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Belgian Science Policy Office (BELSPO)

Statistics in Brief

Report on the economic importance of the ESA funded Belgian space economy

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Highlights

- Space employment in Belgium is estimated at 3,620 full-time equivalent jobs, compared to 3,153 in 2015, and 2,762 in 2011.
- Public funding (over half of the budget) and equity (over one third) are the main funding sources for upstream and downstream space activities in the private sector.

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Report on the economic importance of the ESA funded Belgian space economy

Introduction

The space economy can be defined as “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 utilizing space. The space economy goes well beyond the space manufacturing sector, also comprising the increasingly pervasive impacts of space-derived products, services, and knowledge on economies and societies” (OECD, 2020, p.5)[1].

Space activities are important from different perspectives. Firstly, for the perspective of business and knowledge, space activities contribute to the “knowledge-based society” and create economic return (on investment). Second, space activities inspire and trigger interest for science more broadly. Third, space activities play an important role for Earth and society. They are key for addressing challenges of climate change and for risk and crisis management. Finally, Europe’s space activities are important for in terms of safeguarding or establishing a strong European strategic autonomy policy in cyber security, in Earth observation endeavors, and in ensuring commercial sustainability of the space industry in Europe.

Space policy in Belgium is a federal responsibility. Belgium does not have its own space agency and close to 90% of the 220 million euros annual public funding for space activities in Belgium goes to international space programmes in the framework of the European Space Agency (ESA). Accounting for nearly 6% of the total budget, Belgium is the sixth largest contributor to ESA. ESA offers critical mass on a large scale both in terms of technical competence in all space fields and in terms of administrative structure. It redistributes the national funding contributions to its members by means of a "fair return" system. Beneficiaries are both private and (semi-)public space actors.

The Belgian Science Policy Office (BELSPO) "Space Research and Applications" department is in charge of the follow-up of the funding Belgium contributes to ESA. The Special Law on Restructuring the Institutions (1980, Art 6bis, §2, 3rd bullet) stipulates that space research in an international context is a unique federal competence. On top of this ESA budget (i.e., the other 10% of the budget), the department manages contributions to other intergovernmental organizations and of bilateral agreements and takes the lead in specific national space R&D programmes mainly in the domain of Earth observation. Finally, the department is in charge of the follow-up of European Union space activities and programmes.

The focus in this report is on monitoring the economic importance of ESA funding beneficiaries. Besides ESA, the European Commission is also stepping-up efforts to stimulate space activities (separate from ESA funding). It does so by means of the Horizon2020 and Horizon Europe programmes for space activities, and the broader European Space Programme aiming to tackle pressing societal and governance challenges today, such as fighting climate change, helping to stimulate technological innovation, independent European access to space, independent European Earth and climate observing capabilities (Copernicus), an independent European satellite navigation system (Galileo). In contrast with ESA funding, funding for space activities by the European Commission is not based on a

[1] OECD, 2020, Measuring the Economic Impact of the Space Sector - Key Indicators and options to improve data. OECD, Paris.

system of fair return but on competition. Except for Horizon funding, no information is available regarding beneficiaries of funding by the European Commission.

Given the amounts at stake, and the challenges ahead, there is a need for regular monitoring and evaluation of publicly funded space activities in Belgium. No data is publicly available regarding organizational level space activities in Belgium. That's why data on space activities is collected by means of surveys among ESA funding beneficiaries. The information presented below is based on the second survey on space activities in Belgium. This survey was organized in 2021-2022 and covered space activities in the period 2016-2020. A first similar survey was organized in 2016, covering the 2011-2015 period. Information was collected regarding the space domain(s) in which space organization are involved, the economic importance of space activities, and space R&D activities.

Survey on space activities 2016-2020

After conducting a first survey in 2016, BELSPO (the Belgian Science Policy Office) launched a second survey in 2021 to measure, in a harmonised way, the socio-economic importance of space activities in Belgium.

The survey's target population consists of the private space actors in Belgium, as well as universities and key (semi-)public research organisations active in space (or space-related) activities. The focus is on organizations that received space funding from the European Space Agency (ESA) in the 2011-2020 period, complemented with organizations that received funding from the European Commission Horizon 2020 programme for space activities. The survey intends to provide a snapshot on upstream and downstream space activities, and space-related activities (the use of space technology in other sectors) in Belgium in the 2016-2020 period.

