

A DESCRIPTIVE QUANTITATIVE ANALYSIS OF COMMERCIAL SPACE AND THE SPACE ECONOMY

DOI: 10.17261/Pressacademia.2026.2059

PAP- V.23-2026(7)-p.36-40

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To cite this document

Dirican, C., (2026). A descriptive quantitative analysis of commercial space and the space economy. PressAcademia Procedia (PAP), 23, 36-40.

Permanent link to this document: <http://doi.org/10.17261/Pressacademia.2026.2059>

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ABSTRACT

Purpose- The reason of conducting this study is to provide an overview of the quantitative aspects of research on the rising space economy and commercial space exploration in recent years. With the 77th International Space Congress to be held for the first time in Türkiye, in Antalya, in October 2026, the study is targeting to monitor the current numerical status of academic works in this field.

Methodology - This study uses a descriptive quantitative research approach and descriptive analysis for its aim. The numerical results were obtained as of June 7, 2026, from the most commonly used academic databases such as Web of Science and Scopus, and from academic search engines such as Dergipark and Google Scholar, using relevant keywords.

Findings - The fact that the number of Turkish studies obtained from Google Scholar using the relevant keywords is close to the number of papers submitted from Türkiye to the 77th International Space Congress held in Antalya (with the accepted number being about one-third) is a significant finding indicating that studies on space economy and commercial space, particularly in Türkiye, are at an insufficient level. Indeed, the figures received from Dergipark strongly support this. In foreign publications, the similar levels of Scopus, WoS, and Google Scholar figures suggest that the studies received from all these indexes and search engines may be overlapping studies, and again, despite the importance of the subject, the number of studies on a global scale is low.

Conclusion - As expected, searches on the most widely used academic search engines and index databases using keywords related to space economy and commercial space did not yield many results, particularly for Turkish studies. The fact that the number of Turkish studies was close to the total number of papers submitted from Türkiye to and accepted at the 77th International Space Congress is seen as both a deficiency and an opportunity for the development of this subject in Türkiye (International Astronautical Federation, n.d.). Although engineering, astrophysics, astronomy, and aviation come to mind first when space is mentioned, the subject is now of greater importance in terms of business, finance, accounting, and economics. With the interest and entry of the private sector into this field, an era has begun in the social sciences where many books need to be rewritten and theories and rules need to be reviewed. The simplest example is that concepts such as specific gravity and interest rate will call into question all financial and economic theories with relativity. In JEL codes, it is necessary to create codes and sub-codes for space economics and astroeconomics. In Türkiye, The Council of Higher Education (YÖK) should facilitate the opening of new departments in this field, just as it has done in artificial intelligence. Therefore, Astroeconomics and Space Economy (Space Economics), primarily in finance and economics, will become a new major discipline in the social sciences.

Keywords: Space economy, commercial space, space accounting, new space, space industry, astroeconomics

JEL Codes: B59, O30, R42

1. INTRODUCTION

Space has fascinated humanity throughout history. Following the first human flight by Hezarfen Ahmed Çelebi and the subsequent developments with the Wright Brothers, the journey into space by the Russians first cosmonaut and then the US landing on the Moon during the Cold War marked the beginning of the space economy. Studies in astronomy, astrophysics, and astrobiology now necessitate a re-examination of space within the social sciences, primarily economics and finance.

The space economy (space economics and Astroeconomics), encompassing economic and commercial activities under headings such as commercial space and new space, continues to be discussed under subheadings like space mining, space tourism, sustainability in space, and space debris. Currently, with the human-made Voyager 1 and Voyager 2 missions having already ventured outside the Solar System, space economy research remains primarily focused on the International Space Station, the Moon, and Mars, as well as areas around and near the Karman Line within the Solar System.

While space economy primarily addresses technical and engineering aspects such as rockets, GPS, launches, and orbits, it has gained importance in terms of its economic and financial dimensions, particularly after 2008, with the addition of commercial companies that accelerated their growth following the contraction of public budgets. In subsequent stages, with the possibility of venturing beyond the Solar

System, the beginning of space colonization, and space tourism and mining gaining a galactic dimension, the subject will no longer be limited to Earth, necessitating a new definition and title. This is where "Astroeconomics" will come into play, a more comprehensive and broader term like Astrophysics and Astrobiology. Studies conducted and to be conducted in the social sciences regarding these new phenomena and events will contribute to the formation and concretization of new concepts, as well as help resolve potential conceptual confusion.

Considering that SpaceX, the most popular commercial space company during the period of this study, made history with its \$75 billion IPO, the biggest and most fundamental question is how to apply existing financial and economic theories and formulas to space beyond the atmosphere. Is the current valuation of SpaceX, based on this \$75 billion IPO, at \$1.75 trillion a valuation error? There is no need to discover a new formula for company valuation, but it is necessary to consider the appropriate one from the existing ones. Among the initial discussions, it is possible to determine the value of space companies by discounting dividend payments and valuing orbital activities through free cash flows (Haaker, 2026).

