0.34)
Observations	28587	28587	28587	28587	28587	28587	28587	28587	4031	4031	28587	28587	28587	28587	1211	1211	1211	1211
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.89	0.89	0.95	0.95	0.94	0.94	0.92	0.92	0.82	0.82	0.72	0.72	0.83	0.83	0.95	0.95	0.96	0.96
Y-Mean	98.02	98.02	12.41	12.41	8.02	8.02	11.06	11.06	1.49	1.49	0.97	0.97	0.44	0.44	18.25	18.25	9.80	9.80
Pr > F Row 1 = Row 2	0.00	0.00	0.59	0.13	0.03	0.46	0.31	0.47	0.54	0.46	0.01	0.40	0.02	0.00	0.43	0.34	0.66	0.76
Pr > F Row 3 = Row 4	0.93	0.20	0.43	0.31	0.48	0.65	0.46	0.00	0.05	0.00	0.67	0.78	0.97	0.91	0.01	0.00	0.80	0.59

Table A.17: Main Outcomes of Airport Privatization with Alternative Fixed Effects

This table estimates the main effects with different fixed effects. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. All regressions include airport, year and regional fixed effects. Standard errors are clustered by airport. Columns 1, 3, 5, 7, 9, 11, 13, 15 and 17 report changes in outcome variables by each type of private ownership. The independent variables capture four ownership type, with government ownership as the base group. 𝟙(PE) is one if an airport is owned by PE and zero otherwise. 𝟙(Foreign Private) is one if an airport is owned by foreign non-PE private. 𝟙(Domestic Private) is one if an airport is owned by domestic non-PE private. 𝟙(Partially Gov't Owned Private) is one if an airport is owned by non-PE private that has partial government ownership. Columns 2, 4, 6, 8, 10, 12, 14, 16 and 18 report changes in outcome variables after ownership transitions among the government, PE, and non-PE private. The independent variables capture four ownership transition types, 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight		Log(# Passengers)		Log(# Flights)		# Int'l Routes		Flight Cancellation Rate		# Low-cost Carriers		Share Aircrafts Large		Log(Income)		Log(Expenditure)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
𝟙(PE)	11.62***		0.18**		0.12**		7.59***		-0.32***		0.92***		0.10***		0.35**		-0.05	
	(2.38)		(0.07)		(0.06)		(2.11)		(0.09)		(0.21)		(0.03)		(0.15)		(0.11)	
𝟙(Foreign Private)	-1.14		0.25***		0.33***		11.76***		-0.65		1.83***		0.01		0.49***		-0.12	
	(3.38)		(0.08)		(0.08)		(3.31)		(0.52)		(0.34)		(0.03)		(0.08)		(0.09)	
𝟙(Domestic Private)	-1.03		-0.02		-0.02		1.28		-0.27		0.61***		-0.02		0.03		0.18**	
	(1.92)		(0.05)		(0.04)		(1.20)		(0.28)		(0.17)		(0.02)		(0.21)		(0.08)	
𝟙(Partially Gov't Owned Private)	-0.50		-0.12		-0.10		-2.29		0.95*		0.36		-0.02		-0.88***		0.14	
	(5.73)		(0.12)		(0.11)		(4.79)		(0.53)		(0.49)		(0.04)		(0.19)		(0.13)	
𝟙(Privatization by PE)		15.34***		0.24*		0.17		6.32*		-0.07		1.45***		0.13***		0.53*		-0.09
		(4.02)		(0.15)		(0.13)		(3.53)		(0.08)		(0.40)		(0.04)		(0.27)		(0.21)
𝟙(Privatization by Non-PE)		-0.75		0.06		0.08**		3.74***		-0.24		0.96***		-0.01		0.23		-0.01
		(1.59)		(0.04)		(0.04)		(1.10)		(0.18)		(0.15)		(0.02)		(0.14)		(0.08)
𝟙(Post-Priv Non-PE to PE)		9.86***		0.12*		0.06		7.13**		-0.30***		0.29		0.09***		0.18*		-0.00
		(2.88)		(0.07)		(0.06)		(2.82)		(0.11)		(0.23)		(0.03)		(0.11)		(0.09)
𝟙(Post-Priv PE to Non-PE)		-0.57		-0.11		-0.03		-5.20***		0.45*		0.07		0.11**		-0.45**		0.18
		(8.63)		(0.24)		(0.22)		(1.82)		(0.23)		(0.57)		(0.04)		(0.21)		(0.34)
Observations	28679	28679	28679	28679	28679	28679	28679	28679	4051	4051	28679	28679	28679	28679	1226	1226	1226	1226
Airport FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.89	0.89	0.96	0.96	0.94	0.94	0.92	0.92	0.82	0.82	0.73	0.72	0.83	0.83	0.95	0.95	0.96	0.96
Y-Mean	98.21	98.21	12.43	12.43	8.03	8.03	11.24	11.24	1.48	1.48	0.98	0.98	0.44	0.44	18.27	18.27	9.81	9.81
Pr > F Row 1 = Row 2	0.00	0.00	0.48	0.23	0.03	0.51	0.29	0.49	0.52	0.39	0.02	0.25	0.02	0.00	0.43	0.34	0.66	0.76
Pr > F Row 3 = Row 4	0.93	0.25	0.44	0.35	0.48	0.68	0.46	0.00	0.05	0.00	0.62	0.72	0.96	0.81	0.01	0.00	0.79	0.59

