Indian Institute of Technology Bombay

AE 6103
Introduction to Space Technology

Global Space Industry: Present and Future

Ravi Kumar
210010052

Course Instructor: Prof. T. Chandra Sekar

Contents

1 Introduction

Space industry refers to economic activities related to manufacturing components that go into outer space (Earth's orbit or beyond), delivering them to those regions, and related services.[1] More broadly, the space industry can be described as the companies involved in the space economy and providing goods and services related to space.[2]

1.1 Space Economy

The Space Economy is defined by OECD as the full range of activities and the use of resources that create value and benefits to human beings in the course of exploring, researching, understanding, managing, and utilising space.[3] The Space Economy is experiencing growth and transformation in tandem with advancements in the space sector and its deeper integration into society and the economy. Currently, the existing space infrastructure facilitates the emergence of novel services, thereby enabling the exploration of new applications across various sectors such as meteorology, energy, telecommunications, insurance, transportation, maritime operations, aviation, and urban development. This fosters additional economic and societal benefits. Not only is the space sector expanding on its own, but it also serves as a crucial driver of growth in other sectors.[4]

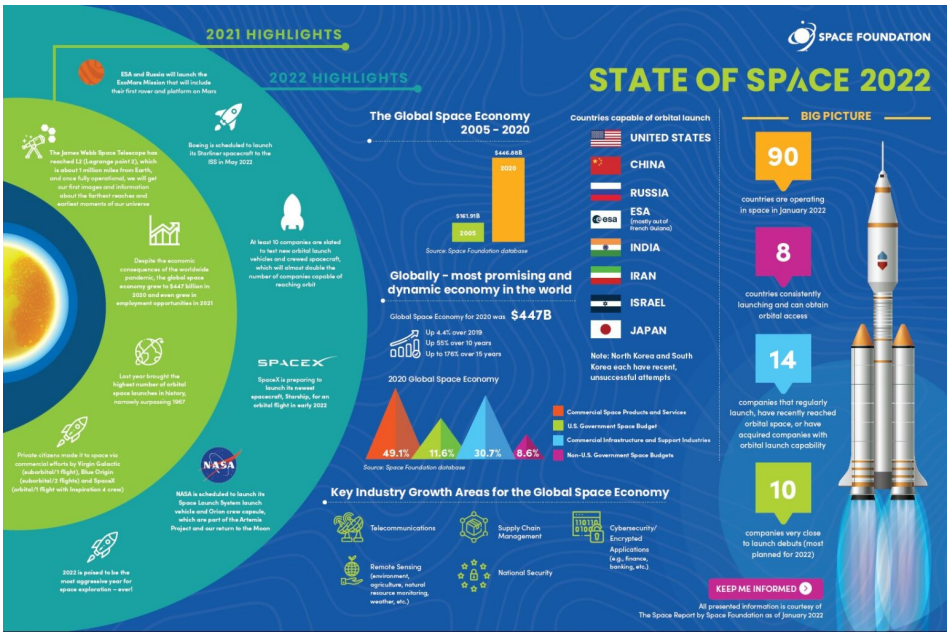

Figure 1: Key Factors in the Global Space Industry

2 Literature Review

Table 1 contains estimates of the size of the space economy taken from various recent publications. According to some financial estimates, the space economy may surpass USD 1 trillion by 2040. The estimates are based on different methodologies and assumptions, and the differences between them are significant. The great discrepancy in estimates is therefore largely due to the use of different definitions and delimitations of the space economy. In particular, the inclusion or exclusion of services supporting consumer markets such as direct-to-home television, and consumer applications relying on global navigation satellite systems (GNSS) signals, etc.

Organisation	**Recent Estimates (2016)**	**Forecasts (2040)**
Satellite Industry Association	USD 339.1 billion	n.a.
Morgan Stanley	USD 350 billion	USD 1.1 trillion
Merrill Lynch/Bank of America	USD 350 billion	USD 2.7 trillion
Space Foundation	USD 329.3 billion	n.a.
Institute for Defense Analyses	USD 166.8 billion	n.a.

Table 1: Source: OECD

2.1 Role of the government sector in space economy

The government sector plays a key role in the space economy as investor, developer, owner, operator, regulator and customer. National agencies, research centres and laboratories also perform space R&D and, in some cases, have a manufacturing role (e.g. India, Korea). The bulk of their funding tends to be public, but they may also receive private financing via contracts and licensing arrangements etc. The international classification of actors involved in R&D, as described in the Frascati Manual, is often used to gather comparable data concerning the R&D activities of governments.

