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Aviation security: Costing, pricing, finance and performance

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ABSTRACT

This article provides an overview of economic issues pertaining to the costing, pricing, financing and performance of aviation security and an introduction to eight articles contributing to this special issue. Topics include benefit-cost analysis, production and input relationships, information flows, human factors and performance measurement, the role of technology, and risk-based security. We highlight resource allocation and measurement problems that are endemic to aviation security, and analyze the growing costs of aviation security over the last 15 years. We also provide data and analysis on financing that demonstrates significant differences in national approaches to the governance of aviation security and the economic consequences of such decisions.

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1. Introduction

A fundamental problem underlies the provision of aviation security; how to best allocate scarce resources in order to reduce the probability of a successful attack against civil aviation to an acceptable level. The economic concept of scarcity has two important meanings here. Firstly, resources devoted to defense activities of any kind (including aviation security) do not directly increase economic welfare (rather such activities serve to prevent potential reductions in welfare). When we are forced to expend resources to protect ourselves we are reducing the resources available for investment in capital goods and technology and for production and consumption of goods and services. Secondly, given a finite budget allocated to the general activity of national defense, the resources devoted to aviation security represent a reduction in resources available to protect non-aviation targets. Moreover, the resource allocation problem is complicated by the fact that such decisions are strategic; aviation security risks are not the same as natural disaster risks. For example, if we decide to allocate more resources to ensure buildings are earthquake-proof, this does not change the probability of an earthquake occurring. However, if we allocate relatively more resources to one aviation security measure

(and relatively less to another) we change the expected payoffs to terrorists and thus potentially change the probabilities and modes of attack.

This article provides an overview of current issues and future prospects for aviation security from an economic perspective and introduces the other articles in this special issue. We begin with some background on aviation security over the last four decades. In Section 2, we present some data on the costs of aviation security in Canada and the US and some analysis of the costs of aviation security at European airports, noting sizable differences across airports even in the same country.¹ In Section 3, we discuss difficulties in defining and measuring output and the use of benefit-cost analysis to aid in resource allocation. We also outline input relationships in the production of aviation security layers and the role of human factors in the delivery and efficiency of aviation security. Section 4 examines the financing of aviation security and the relationship between financing and governance. In Section 5 we discuss the potential evolution of international security towards a risk-based system and we offer some brief concluding remarks in Section 6.

¹ Much of the data we report focuses on the USA and Canada for the simple reason that data for other jurisdictions are not consistently available in any form that permits analysis or comparison. In most cases there needs to be a dramatic improvement in the collection, transparency, consistency and reporting of data related to aviation security.

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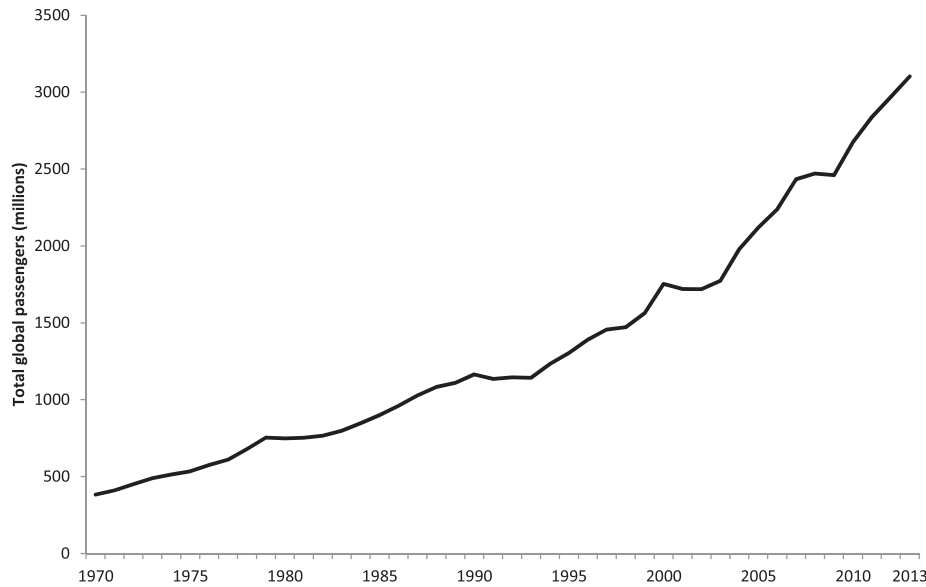