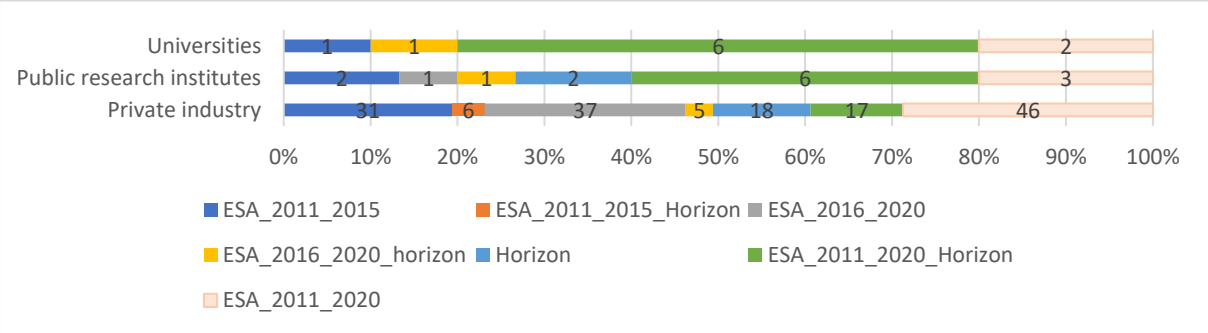
Four dedicated surveys were developed: one for large private actors (launched in May 2021, with a reminder in June and July, and telephone follow-up for item and unit non-response in September-October), one for (semi-)public institutes (launched in May 2021, with a reminder in June and July, and telephone follow-up for item and unit non-response in September-October); one for universities (launched in August, with a reminder in September and October, and telephone follow-up in November-December), and one for SMEs (co-ordinated with a similar ESA survey, launched in January 2022, with a reminder in February and March, and telephone follow-up in March-April). The surveys were organized at the legal entity level (VAT number), and excluded activities carried out by parent or subsidiary organisations. For universities the survey was organized at the department level.

The data presented in this report include data collected in the 2021 survey (period 2016-2020) and the 2016 survey (period 2011-2015). In the 2021 survey, data was also collected for the year 2015 to enable comparison with the 2016 survey results. The response rate to the 2021 survey amounted to 50% overall. The response rate among the 20 organizations having received the largest part of ESA funding (i.e., 85% of the overall budget) amounted to 90%. There is no indication of response bias for organizations outside the top 20. The respondent profiles were CEO or managing director (43%), R&D or space department head (48%), or head of sales or commercial activities (9%). The responses to the survey were cross-checked and complemented with data provided in the national accounts (BelFirst). For numerical data (space employment and turnover) unit and item non-response has been estimated based on responses to the previous survey and careful screening of information provided in annual reports and on the organizations' websites, cross-checked with public funding that has been provided.

1. Population of publicly funded space actors in Belgium

To provide a longer time-period view on the population of space actors in Belgium, we start with an overview of the number of organizations that received ESA funding in the 2011-2020 period, complemented with organizations that received funding from the European Commission Horizon 2020 programme for space activities. In total, 185 organizations (separate legal unit – VAT number) received funding. An overview of the funding sources is given in Figure 1. A distinction is made between private industry organizations, (semi-)public research institutes, and universities.

Figure 1: Organizations that received space funding in the period 2011-2020

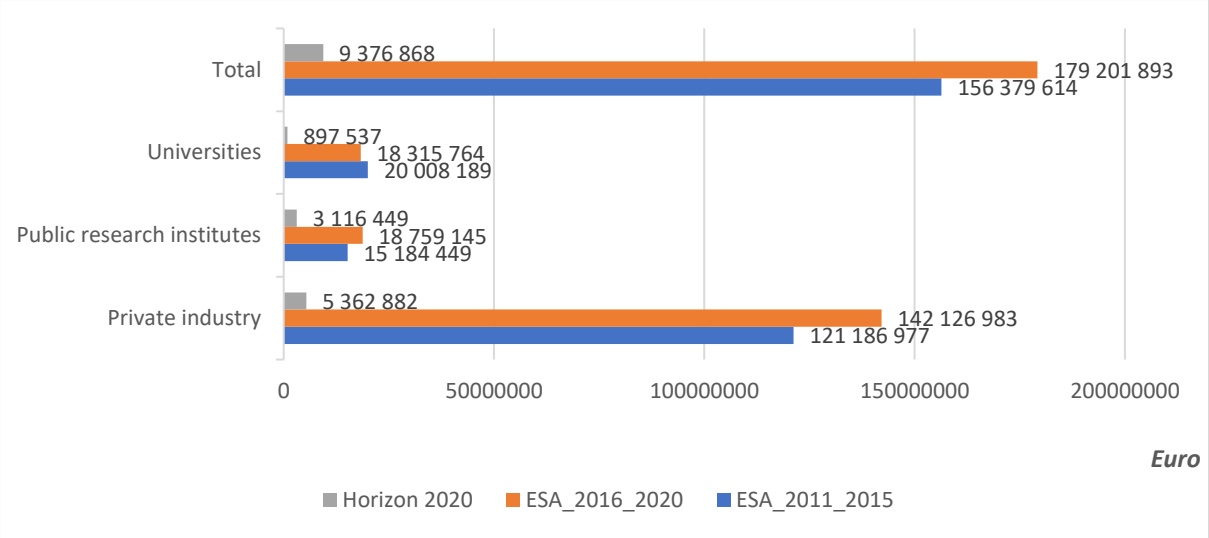


Note: Funding sources as presented in the figure are mutually exclusive. For example, ESA_2011_2015 counts the number of organizations that only benefitted from ESA funding in the period 2011-2015 (and not from Horizon funding or ESA funding in the period 2016-2020).