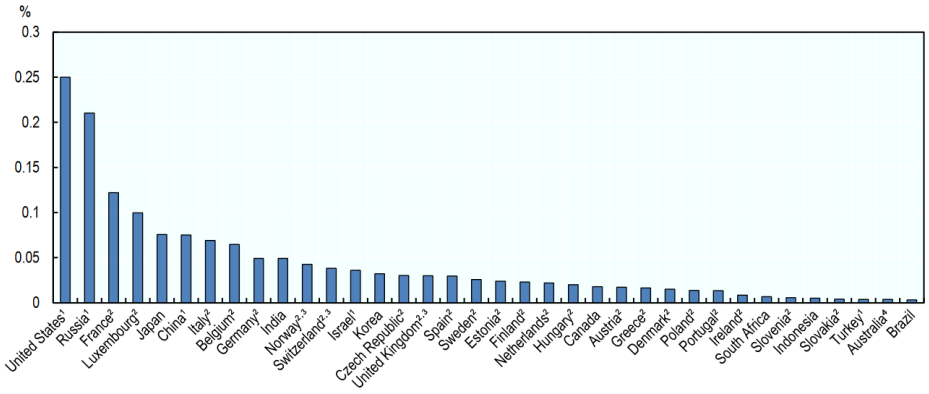

Figure 2: Measured as a share of GDP in 2020

Figure 2 shows the share of GDP spent on space activities in 2020. The United States, Russia, and France are the top three countries in terms of space spending as a share of GDP. The United States is the largest spender on space activities, accounting for 0.25% of its GDP. Russia and France are the second and third largest spenders, accounting for 0.22% and 0.12% of their GDP, respectively.

2.2 Global Space Interests - Trends and Forecasts

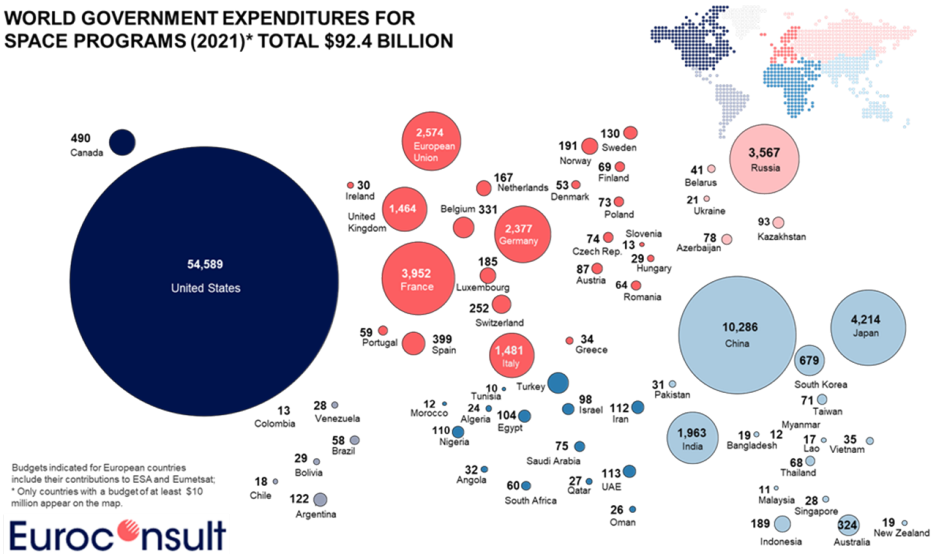

Figure 3: Space Expenditures of countries in 2021

Figure 3 shows the space expenditures of countries in 2021 while Figure 4 shows the gross domestic expenditure on space R&D by sector in a developing country like Korea.