Fig. 1. Total global air passengers (millions); 1970–2013.
Source: Airlines for America ²

1.1. Background

In the last 45 years, trade, technology, and economic growth have created an age of globalization in which the welfare of people, firms and nations have become ever more interconnected. During this period, civil aviation has evolved from a heavily regulated system of national airlines and government operated airports to a much larger and more competitive global industry in which private airlines and airports compete along with publicly owned counterparts and hybrid organizations under diverse regulatory regimes. Fig. 1 shows the remarkable growth in the number of global air passengers over the last 43 years, a long-term trend which has been largely impervious to the negative shocks of macroeconomic recessions, health crises, military conflicts and acts of terror. In 2013, approximately 3.1 billion air passengers were transported.

However, civil aviation has been a visible target for acts of violence and terrorism throughout this period. Fig. 2 shows the total number of attacks inside planes worldwide by attack type over the four decades between 1970 and 2009 and indicates the percentage of total attacks in each decade accounted for by each attack type.

In the 1970's, attacks on aircraft were heavily skewed towards hijackings however this mode of attack has declined both in number and in relative importance over time. The figure also shows a sharp rise in the number of bomb attacks that occurred in the 1980's falling again in the subsequent decades. The data thus captures the evolutionary nature of aviation security; as authorities implement security measures to nullify a given mode of attack, terrorists adapt their strategies and the preferred mode of attack evolves. Overall the total number of attacks has declined significantly over time with 111 attacks in the 1970's but just 21 attacks between 2000 and 2009. In terms of fatalities, there were a total of 557 deaths as a result of all attacks inside planes in the 1970's. This number rose to 1115 in the 1980's mainly as a result of a small number of attacks that inflicted a large number of

casualties, including Air India flight 182 in 1985 (329 fatalities) and Pan Am flight 103 in 1988 (270 fatalities). In the 1980's the objectives for attacking aircraft had evolved from attention-seeking through prolonged live media coverage of a hijacking to the shock and terror generated by the sudden and unexpected mass killing of innocent civilians. By the 1990's aviation security had responded and was evolving into a complex (and expensive) system combining intelligence agencies, security personnel at airports and investments in scanning equipment to detect bombs, weapons and prohibited items. In the 1990's, the total number of fatalities from all terror attacks inside planes declined to 160, but the following decade will forever be defined by the 2938 deaths resulting from the attacks in New York and Washington on September 11th, 2001. Excluding the 9–11 attacks, there were just 94 fatalities worldwide as a result of terrorist attacks inside aircraft from 2000 to 2009.

The events of September 11th, 2001 represent by far the biggest and most shocking realization to date of the ever-evolving threat of terror attacks against aviation. In particular, the attacks demonstrated how civilian aircraft could be used as weapons to kill large numbers of civilians and destroy assets on the ground. The attack created mass panic over the vulnerabilities of the civil aviation system and led to sweeping and significant changes in the design, provision and financing of aviation security throughout the world. Since 2001, governments have created new organizations to implement airport security systems and there have been massive investments in both technology and the hiring and training of security personnel. Through all of these changes and increases in security costs, airports and airlines have faced new challenges in managing passenger throughput, minimizing delays and negative passenger experiences resulting from elevated levels of security effort. The general public and the travelling public have borne both the direct and indirect economic costs of these investments.

2. Costs of aviation security

Unless significant changes are made, the monetary and economic costs of the current aviation security system are likely to

² Airlines for America (2015); data from <http://airlines.org/data/annual-results-world-airlines>.

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