



# US airport financial reform and its implications for airport efficiency: An exploratory investigation



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## ABSTRACT

This study investigates the effect on airport productive efficiency of two major funding sources used by US airports, namely the Airport Improvement Program (AIP) grants and the Passenger Facility Charges (PFC). A two-stage Data Envelopment Analysis (DEA) modeling approach is employed for this purpose. In the first stage, we estimate airport productive efficiency using a variable returns-to-scale DEA model with both desirable and undesirable outputs. In the second stage, random effects regression models are estimated with airport efficiency scores from the first stage as the dependent variable and PFC and a proxy for AIP grants as two of the explanatory variables. By applying the two-stage DEA model to 42 primary US airports, it is found that PFC use has a positive impact on airport productive efficiency, whereas the impact of AIP grants is negative. Multiple counterfactual scenarios are examined by altering the mix of the two types of funding sources. The results show that simultaneously raising the PFC ceiling and decreasing AIP grants could lead to greater airport productive efficiency. The US federal aviation authority would also benefit from realizing these scenarios, especially given the budgetary constraints it faces.

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## 1. Introduction

Airport Improvement Program (AIP) and Passenger Facility Charges (PFC) represent two major funding sources for US airports. AIP is a federal grant program that provides grants to eligible airports for capital planning and development, safety and security enhancement, noise abatement, and other non-revenue generating projects. PFC is a locally imposed passenger tax, collected as part of the ticket price by airlines and then handed over to the airports. Other funding resources include tax exempt bond, state/local grants, and airport revenue. Collectively, PFC and AIP account for nearly 46% of the total airport funds in the US (Dillingham, 2007).

AIP fund and PFCs bear complementary relationship for airport finance in the US (Kirk, 2009). AIP funds consist of formula and discretionary parts. The allocation of the formula part to different airports is based on the number of airport passengers enplaned. PFC is also levied on enplaned passengers. Therefore larger airports are able to collect a greater amount of both PFC and AIP than smaller airports. This advantage is, however, intervened by the US Federal

Aviation Administration (FAA), which mandates the PFC collecting airports to forego their AIP formula entitlement by 50% or 75% depending upon the charging levels of PFC. Because of their large passenger demand and resulting PFC revenue collected, and the complementarity between AIP funds and PFC, primary airports<sup>1</sup> are in general less dependent on AIP as the main financial source than their smaller counterparts for capital development.

The amount of AIP grants allocated to all participating airports averaged between 2001 and 2005 is \$3.6 billion per year; whereas the PFC revenues collected amounted to \$2.2 billion annually (Dillingham, 2007). The participating airports are those identified in the National Plan of Integrated Airport Systems (NPIAS), which include 3355 out of 5171 public use airports in the nation (Office of Airport Planning and Programming, 2012). The vast number of airports suggests considerable financial burden imposed on AIP. In 2011, the H.R. 608 FAA Reauthorization and Reform Act proposed annual AIP funding cut by \$500 million from 2012 through 2014. This, together with the uncertainties about future federal aviation budget, has given rise to discussions on various options to reduce

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<sup>1</sup> See Appendix A for the primary airport classification.

AIP spending. As a consequence of potential AIP funding cut and given its complementarity with PFC, possibilities to raise PFC ceiling has been brought to the central stage of the U.S. airport policy debate. One key issue in the debate which has not been adequately investigated is how efficiently AIP funds and PFC are being used in airport production process, and whether potential AIP-PFC substitutions could lead to airport efficiency improvement. Towards this end, the present study develops a two-stage empirical procedure for determining the efficiency of airports and the effect of AIP and PFC on the productive efficiency of the airports. In the first stage, airport productive efficiencies are computed using a non-parametric Data Envelopment Analysis (DEA) approach. In the second stage, random effects regression models are estimated to study the effect of AIP grants and PFC on the efficiency scores from the first stage. This study further considers plausible AIP-PFC substitution scenarios and tests alternative funding schemes which could help alleviate budgetary constraints facing the FAA, while improving the efficiency of airport production process. To the best of the authors' knowledge, this study of airport finance is a first of its kind, in terms of the problem proposed and analysis approach. The outcomes of this study are expected to provide quantitative insights for airport policy makers and inform the ongoing debate about the reforms on AIP and PFC.

The remainder of the paper is organized as follows. The next section provides an overview of the AIP, PFC, and the related policy debates in the US. Section 3 reviews the airport efficiency literature. Section 4 describes the methodology and data used in this paper. Section 5 presents results and discussions. Section 6 examines counterfactual scenarios and their implication on airport production process. Conclusion and directions for future research are offered in Section 7.

