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OECD Global Forum on Space Economics

10 (e): The Space sector and international trade - A OECD/SG/AU report

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OECD GLOBAL FORUM ON SPACE ECONOMICS: THE SPACE SECTOR AND INTERNATIONAL TRADE

1. Globalisation of the economy can be seen in a large number of sectors, including domains linked to strategic government-funded activities - sometimes almost unexpectedly - like in the case of space applications. Historically born in the larger aerospace and defence sectors, civilian space products and services have developed their specific value chains over the past decade, with very successful societal and commercial downstream applications (e.g. satellite communications, meteorology, GPS). This paper presents recent work conducted by the OECD Global Forum on Space Economics, with excerpts from the upcoming publication *The Space Economy at a Glance*, with a particular focus on trade issues. Comments by delegates on possible interactions with OECD and external statistics research activities are welcome, particularly on possible improvements to international trade statistics with links to the space sector.

1. Introduction

2. Research on space-related statistics is conducted by the OECD Global Forum on Space Economics, hosted by the International Futures Programme (IFP), a forward-looking multidisciplinary group within the OECD. The IFP mission is to alert the Secretary-General and the Organisation to emerging issues by pinpointing major developments and analysing long-term concerns in order to help governments map their strategy.

3. In 2002, in collaboration with the space community, the IFP launched a project to explore how space technologies could potentially contribute to finding solutions to some of the major challenges facing society. Two publications resulted from that in-depth project. *Space 2030: The Future of Space Applications* (OECD, 2004) explored promising applications for the 21st century. *Space 2030: Tackling Society's Challenges* (OECD, 2005) assessed the strengths and weaknesses of the policy and regulatory structures that govern space and formulated a policy framework that OECD governments might use in drafting policies to ensure that the potential offered by space is fully realised.

4. Upon completion of the two-year project, there was strong encouragement from a number of institutions, especially space agencies, for the OECD to continue exploring the economic dimensions of space infrastructure. In February 2006, the OECD Global Forum on Space Economics was launched, hosted as a voluntary Forum by the IFP. The Forum is an innovative platform for international dialogue on the social and economic aspects of space activities. It is supported by voluntary contributions from a number of OECD governments and space agencies.¹

1. As of August 2007, the Space Forum's Steering Group participants are the Agenzia Spaziale Italiana (ASI), British National Space Center (BNSC), Centre National d'Etudes Spatiales (CNES), Canadian Space Agency (CSA), European Space Agency (ESA), National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), Norway Space Center (NSC), and the U.S. Geological Survey (USGC).

5. The OECD Global Forum on Space Economics aims to provide evidence-based analysis to assist agencies and governments in shaping policy. One of the first tasks the Forum embarked upon was the collection and production of a set of basic data providing a quantitative picture of space-related activities in the OECD area and beyond.

6. The upcoming publication *The Space Economy at a Glance* is the first output of this exercise, presenting compilations of statistics on the space sector and its contributions to economic activity. As the first OECD statistical overview of the emerging space economy, *The Space Economy at a Glance* offers critical insights into some of the main problems involved in deriving internationally comparable data for the industry and its downstream activities. Much remains to be done to develop a universal, data-driven methodology to measure the space sector, but this publication represents an important first step in data collection. It also examines the conceptual and definitional differences amongst countries that will have to be tackled to make objective international comparisons possible.

2. Basics on “the space economy”

7. An increasing number of countries are developing space systems and applications, but internationally agreed definitions for statistical terminology on space activities do not yet exist. The current edition of the United Nations International Standard Industrial Classification (ISIC Revision 3.1) includes most parts of the space sector under different aggregate categories. Indeed, there is no specific “space activity” classification in the ISIC, and disentangling the space sector from the larger aerospace sector remains a challenge in many countries.

8. The OECD Space Forum defines the emerging space economy as: *“All public and private actors involved in developing and providing space-enabled products and services. It comprises a long value-added chain, starting with research and development actors and manufacturers of space hardware (e.g. launch vehicles, satellites, ground stations) and ending with the providers of space-enabled products (e.g. navigation equipment, satellite phones) and services (e.g. satellite-based meteorological services or direct-to-home video services) to final users.”*

9. Estimates of the size of the space economy vary considerably, due the lack of internationally comparable data. Worldwide, trends in institutional budgets (around USD 45 billion in 2005 for OECD countries) and new commercial revenues from space-derived products and services (around USD 110-120 billion in 2006) indicate that the underlying trend in the space economy is one of growth. And this remains true, despite the cyclical nature of commercial space activities (e.g. regular replacement of telecommunication satellite fleets).

10. Downstream space activities (applications) are often much larger than the traditional upstream segment (manufacturing). In 2006, manufacturing revenues (e.g. building satellites, rockets) were estimated at around USD 12 billion and space-related services (e.g. direct to home satellite television, GPS) were estimated at more than USD 100 billion. As for human resources in the space industry, data are very fragmented; but an estimated 120 000 people in OECD countries are employed, mostly in upstream sectors in 2006.