Table A.18: 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.19: Heterogeneous Effect of Airport Privatization by Domestic Governance

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 Equations 5 on an airport-year level panel from 1996 to 2019. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variables include four indicators representing PE and non-PE Private ownership interacted with a binary characteristic. The binary characteristic divides acquisitions according to whether the airport is in a low or high corruption country. A country is defined as high (low) corruption country if its Corruption Index from Transparency International is above (below) the median. We report two p-values on F-tests for equality of coefficients. The first compares the first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE Low Corruption)	13.24***	0.11	0.05	8.23**	-0.26	0.76***	0.10***	0.28	0.03
	(3.11)	(0.07)	(0.05)	(3.41)	(0.21)	(0.27)	(0.03)	(0.18)	(0.08)
𝟙(PE High Corruption)	10.14***	0.29**	0.24**	8.76***	-0.50***	1.44***	0.11**	0.55**	-0.24
	(3.67)	(0.12)	(0.11)	(2.83)	(0.17)	(0.34)	(0.05)	(0.27)	(0.31)
𝟙(NonPE Low Corruption)	2.19	0.16***	0.16***	7.37***	-0.24	1.19***	0.02	0.17	-0.00
	(2.19)	(0.05)	(0.05)	(1.75)	(0.25)	(0.22)	(0.02)	(0.13)	(0.08)
𝟙(NonPE High Corruption)	-3.93**	-0.08*	-0.02	-0.22	0.14	0.59***	-0.04*	-0.26***	0.09*
	(1.84)	(0.04)	(0.04)	(0.74)	(0.09)	(0.18)	(0.02)	(0.10)	(0.05)
Observations	28679	28679	28679	28679	2879	28679	28679	1226	1226
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	0.89	0.96	0.94	0.92	0.83	0.72	0.83	0.95	0.96
Y-Mean	98.21	12.43	8.03	11.24	1.48	0.98	0.44	18.27	9.81
Pr > F Row 1 = Row 2	0.51	0.19	0.10	0.91	0.28	0.11	0.74	0.40	0.42
Pr > F Row 3 = Row 4	0.03	0.00	0.01	0.00	0.15	0.03	0.06	0.01	0.32