A study examining whether this valuation of \$1.75 trillion is realistic, considering discounted cash flow, comparable companies, and cost of capital, states that it is not feasible because many space companies comparable to SpaceX are not publicly traded, and that operational activities have been overly optimistically assessed. In this context, it is suggested that such a high valuation could be realized through ETF impact, inclusion in indices, and portfolio diversification (Wagner, 2026). In here, it should be reminded that the valuation of SpaceX in 2026 is almost equal to the market volume expected in 2035 by some space related reports.

Dirican (2018) wrote that interest calculations in space should be considered differently due to the rotation speed of planets around their own axes and relativity, that the situation would change with reaching the speed of light, and that commodity pricing, especially in futures markets, should be considered differently due to gravity and weights.

Indeed, Krugman (2010) discussed same concepts such as the speed of light and the Gemini Paradox, as well as which interest rate should be calculated in financing interstellar trade, in a humorous article (He wrote his article in 1978 while he was an assistant professor, but the original peer-reviewed publication was in 2010).

This study tries to discover the current state of academic literature on the so-called "new space", "space economy" and "commercial space" exploration. The goal is to identify the number of national and international publications in selected indexes and databases using the most frequently encountered keywords, and to create an archival record in space-time. The findings highlight that academic research lags behind the pace of commercial development.

2. LITERATURE REVIEW

Accordingly, some important definitions regarding the basic headings related to the subject are as follows. The aim of this study is to show the current environment of the literature as of the date of the study, based on these general definitions and concepts.

The space economy brought together all activities and utilization of the resources that can provide added value and beneficial outcomes for humanity in the process of exploring the space, understanding and managing it, and exploiting from its potential. It includes all space-related outputs such as products and services, from innovation and R&D activities in the public and private sectors to manufacturing, ground stations, launches, satellites, meteorology, and satellite phone applications (OECD, 2022).

Commercial space is a concept generally subject to debate regarding the definition and scope of the word "commercial." Nevertheless, it can be defined as follows: *"Private equity is the primary risk-taker among products and services for space, customers other than states are involved in the activity and trade, the entirety of commercial activities determines the dynamics of the overall market, and the leadership and determinants of these activities are held by private sector companies"* (Davidian, 2020).

Space mining is the commercial operation encompassing the search for, extraction, launching, and processing (in situ, en route, or on Earth) of minerals or elements that are found or detected in limited quantities on Earth, located on celestial bodies, different planets, the Moon, and other stars. These activities are undertaken with the aim of establishing and sustaining colonization in space and further exploring the universe (Modell, 2025).

Space accounting is a subfield of accounting that examines the role of the corporate dimension of activities conducted in outer space within the accounting field. Following definitions related to the space economy, Alewine explored the challenging effects of space-specific conditions such as gravity and distances from a financial or management accounting, tax, and audit perspective (Alewine, 2020). The world's first congress on space accounting took place in Gaziantep, Türkiye on December 5-7, 2025 (Dirican, 2025; uzaymuhasebesi.com, 2025).

Space tourism is when people fly into space, either at their own expense or on behalf of other companies, for recreational or commercial purposes, over the Karman Line (Von der Dunk, 2011). Understanding the psychology of the space tourist (tourism) will also help to understand the market and its developments (Mehran, Olya, & Han, 2023).

New Space refers to space programs that accelerated during the Cold War and were primarily conducted by state space agencies, but are now carried out through innovative R&D efforts and with broader commercial participation by private companies and public-private partnerships (Ferrara, Cicconi, Minotti, Trovato, & Caputo, 2025).

In summary, the numerical data on the space economy in 2024 was €122 billion in the public sector and €7 billion in the private sector worldwide. The EU's share in the public sector is around 10% globally, while the private sector is around 20%. The ratio of the public space budget to the economy is still at the level of one-tenth of a percent, with the US leading the way, followed by Russia, Luxembourg, Japan, France, and China (ESA, 2025). According to a World Economic Forum report (prepared jointly with McKinsey), the size of the space economy

will reach \$1.8 trillion in 2035, and the sector, which will grow at a rate exceeding the global growth rate, will have a significant share and revenue weighted by the private sector (WEF, 2024).

3. DATA AND METHODOLOGY

The study's methodology is descriptive (cross-sectional) quantitative research; frequency and numerical data were examined using descriptive analysis methods.

In qualitative descriptive research, quantitative data can be included in the study if they help explain a phenomenon (Colorafi & Evans, 2016).

Conducting descriptive studies are done to understand and to see the distribution of one or many variables without considering any causality or hypothesis. Types include case reports as well case series, the other two forms are cross-sectional and ecological studies. Cross-sectional studies aim to gather information about the presence, level, or outcome of one or more variables; when conducted to determine their distribution, they are considered descriptive (Aggarwal & Ranganathan, 2019).

The data was obtained from queries made to relevant academic databases as of June 7, 2026. Queries were conducted using the following keywords in Scopus, Web of Science indexes, Google Scholar, and Dergipark search engines. These indexes and databases were chosen because they are among the most frequently used in academic research, in Türkiye's as well.

