

Introduction

The *Space Economy at a Glance* provides a quantitative, internationally comparable view of not only the space sector itself, but also its broader role in the economy and society. This 2011 edition brings together published and unpublished data and statistics from official and unofficial sources, as well as from OECD databases that cover a wide range of space applications, public space budgets, space sector revenues, trade in space products and space patents to name but a few, in order to illustrate the economic and societal impacts of space-based activities.

Defining the space economy

Space technologies are increasingly an important part of everyday life. Weather forecasting, air traffic control, global communications and broadcasting – these and many other essential activities would be almost unthinkable today without satellite technology. But despite the growing number of countries developing space systems and applications, internationally agreed definitions for statistical terminology on space activities do not yet exist.

The space sector. According to OECD classifications, there are nine main product groups of high-technology: 1) aerospace; 2) computers and office machines; 3) electronics and telecommunications; 4) pharmacy; 5) scientific instruments; 6) electrical machinery; 7) chemistry; 8) non-electrical machinery; and 9) armaments (Hatzichronoglou, 1997). The space sector is embedded into these wider high-tech sectors, mainly in aerospace, with segments in electronics and telecommunications and even armaments, since rockets are considered as weapons (*i.e.* missiles) in most countries (OECD, 2007).

The current edition of the United Nations International Standard Industrial Classification (ISIC Rev. 4 released in August 2008) includes most parts of the space sector under different aggregate categories. There is no specific “space activity” classification in the ISIC, and disentangling the space sector from the larger aerospace and defence sectors remains a challenge in most countries. This is also true for other international classifications, such as the Central Product Classification (Version 2) or the Harmonised Commodity Description and Coding System (HS) of the World Customs Organization (OECD, 2011).

At national and regional levels, some countries go further in identifying space products and services as economic activities, by adding more digits to the general international codes. But this causes discrepancies when trying to compare the data internationally. This classification problem, often found for emerging economic sectors, is however not new. Already in the late 1960s, at the beginning of the space age, the general “missiles and spacecraft” statistical category was identified as causing methodological difficulties in the United States when trying to assess aerospace prices over time because of the heterogeneity of the products covered in the single category (Campbell, 1970).

One interim solution is to build on existing codes to advance international comparability. This could be done by encouraging statistical rapprochement between selected countries, using the same lower digits codes and definitions, and gathering data via common industry surveys using the same key questions. Such efforts could be spearheaded by the private sector, particularly via aerospace industry associations agreeing on a number of key definitions. Co-operation in that area is increasing via the OECD Space Forum's activities, for example via the regular meetings of "the space economy" technical committee. This committee was created in 2008 with the International Astronautical Federation to tackle the issue of comparability of economic data on the space sector. Ultimately, a move to change international classifications for an increasing number of space activities could contribute to more clarity. This already occurred during the ISIC Rev. 4, which created a new and separate ISIC Class specifically for satellite telecommunications activities.

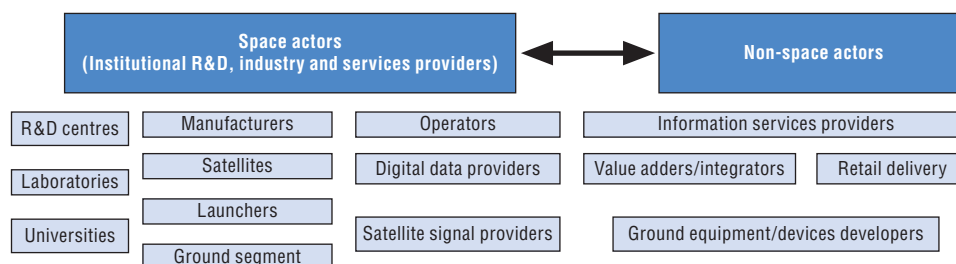
The wider space economy. Trying to better identify statistically the different space applications has thus become an important theme, as the space sector has been spurring more commercial activities outside its traditional research and development (R&D) scope over the years. Activities include specific information technology products and services, such as GPS receivers, satellite television and even investments in new tourism-related activities (e.g. space-related amusement parks, suborbital flights).