## 2. Overview of AIP, PFC, and related policy debates

The Airport Improvement Program has long existence in the US aviation history, with its precedents dating back to the 1940s (FAA, 2014a). The current AIP was established in 1982 and has since then undergone several amendments. The source of funding obligated for the AIP is Airport and Airway Trust Fund (AATF), which accounts for over two thirds in total FAA appropriations for all FAA programs and activities (FAA, 2014e). AATF revenues are derived from excise taxes on domestic airline passenger tickets, domestic airline passenger flight segments, international passenger arrivals and departures, air cargo waybills, aviation fuels, and amounts paid for the right to provide mileage awards (FAA, 2014b). Airports participating in the AIP are all publicly owned and included in the NPIAS, ranging from very large primary airports such as Atlanta Hartsfield-Jackson and Chicago O'Hare to small general aviation and reliever airports. The spending of AIP grants has been mostly on airfield capital improvements or repairs and, in some specific situations, for terminals, hangars, and non-aviation development. Eligible AIP funded projects are strongly related to the demand at the airport—indeed, the FAA requires AIP projects to be justified by aviation demand (FAA, 2014c). Compared to other finance options, the main financial advantage of AIP to airports is that AIP can provide funds for a known range of capital projects without placing financial burden to airports through bond issuance or other types of debt financing.

The AIP grants can be divided into formula funds (also referred to as entitlements or apportionments, which we use interchangeably in this paper) and discretionary funds. Formula fund is generally divided into four categories, depending on the airport types: primary airports, cargo service airports, general aviation airports, and Alaskan airports. Further details about airport definitions are provided in the Appendix A. Each category distributes

AIP funds by its respective formula. Discretionary funds include money not distributed under the apportionments, and foregone PFC revenues (which will be discussed later) that are deposited into the AIP Fund. In recent years, discretionary funds account for 24–30% in the total AIP funding (Kirk, 2009). While it would be desirable to examine AIP use efficiency across all airports, this study focuses only on primary airports, which are defined as airports with more than 10,000 passenger enplanements per year, because existing data are available only for this type of airports. Following Kirk (2009), the AIP apportioned equals double the amount of what would be received from the following formula, where the enplanements are based on the previous year's data:

- \$ 7.80 per passenger for the first 50,000 enplanements
- \$ 5.20 per passenger for the next 50,000 enplanements
- \$ 2.60 per passenger for the next 400,000 enplanements
- \$ 0.65 per passenger for the next 500,000 enplanements
- \$0.50 per passenger for the excess of 1 million enplanements

The ever growing demand for air travel has put pressure on airports to enhance their capacity in order to continuously provide smooth service to passengers. Given the important role that AIP has been playing in funding airport capacity projects, the pressure is also in part passed onto the FAA to more efficiently administer and allocate its AIP funding. Fig. 1 shows the distribution of the AIP fund from 1992 to 2009. It is observed that the amount made available by the FAA to the AIP program is always less than the authorization amount. The AIP authorization has been increasing during the presented period—except for in year 1994/1995. On the other hand, the amount made available had a reverse trend from 1993 to 1997 where the spending of AIP was reduced as a part of the federal deficit reduction process (Kirk, 2009). There was a sharp increase in the amount made available in 2001 due to the passage of the Wendell H. Ford Aviation Investment and Reform Act for 21st Century (AIR-21). Overall, the difference between the authorized amount and the amount available, which can be considerable in some years, signifies the historic presence of AIP budgetary constraints in the FAA.

In contrast to AIP which is a federal grants-in-aid program, Passenger Facility Charge (PFC) is a locally levied tax on a per head basis. Formally enacted by law in 1990, PFC was considered complementary to AIP funding given the tightening AATF and other sources to fund airport development during that time. The money collected from PFC can be used to finance a broader range of eligible

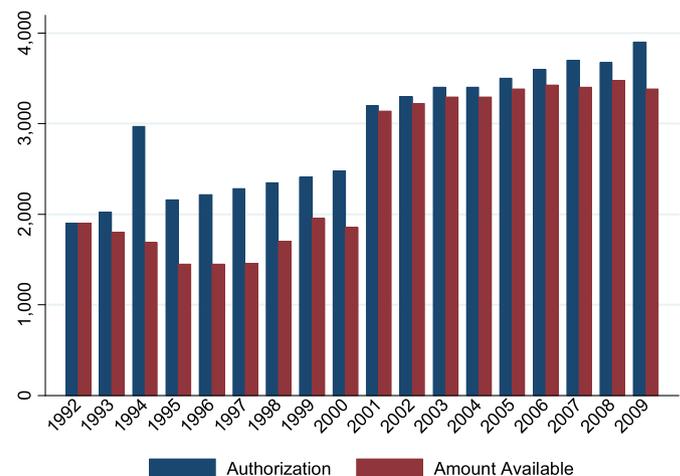


Fig. 1. AIP grants authorizations and the actual amounts made available between 1992 and 2009 (in \$million).

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