Table A.20: 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 Equations 5 on an airport-year level panel from 1996 to 2019. Dependent variables include airport traffic, number of international routes, flight cancellation rate, number of low-cost carriers, share of large aircraft, and financial performance. Share Aircrafts Large is the fraction of flights where the aircraft is a jet rather than a small or regional craft, Income is operating net income, and Expenditure is operating expenditure per 1,000 passengers. The independent variables include four indicators representing PE and non-PE Private ownership interacted with a binary characteristic. The binary characteristic divides acquisitions according to whether an airport serves any state-owned flag carriers. We report two p-values on F-tests for equality of coefficients. The first compares the first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Passengers per Flight	Log(# Passengers)	Log(# Flights)	# of Int'l Routes	Flight Cancellation Rate	# Low-cost Carriers	Share Aircrafts Large	Log(Income)	Log(Expenditure)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
𝟙(PE State-Owned Flag Carrier)	13.80***	0.42**	0.35**	13.87***	-0.70***	1.94***	0.12***	0.65**	-0.29
	(3.76)	(0.17)	(0.16)	(3.65)	(0.24)	(0.38)	(0.03)	(0.26)	(0.31)
𝟙(PE No State-Owned Flag Carrier)	10.74***	0.10	0.05	6.26**	-0.32**	0.74***	0.10***	0.29*	0.03
	(2.95)	(0.06)	(0.05)	(2.68)	(0.15)	(0.25)	(0.03)	(0.17)	(0.08)
𝟙(NonPE State-Owned Flag Carrier)	0.73	0.17***	0.21***	8.38***	-0.66*	1.33***	0.00	0.49***	-0.16*
	(2.99)	(0.05)	(0.05)	(2.91)	(0.34)	(0.32)	(0.02)	(0.07)	(0.09)
𝟙(NonPE No State-Owned Flag Carrier)	-1.15	0.01	0.04	2.48**	0.22**	0.79***	-0.01	-0.32***	0.23***
	(1.69)	(0.04)	(0.04)	(0.98)	(0.11)	(0.16)	(0.02)	(0.12)	(0.08)
Observations	28679	28679	28679	28679	2879	28679	28679	1226	1226
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	0.89	0.96	0.94	0.92	0.83	0.72	0.83	0.95	0.96
Y-Mean	98.21	12.43	8.03	11.24	1.48	0.98	0.44	18.27	9.81
Pr > F Row 1 = Row 2	0.51	0.07	0.07	0.10	0.17	0.01	0.58	0.26	0.34
Pr > F Row 3 = Row 4	0.58	0.02	0.01	0.05	0.01	0.12	0.55	0.00	0.00

Table A.21: 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 on an airport-year level panel from 1996 to 2019. The sample is restricted to the government-owned airports. The dependent variables are the log of the number of passengers (column 1) and the log of the 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 first two rows and the second compares the last two rows. Standard errors are clustered by airport. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Log(# Passengers)	Log(# Flights)
	(1)	(2)
𝟙(Privatization by PE Nearby)	0.03	-0.01
	(0.07)	(0.05)
𝟙(Privatization by Non-PE Nearby)	0.04	0.07**
	(0.04)	(0.03)
𝟙(Post-Priv Non-PE to PE Nearby)	0.05	0.03
	(0.06)	(0.05)
𝟙(Post-Priv PE to Non-PE Nearby)	-0.11	-0.14
	(0.09)	(0.09)
Observations	25720	25720
Airport FE	Yes	Yes
Year FE	Yes	Yes
Controls	Yes	Yes
R^2	0.96	0.94
Y-Mean	12.38	7.99
Pr > F Row 1 = Row 2	0.89	0.18
Pr > F Row 3 = Row 4	0.14	0.11

Appendix B. Details on Performance Data and Variable Definitions

B1. 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	2,090	91	333
Airlines and Routes	Official Aviation Guide of the Airways (OAG)	1996–2019	2,090	91	333
Flight Cancellation Rate	Official Aviation Guide of the Airways (OAG)	2016–2020	1,031	68	170
Awards	Airports Council International (ACI)	2016–2021	147	82	233
Financials	Air Transport Research Society (ATRS) at Embry-Riddle Aeronautical University	2001–2017	110	22	28
Physical Capacity	Google satellite images	1996–2019	218	80	163
Fees	RDC Aviation	2010–2020	1,528	75	199

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 as of 2016 to focus on commercial airports, excluding airports that are exclusively for general aviation or military activities.