This wider "space economy" can be defined using different angles. It can be defined by its products (e.g. satellites, launchers...), by its services (e.g. broadcasting, imagery/data delivering...), by its programmatic objectives (e.g. military, robotic space exploration, human spaceflight, earth observation, telecommunications...), by its actors/value chains (from R&D actors to users), and by its impacts (e.g. direct and indirect benefits). One drawback is that narrow definitions might ignore important aspects, such as the R&D actors (e.g. labs and universities), the role of the military (i.e. as investor in R&D budgets and a customer for space services), or ignore scientific and space exploration programmes altogether.

The OECD Space Forum members established that the space economy should not be limited to only a few characteristics because of the growing pervasiveness of space applications in many daily activities (meteorology, telecommunications...). Using lessons learned from other sectors (the information society notably), a broad definition of the space economy seemed appropriate to encompass the different dimensions of programmes, services, actors. The proposed working definition below represents the starting point of this publication:

The space economy is the full range of activities and the use of resources that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilising space. Hence, it includes all public and private actors involved in developing, providing and using space-related products and services, ranging from research and development, the manufacture and use of space infrastructure (ground stations, launch vehicles and satellites) to space-enabled applications (navigation equipment, satellite phones, meteorological services, etc.) and the scientific knowledge generated by such activities. It follows that the space economy goes well beyond the space sector itself, since it also comprises the increasingly pervasive and continually changing impacts (both quantitative and qualitative) of space-derived products, services and knowledge on economy and society.

Thus, the space economy is larger than the traditional space sector (e.g. rockets and satellites) and it involves more and more new services and product providers (e.g. geographic information systems developers, navigation equipment sellers) who are using space systems' capacities to create new products. However the unique capabilities

Figure 0.1. **The space economy's simplified value chain**

offered by satellites (i.e. ubiquitous data, communications links, imagery...) represent often only small, albeit essential, components of those new products and services (see Figure 0.1).

As a consequence, the space economy concept helps capture the space sector's derived products and services. But one should be careful not to extend this concept so wide as to lose the space "link" and risk overselling the space sector's socio-economic impacts. As the space economy overlaps with many fields, more methodological work is ongoing to illustrate in greater detail space economy-related services.

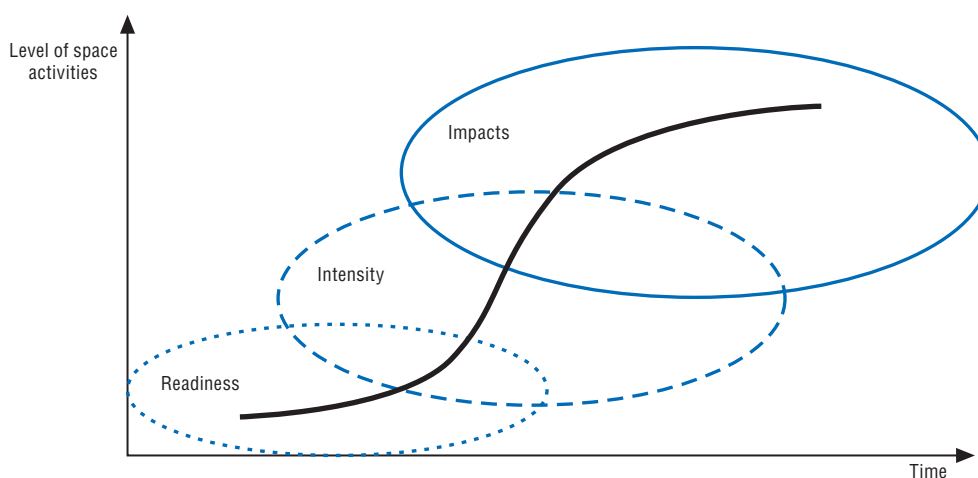
What is new in the publication?

