



## Transatlantic space cooperation: An empirical evidence



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### ABSTRACT

After the Cold War ended in the disintegration of the Soviet Union, the space race was not the factor behind the space exploration and exploitation anymore. The aim of this paper is to analyze the transatlantic space cooperation between the USA (more specifically NASA) and the ESA. The cooperation can be driven by two major motives – economic and political. The empirical evidence suggests that while ESA is motivated by the economic one NASA is motivated by the political one. ESA is seemingly on NASA's tail but it benefits economically.

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### 1. Introduction

Four recent journal articles relating to Space Policy that concern the European dimension [1], European–Japan dimension [2], Latin America–India dimension [3] and Latin America–China dimension [4], have pointed out the marked increase in global space collaboration and its positive benefits. The space community's focus has shifted toward increasing cooperation over the last two decades and there has been a multitude of published material about the practical aspects of cooperation. This is indeed a relegation from the traditional view of space exploration as being motivated by the self-interested international competition.

Traditionally, international competition between superpowers has been the major driving force behind space exploration and exploitation of its natural resources. The ideological competition and bipolar division of the world have created perfect conditions for space activities to thrive. The space race between the USA and the USSR is reflected in the increased funding of space activities [5]. This has subsequently led to a series of major achievements by human kind in the last century. The space race has caused an incredibly rapid development of space capabilities and has facilitated numerous innovations. However, politicians rarely see these economic 'spin-offs' as substantial enough to motivate ambitious space activities (with one exception of the President

Clinton [6]). Indeed, it appears that space policy has been more an integral part of many nation's foreign policy than anything separate and distinct.

After the break-up of the Soviet Union, the US space policy and its space activities continued. This raises a question; what are other international driving forces behind the space exploration and exploitation? One driving force, and likely the most important, is international cooperation. This new approach to space exploration demands empirical analysis of the development of national space expenditures in order to examine and understand the consequences of international cooperation. This article will empirically explore this phenomenon, and employs quantitative methods to investigate issues in space policy. This short paper is the first one that empirically explores this phenomenon and one of very few that employs quantitative methods in space policy.

The central question of this article is; is there an evidence of international space cooperation? In answering this, subsequent questions emerge such as; what are the budgetary consequences of this cooperation? Indeed, the aim of this article is to analyze the transatlantic cooperation between the USA and the European Space Agency (ESA). The empirical analysis focuses on the most developed space cooperation, which has operated for many decades and goes literally beyond the limits of the Inner Solar System. The second part of the article briefly introduces the major achievements of the transatlantic cooperation to illustrate the interconnections of the two parties involved. The third part formally introduces the data and empirical analysis of space cooperation. Finally, the summary of the results in the fourth and

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final part is followed by a discussion regarding the implications for space policy analysis.

## 2. Cooperation time

The flagship of transatlantic space cooperation is the International Space Station (ISS). The ISS is an evolutionary offspring of the Freedom Space Station which was a concept derived during the Cold War. This program was from the very beginning intended to be an international project headed by the USA. European nations as well as Japan and Canada were participating on the Space Station project from its beginning [7]. The main motive behind the project was, however, the competition of the USA and the USSR, even though a certain degree of cooperation was naturally present.

At the end of the Cold War, President Bush introduced the ambitious space policy program Space Exploration Initiative. However, this policy didn't manage to adjust to the new post-Soviet era. With the new era a reformulation of US space policy – Space Station included – was essential. President Clinton however, was averse to any space policy of this scale and focus [8]. Moreover, Clinton wanted to include the Russians to the project of the Space Station [9]. This would transform the US space policy/program from a “competitive” one to the truly “cooperative” one. From the end of the Cold War, space cooperation entered a higher level and interconnections became more intensive. The ISS has been the space “jewel” of this cooperation across the globe. It has served to establish the pillars of a bridge of cooperation between the USA and Europe – and well as other participating parties – in space exploration and exploitation. Indeed, the will for strong cooperation was explicitly stated in the NASA–ESA agreement on ISS [10].

While ISS continues to be the major international space program, other programs have received less media attention, despite being of no less importance. In 1993, the International Rosetta Mission was approved [11]. Further cooperation is witnessed by reference to missions such as SOHO [12], Planck [13] and Herschel Space Observatory [14]. Both agencies run, or have plans to cooperate on missions like Euclid [15], Solar Orbiter [16], Orion Service Module [17], and the James Webb Telescope [18]. More importantly, the plans for future cooperation are much more ambitious and include planetary and moon missions to Europa, the Jupiter System Mission and the Titan Saturn System Mission [19].