11. Capital stocks, as well as annual levels of investment, for space assets are very difficult to estimate; however focusing on satellites’ values, a 2005 study estimated that the 937 satellites in the Earth’s orbit at that time had a replacement value of USD 170 to 230 billion.

12. Finally, patent data are considered an indicator of technological innovation and the economic vigour of a given sector. Between 1990 and 2000, the number of space-related patents tripled both in Europe and the US, with the US, France, Germany and Japan accounting for a major portion.

3. The space sector and international trade

13. Although not many space products and services are fully commercial (i.e. most are strategic in nature and not freely traded), the Forum has started to explore a number of avenues to track space-related trade, as a parallel effort with existing data on commercial applications markets, which are often coming from private sources (industry associations, consulting firms).

14. The exports of two commodity groups with significant space components were examined from the International Trade in Commodity Statistics (ITCS) database, defined in detail below. Exports are those of OECD countries. Trying to determine what exactly constitutes trade in space-related commodities can be complicated. Nevertheless, the two commodity codes employed clearly indicate “space-related” elements: (1) HS880260 (“Spacecraft, including satellites, and suborbital and spacecraft launch vehicles”); and (2) HS880390 (“Parts of balloons, dirigibles, and spacecraft not elsewhere specified”). The estimates from those commodity codes include therefore more items than just space products.

15. Statistics on the quantity and markets for exports of OECD economies come from the ITCS database jointly managed by the OECD and the United Nations.² It includes details on imports and exports for all UN member states. The OECD is responsible for the collection of statistics related to its Member countries, and the UN for all others. Exports from these two commodity classifications are those of OECD countries to all countries of the world (both OECD and non-OECD Member countries).³ All statistics are presented in current US dollars, by converting domestic currencies using annual trade-weighted aggregates of monthly exchange rates.

16. Data for 2004 from OECD Member countries reveal that exports of space products are dominated by a few major countries, with the G7 accounting for 91%, and the US, France and Germany alone accounting for 71% (Figure 1). Total space exports in 2004 fell by 13% compared with 2003, to USD 3.74 billion. While exports of “Spacecraft, including satellites, and suborbital and spacecraft launch vehicles” (ITCS category HS880260) rose by USD 570 million, exports of the much larger category “Parts of balloons, dirigibles, and spacecraft not elsewhere specified” (HS880390), dropped by USD 1.135 billion leading to an overall decline from 2003 of USD 560 million. Statistics from 1996 to 2004 also show that recent exports by OECD countries have fallen substantially from their high of 1998. This trend parallels the cyclical downturn of the aerospace sector around 2001. An examination of G7 exports for 2004 reveals that they are focused on a few key markets (Table 1). In fact, 97% of the USD 3.395 billion space exports went to three of the 10 continents/regions and intra-G7 exports accounted for USD 1.98 billion (58%) of the total. Among non-OECD markets, Asia appears to be the most important with over 75% of the total.

4. General challenges to overcome in data collection

17. Future space-related data collection efforts will need to overcome a number of obstacles in order to more accurately quantify the space sector and render data and statistics comparable across countries. The challenges include:

- Disaggregating data. Disentangling space data from aircraft data in the larger aerospace sector will be essential; likewise, separating manufacturing data from services in some instances. This is already possible in some cases, due to detailed national classifications (e.g. French statistical system).

2. OECD / UN (2007), International Trade in Commodity Statistics (ITCS) database, April.

3. The only case where export data on these commodities are not available is for the United Kingdom, which lacked the data for 1999, 2000, 2003 and 2004. As substitute measures of UK exports for these missing years, the values of imports of these two commodities by the rest of the world from the UK were used.

- Double counting. As for other sectors, production data in the sector are often subject to double counting. Efforts to break out value added will be necessary.
- Limited international comparability. Countries use their own methodologies, concepts, and definitions in official government data.
- Confidentiality. Many data are subject to secrecy due to dual-use military and civilian applications of space developments and/or the existence of only one or a few major space-related companies in a country.
- Non-OECD countries. As in the case of other economic sectors, obtaining official data is challenging, and purchasing power parity issues need to be taken into account.
- Employment. Data broken down into R&D or production, for instance, are not readily available.
- Detailed services. Only satellite telecommunications services have been partly measured; as we have seen previously, trade in other services is inadequately quantified.