Routes and Airlines As the downstream performance measures, we use the information on the list of routes, the flight frequencies of each route and the operating airlines. The data include airport-year-airline-route level information.

Flight Cancellation We obtain information on airport on-time performance 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/.

Financials The dataset provides financial statements of 239 airports worldwide, which mainly include 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 Google Earth App. We measure the terminal size using a ruler tool and count number of runways. Figure A.1 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 mid-sized standard aircraft type for analysis: 320 (short international routes). 320 can carry up to 169 passengers per flight. 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.

B2. Variable Definitions

Traffic and Downstream Performance

- Passengers per Flight: Number of passengers/number of flights
- Number of International Routes: Number of unique direct routes where final destination is outside of the airport's country
- Flight Cancellation Rate: (Number of flights cancelled/Number of flights)×100.
- I(Award): An indicator variable that is one if an airport has received an ASQ award in that year.
- Number of Low-cost Carriers: The number of low cost carriers that are operated in the airport. Official Aviation Guide of the Airways (OAG)'s airline-route level data provides information about whether an airline is "Mainline" or "Low Cost". We follow their identification and define an airline as "Low Cost Carrier" if the data identify them as "Low Cost".
- Share Aircrafts Large: the number of flights served with relatively larger sized aircraft jets, which have a maximum capacity to accommodate on average 216 or more passengers, divided by the total number of flights served. Planes that accommodate on average 216 passengers or more are defined as aircraft jets, while planes that accommodate 73 or less passengers are defined as regional/small planes.
- I(State-Owned Flag Carrier): An indicator variable that is one if an airport serves any airlines that are majority or wholly owned by the local government.

Financials

- Income: Operating net income = Total operating revenue – total operating expenditure.
- Revenue: Operating Revenue, the total amount of money coming into airport from both aeronautical and non-aeronautical activities.
- Aero Revenue: Aeronautical Revenue, the total amount of revenue coming into airport from aeronautical activities.
- Non-Aero Revenue: 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.
- Expenditure: Operating Expenditure per 1000 passengers =(Total expense an airport incurs through its normal operations/Number of Passengers)×1000.

Aircraft and Airport Capacity

- Terminal Size: The size of of the passenger terminals (sqmt)
- Number of Runways: The number of runways.
- Employees: Employees per 1000 passengers = (Number of Employees/Number of Passengers)×1000.

Fees Charged to Airlines

- Total Fee: Amount of total fees, charged to a mid-sized standard aircraft type (320), averaged over the year. Fees are charged per aircraft movement.
- Passenger Fee: Passenger fee is levied for processing passengers and includes security costs. They are charged per passenger. We calculate the amount of passenger fees per aircraft assuming that aircraft is 80% full.
- Runway Fee: Runway fee is levied for using the runway infrastructure of the airport for a flight. They are charged per aircraft movement.

Price Regulation Variables

Airort price regulation data 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.

- I(No Regulation): Indicator variable of 1 if there is no price regulation in that airport-year and 0 if there is a regulation. Price regulations include cost-based one, which charges the same price that would ideally prevail in a perfectly competitive market, and revenue cap, which sets an overall limit in the allowed average price increase.

Country-level Variables and Others

- GDP Per Capita: Annual GDP per capita (source: World Bank)
- Trade Volume: Annual summation of import and export units in $ US Mil (source: World Bank)
- Rank: Share Passenger Intl: Decile rank of the share of international passengers, with 10 indicating the highest share (Number of international passengers / Number of passengers)
- Ease of Doing Business: A scale from 0 to 100, where 0 represents the lowest and 100 represents the best regulatory performance for businesses and stronger protection of property rights (source: World Bank)
- Corruption Perception Index (CPI Score): A scale from 0 to 100, where 0 represents the highest corruption and 100 represents the lowest corruption (source: Transparency International)
- Number of Airlines: The number of airlines served by airports
- Number of Routes: The number of unique direct routes served by airports
- I(Competing Airports): Indicator variable equal to one if an airport has at least one airport nearby within a radius of 200 km, and zero otherwise