Table 1 presents the volume of NASA expenditure on the aforesaid programs included in the transatlantic cooperation as the percentage of the total NASA budget. This data is rough because some of the programs were omitted and the majority of expenditure is spent on the ISS – nevertheless, the trend is obvious. The total NASA expenditure on the programs in the transatlantic cooperation was around \$3.5 billion in the year 2011. This is roughly half of the annual budget of the European Space Agency. ESA as an organization is practically based solely on cooperation. Thus, harvesting the benefits of this cooperation should come naturally.

The transatlantic space cooperation has intensified over recent years as was foreshadowed by John Logsdon [20], and as Table 1 illustrates. So far, only the space race was analyzed in detail. Zervos' analysis [5] proved that space exploration was motivated by international conditions (competition of superpowers) during the Cold War period. However, the competitiveness has been replaced

by a more intensive cooperation after 1993. The cooperation is a logical step in space exploration as there is no obvious need for politics to use space policy primarily as a tool promoting national interests in international relations.

Cooperation erases duplicities, and as a consequence the costs of space activities for the individual state (see for example [11]). Alternatively, more can be done with similar budgets. This further increases economic benefits (a very good systematization of the problem is provided in Ref. [21]). Increasing specialization in space exploration can lead to decreasing unit costs and increased efficiency. As such, the cooperation should eventually lead to a reduction of the agencies' total space expenditures and budgets. Some authors see cooperation even as a tool that might help to boost space programs in the countries where it is currently underdeveloped [9].

However, the increasing importance of cooperation does not mean that space policy programs will not be used in a competitive way anymore. Cooperation between the space superpowers can be difficult. Hilborne [22] pointed out that cooperation with China has to be fragile. Moreover, the recent reaction to the Crimean crisis – towards Russia and its space agency – showed that politics can change space policy from cooperation to competition again at any time.

Summing up, the concept of cooperation can be catalyzed by two major motives – economic and political. If economic motive prevails, cooperation should lead to a decrease in the space expenditures of all involved parties. Erasing duplicities and exploiting the space specialization will save some funds without affecting the goals of space policy or related programs. However, this concept is too simplistic. The consequences of the economic motivation behind cooperation on the observed budget expenditures can be insignificant. The space agency can use the extra funds to enhance the already existing programs or to start new ones. If the political motives prevail the consequences for space expenditures will be unclear. More developed space programs can subsidize the less developed one or the more developed space program can transfer some less complicated activities to the less developed space programs. Hence, the budgetary changes are unclear. It is obvious that the reality of cooperation is much more complicated than the one of competition.

The empirical analysis can therefore aim only at the economic motive and analyze whether cooperation results in the simultaneous reduction of the space expenditures or whether the extra funds are spent elsewhere. Evidence of political motives can be difficult to find in the raw data.

## 3. Space expenditures: modeling cooperation

The time series were compiled using multiple data sources to create sufficiently robust data for the space expenditures in real terms. Space expenditures of NASA and the Department of Defense (DoD) are based on the data available in Air Force Magazine's Space Almanac 2009 [23] and were prolonged using The Space Report 2012 [24] as well as NASA budgets [25]. Time series were adjusted for the inflation using the Implicit Price Deflator of the Bureau of Economics' Analysis [26]. Space expenditures of ESA (SE ESA) were collected using expenditures for the given year provided in Annual Reports of ESA [27]. The ESA time series was also adjusted for the inflation using the Producer Price Index for Eurozone countries [28]. Hence, all space expenditures represent the real expenditures adjusted for the influences of changes in price levels. We opted not to convert the ESA expenditures using exchange rates as our main focus. The focus is not on the comparison of their levels, but on the influence of changes in their development. Space expenditures of the USA (SE USA) are calculated as the sum of space expenditures of

**Table 1**  
Share of the programs with European participation on the budget of NASA.

	2005	2006	2007	2008	2009	2010	2011
% share	10.5%	12.8%	13%	12.7%	13.5%	14.9%	17.4%

Source: budgets of the NASA

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