4. The next steps

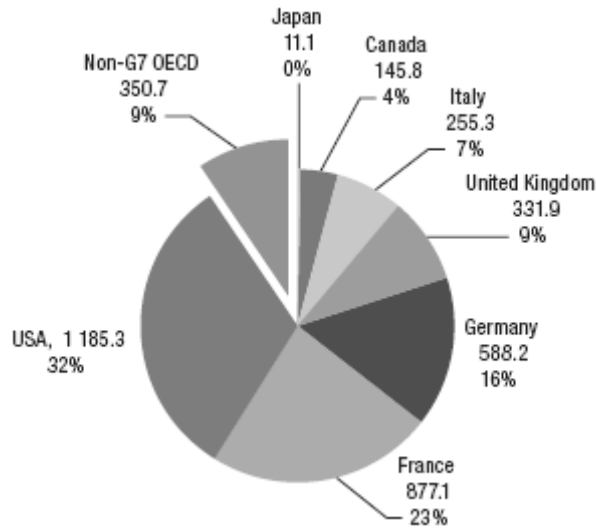
18. Much work remains to be done to develop universal, data-driven indicators for the emerging space economy. More efforts in that direction could benefit both decision makers, industry and citizens, and help them have a better understanding of the significance of space activities in the larger economy.

19. Further actions could include international efforts to separate the statistical classifications for aircraft and spacecraft industries, as well as exercises that drill down on space-related services (such as telecoms, satellite navigation). Case studies that assess the social and economic impacts of space applications in today's world would help to better qualify and quantify the space economy. The OECD Global Forum on Space Economics could be the platform that provides the impetus for such work, while further international co-operation will be required with national statistical offices, space agencies and industry associations.

20. As a priority, the Space Forum is looking at trying to disentangle specific segments of the space sector, especially space applications and services, within official statistical classifications. For example, space-related ground equipment and communication equipment are included under broader categories in the manufacturing sector. Overall, the space sector will not have much more visibility in the 2007 revision of the ISIC (Revision 4.0), although satellite communications activities should be better represented. Class 6130: *Satellite telecommunications activities* (within *Section J: Information and communication, and Division 61: Telecommunications*) will include the activities of "operating, maintaining or providing access to facilities for the transmission of voice, data, text, sound, and video using a satellite telecommunications infrastructure." In that context, activities that the Forum would already like to particularly "track" in official statistics include: trade of satellites telecommunications services (e.g. uses of transponders), and navigation equipment.

21. Comments by delegates are welcome on how they could benefit from and potentially contribute to those innovative efforts on "space statistics", in parallel to other activities in trade globalisation indicators.

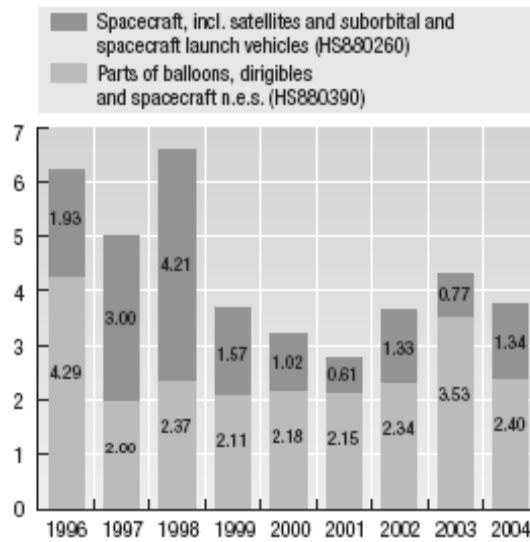
Figure 1. Amount and share of OECD space products exports, 2004
Exports in millions of current US dollars and as a percentage of OECD total



Source: OECD (2007), *The Space Economy at A Glance*, OECD, Paris

Note: Data derived from the OECD/UN International Trade in Commodity Statistics (ITCS) database, April 2007.

Figure 1. OECD Exports of Space Products 1996-2004
Exports in billions of current US dollars



Source: OECD (2007), *The Space Economy at A Glance*, OECD, Paris

Note: Data derived from the OECD/UN International Trade in Commodity Statistics (ITCS) database, April 2007.

Table 1. G7 total exports of space products¹, 2004
Millions of current US dollars of exports

2004 G7 totals	Millions of US dollars	Percent
TOTAL	3 394.56	100.0%
By continent/region:		
Europe	1 662.84	49.0%
Asia	1 236.36	36.4%
North America	395.36	11.6%
South America	45.78	1.3%
Middle East	21.47	0.6%
Africa	18.39	0.5%
Oceania	11.50	0.3%
Central America	2.94	0.1%
Unspecified	0.032	0.0%
Antarctica	0.000	0.0%
Of which:		
OECD countries	2 432.24	71.7%
Non-OECD countries	962.29	28.3%
Unspecified	0.00	0.0%
OECD countries	2 432.24	100.0%
Of which:		
G7 Countries	1 979.47	81.4%
Non-OECD countries	962.29	100.0%
of which:		
Asia (excluding Middle East)	724.26	75.3%
Europe	149.34	15.5%
Americas	48.73	5.1%
Middle East	21.47	2.2%
Africa	18.39	1.9%
Oceania	0.10	0.0%

1. Space products are: HS880260 (Spacecraft, etc.) and HS880390 (Parts of balloons, spacecraft, etc.).

Source: OECD/UN (2007), *International Trade in Commodity Statistics (ITCS) database*, April.