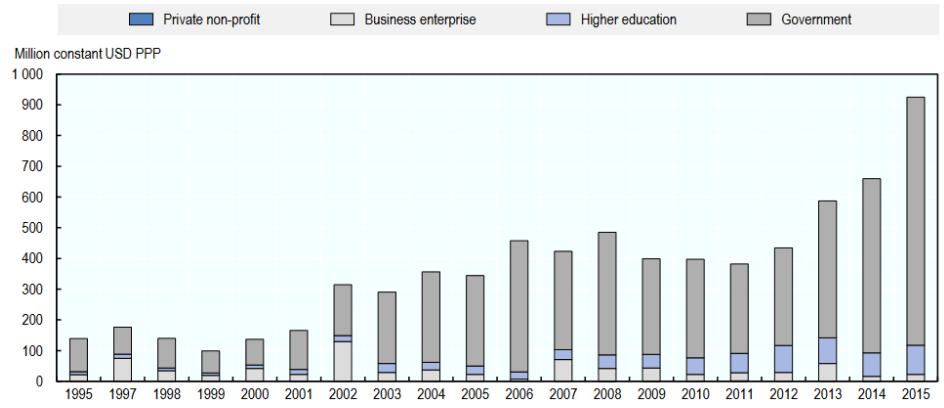

Figure 4: Gross domestic expenditure on space R&D by sector in Korea

Countries like India, China, and Korea are increasing their space spending, and the space economy is expected to grow significantly in the coming years. According to

IN-SPace in this report [5], the space economy of India is expected to grow to USD 44 billion by 2033, with about 8% of global share.

3 Observations

In today's race to space, countries seem to be coming together to work on global problems in space. The space industry is expected to grow significantly in the coming years, and the space economy is expected to reach USD 1 trillion by 2040. While the government sector plays a significant role in the space economy, private space companies are a booming industry, especially in countries like India, China, and Korea.

- The United States and Japan and their private moon landings [6].
- SpaceX, Blue Origin, and other private space companies are leading the way in space exploration and are expected to play a significant role in the future of the space economy.
- Lunar exploration is expected to be a significant part of the space economy in the coming years, with countries like India having ambitious plans like the Chandrayaan-3 mission.

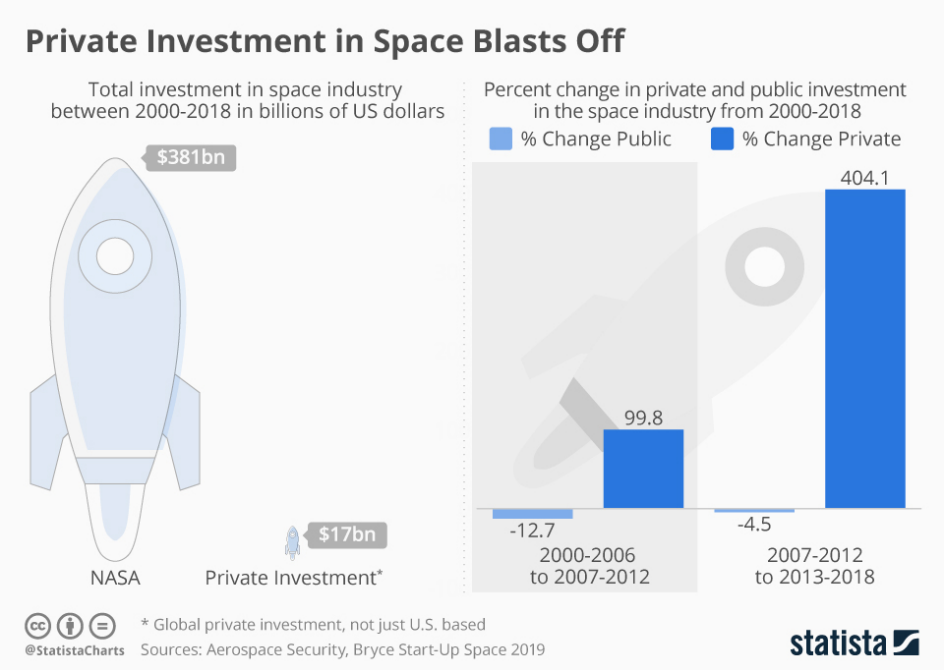

Figure 5: Investment in Private Space Companies

4 Conclusion

References

[1] Joan Lisa Bromberg (October 2000), NASA and the Space Industry

[2] Kai-Uwe Schrogl (2 August 2010), Yearbook on Space Policy 2008/2009: Setting New Trends

[3] OECD Handbook on Measuring the Space Economy

[4] What is the Space Economy? [Oct/2019] European Space Agency

[5] IN-SPACe unveils decadal vision and strategy for Indian space economy [Oct 2023] The Hindu

[6] U.S. and Japan spearhead new era of private moon landings