This publication is an updated and more comprehensive version of *The Space Economy at a Glance* (2007), the first OECD statistical overview of the emerging space economy. This version provides not only new indicators and statistics, featuring both official and private data, but also a strategic outlook for the space sector, identifying key issues for the future. The new items featured in this publication include:

- **More data sources.** More official sources are collected in this edition, with more OECD calculations to facilitate international comparisons when possible.
- **Wider geographical coverage.** The figures cover many countries, and for first time include official statistics and new OECD calculations concerning the Brazilian, Indian, Israeli and Chinese space programmes.
- **More topics.** Key issues for decision makers and analysts are covered in this edition: the role of the space sector as a potential source of economic growth; the evolutions of a skilled workforce in such a high-tech sector; the impacts of international technology transfers, particularly between OECD and Brazil, the Russian Federation, India and China (i.e. the BRIC countries); and the role of military space.
- **Methodological tools.** In addition to new figures that have been integrated into the publication to facilitate analysis, an OECD Working Paper is being published as a *Guide to Measuring the Space Economy at a Glance*. This paper provides readers and analysts with more information on methodological issues concerning indicators on the space sector (e.g. discussions on industrial classifications).

Structure of the publication

The publication features a strategic outlook for the space sector, identifies key issues for the future and provides statistics and indicators on the space economy. The data based on official and private sources are presented in a framework that consists of three stages: readiness (inputs), intensity (outputs) and impacts. Each stage provides an indication of the maturity of the sector. The diagram below illustrates the different steps from readiness to impacts.

Figure 0.2. **The different phases of development of the space economy**

The publication consists of six chapters:

1. The first chapter of the publication provides a prospective view of the space sector, featuring some key issues that will shape its future. It includes: the growth and impacts of international technology transfers in mapping a new world of space powers; the role of commercial actors; the evolution of a skilled workforce in the space sector; and the development of new technologies and innovative applications on the horizon.
2. The readiness factors (inputs) of the space economy consist of the overall technical, commercial, human capital and financial infrastructures necessary to engage in pertinent space activities. This chapter deals with the financial and human resources that are employed in producing space-related hardware and the provision of relevant services. It examines R&D, financial support for space programmes and human capital.
3. The intensity factors (outputs) of the space economy describe the use that is made of space activities. The outputs refer to the specific space-related outcomes that are derived from the inputs. Thus, outputs may include products or services that are produced or provided in the realm of the space sector, such as the number of space launches or the number of space exploration missions. They also include the benefits to industries/nations, including financial benefits (sales and trade revenues) and indications of future financial benefits (*i.e.* patents).
4. The impacts of the space economy, which are difficult to measure, consist of the “societal value-added” created by space activities. Examples provided are of benefit to society as a whole, but also cost efficiencies derived from space products and services.
5. The spotlights on selected countries offer some insights into the space-related activities of member countries participating in the OECD Forum on Space Economics and other countries. Data come from their official sources (such as national space agencies or statistical offices) as well as private sources. In this section, direct comparisons between countries are not always possible due to definitional, conceptual and methodical differences.
6. The final chapter on the aerospace sector provides the wider context from which the space economy has emerged. It also highlights the importance of future endeavours to separate the aircraft and spacecraft industry components for more meaningful official data.

Data sources

The *Space Economy at a Glance* builds on both official and private sector statistics:

- OECD databases and reports, which provide the most international comparability;
- official statistics, which consist of data from national statistical offices, national space agencies and other governmental departments; and
- private data sources, which include industry associations and consulting firms.

The quality of available measures and comparable data for the space economy varies strongly for the input, output and impact stages. Some official statistical data are available for the readiness (input) factors (although not always readily comparable) and the intensity (output) factors, but these need to be supplemented by private data sources (e.g. industry surveys for revenues of the space sector). There are relatively less data on impacts, although the number and quality of datasets have improved since the early 2000s, as more countries study the impacts of their respective space sector on the wider economy. In order to provide a better indication of the state of the space economy, more work on the concepts and definitions for the space sector and the larger space economy is needed. This calls for significant international co-operation, and the OECD Forum on Space Economics is working with the space community to provide a platform for such work.

References

- Campbell, H.G. (1970), *Aerospace Price Indexes*, RAND Corporation, Report prepared for the US Air Force, Washington DC, December.
- Hatzichronoglou, T. (1997), "Revision of the High Technology Sector and Product Classification", *OECD Science, Technology and Industry Working Papers*, OECD Publishing, 1997/2, Paris.
- OECD (2007), *The Space Economy at a Glance 2007*, OECD Publishing, Paris.
- OECD (2011), "Measuring the Space Economy: A Guide", OECD Publishing, Paris (forthcoming).



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