The number of relevant keywords should be considered as a limitation of the research; naturally, more keywords will yield more results. Similarly, even when queries are made with the same keywords at different times, different numerical results will be obtained. Numerical data are presented as frequencies and generally as the top 3 entries in the relevant descriptive headings. Due to time constraints, different research methods such as bibliometric analysis and text mining were not used in this study. Therefore, it is natural to obtain different results. Similarly, it is possible to obtain different results in the YÖK National Thesis Monitoring Center or other databases and indexes.

4. FINDINGS

The following keywords were used in this study. These keywords were selected by the author from the most commonly used terminology in current space activities. The author also drew ideas from his newspaper articles and his previous academic work on this subject. The author is currently the owner of the "Astroekonomist" trademark in Türkiye.

The keywords "space economy", "commercial space", "space accounting", "astroeconomics", "space mining", "space tourism", "space ecosystem", "space entrepreneurship", "space industry", and "new space" have been used in relevant indexes and search engine for getting the current figures.

In Google Scholar's advanced search section, under the "containing any of the keyword patterns" option, 1,130 results were obtained for Turkish studies where these keywords appeared anywhere in the articles; 997 of these were from after 2000, and 27 of those that appeared in the article title were predominantly related to space tourism. For foreign publications, 17,200 results were returned based on text and 6,850 based on article title.

Scopus's advanced search yielded 19,350 returns under the heading "title, abstract, and keywords."

Dergipark's advanced search yielded 43 article returns under the heading "abstract." Due to the low number, there was no need to perform separate searches between article titles and keywords.

Advanced searches on the Web of Science search engine yielded 12,116 returns (1,022 of which were in the business and economics field) under the "subject" heading and 2,136 returns (285 of which were in the business and economics field) under the "heading" tab, primarily from institutions such as the USA, China, and the UK, as well as NASA and ESA.

The results show that there is a lack of research in both national and international literature. Naturally, this number will increase day by day. Especially after SpaceX's IPO, there will be more research specifically on financial markets, and it will be possible to increase studies on multi-criteria decision-making methods, panel data, and time series analysis, etc. among space companies, and to compare them with other (stock) indices and other sectors and companies.

In this way, as national statistics on the space economy increase, similar to private sector data, more integrated and cross-referenced analytical and econometric studies will become possible. Establishing statistical infrastructure in Türkiye, primarily in the Istanbul Stock Exchange and other databases related to the Turkish Statistical Institute (TÜİK), will be a significant gain for national academic literature and research (Dirican, 2022).

5. CONCLUSION

In foreign publications, the fact that the results for the title, abstract, and keywords of the study are very similar across three different platforms indicates that there is still a long way to go in terms of foreign publications. This finding is supported by the fact that the number of titles alone in these foreign studies is still around 2,000, that the publications mainly originate from leading space agencies rather than universities, and that the number of entries in business/economics topics remains low. For Turkish findings as well, the number of works is comparatively low and needs to be boosted by encouraging space-related social science research.

The limited number of space-related institutes in the world (usually graduate-level) need to be supported by opening undergraduate programs. The recent actions taken by the Council of Higher Education (YÖK) regarding artificial intelligence should also be rapidly reflected in space-related programs especially in social sciences. On the other hand, there are currently no equivalents in AEA JEL codes for the main

headings of space economy, astro-economics, space mining and space tourism, and commercial space, as well as their numerous sub-disciplines in business, finance, public sector, private sector, accounting, labor market, etc.

While there is still no complete consensus in the literature regarding definitions and scope of the space economy and its sub-categories, studies in this area will serve to clarify the framework for space and help achieve agreement on definitions. Increased research in this area will facilitate the measurement of the space economy, particularly its size. In later stages, this will provide a foundation for research enabling the calculation of interest rates (return on investment, futures contracts, depreciation, aging, rediscounting, etc.), national statistics, accounting, and taxation not only on Earth but also in outer space.

In outer space, within the realm of relativity, the different orbital motions of different planets, considering variables such as the speed of light, the weight of matter, and gravity, present a fundamental difference in how financial transactions are handled and accounted for, and how they are evaluated in light of concepts such as information asymmetry and the (accounting) periodicity principle. It is evident that the fundamental assumptions in economics, such as the optimal use of limited resources and inflation, necessitate a new economic understanding in the face of the uncertainties within the ever-expanding infinity of the universe. Therefore, it is possible to foresee that the space economy, currently shaped by activities below the atmosphere, will evolve into the science of Astroeconomics in the future, taking its place among concepts such as Astrophysics and Astrobiology.

In light of all this summary information, it has become clear that encouraging research in the social sciences, and especially in business, economics, finance, and accounting, on space economy and commercial space is both an opportunity and a necessity for the development of the business dimension of the ecosystem, as well as its technical dimension together with its (space) policies and securities.

ACKNOWLEDMENT

This study draws upon the author's own news reports and columns—published at various times in the “Dünya” and “Şalom” newspapers—as well as their academic work on similar topics, utilizing the general ideas found therein. During the translation and literature search phases, support was obtained from Google Translate and Google AI tools; however, the design and writing of the study rely entirely on the author's original interpretations and phrasing, with the author maintaining oversight regarding the authenticity of sources and the originality of the text. This study does not require ethics committee approval.

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