160 private firms, 15 (semi-)public research institutes, and (33 departments in) 10 universities in Belgium received ESA or Horizon funding in the 2011-2020 period. Taking a longer time period is of relevance to identify both stability and renewal in the space industry target population in Belgium. 31 private actors having received ESA funding in 2011-2015 no longer received ESA funding in 2016-2020, and 37 private actors having received ESA funding in 2016-2020, did not receive such funding in the 2011-2015 period (8 of these firms were created after the year 2015). As such, about one third of the private firms having received ESA funding in the most recent period did so for the first time. 63 firms received ESA funding both in 2011-2015 and in 2016-2020. 17 of these firms also received Horizon funding. 6 firms having received ESA funding in 2011-2015 did no longer receive ESA funding in 2016-2020, but relied on Horizon funding. 18 firms having received Horizon funding did not receive ESA funding. For universities and public research institutes there was one new actor receiving ESA funding in the 2016-2020 period.

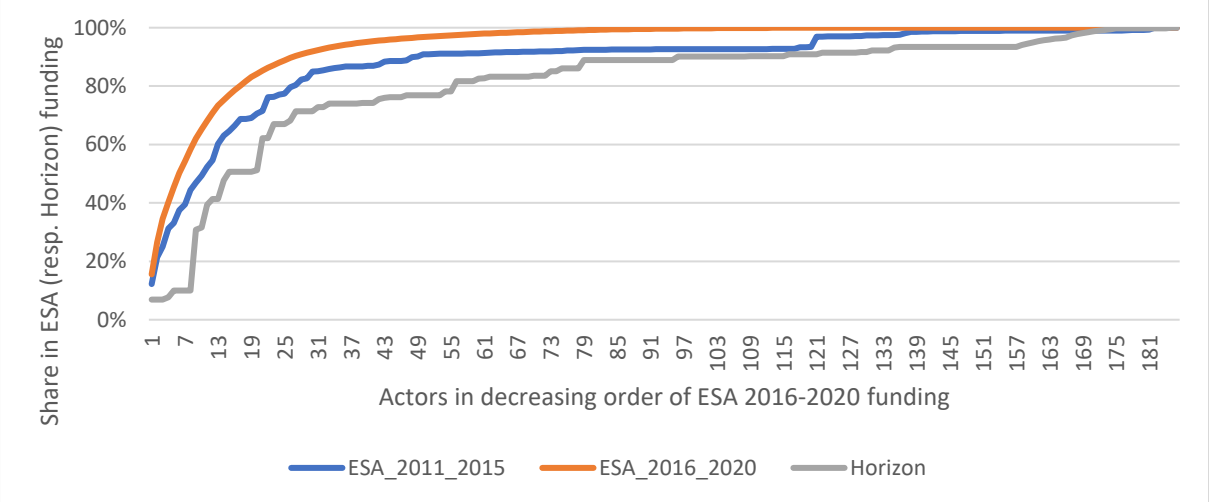
Figure 2 offers insights in the total amount of ESA and Horizon 2020 funding. The yearly average ESA funding (the retour – after deduction of ESA overhead) increased from 156 million euro in the 2011-2015 period to 179 million euro in the 2016-2020 period. There was a substantial increase in funding for the private sector, whereas ESA funding for universities slightly decreased. With a yearly average funding of 9 million euros, Horizon 2020 funding is still relatively small compared to ESA funding, but for public research institutes in particular, and in relative terms, it turns out to be a substantial funding source.

Figure 2: ESA (2011-2015 and 2016-2020) and Horizon 2020 funding (in current prices)



Public funding of space activities in Belgium is largely concentrated in a limited number of space actors. In the 2016-2020 period the 6 largest ESA funding beneficiaries obtained 50% of overall funding (Figure 3). The same actors, in the 2011-2015 period received 38% of overall funding. The top 6 beneficiaries consist of 5 private companies and one university. 14 actors accounted for 75% of total funding, and 90% of total funding was concentrated in 27 actors. These same actors obtained 80% of total funding in the 2011-2015 period. In the 2016-2020 period, the remaining ten percent of total funding was distributed among 99 actors. In the 2011-2015 period, 29 actors accounted for 90% of total ESA funding, and the remaining 10% of the ESA budgets was distributed among 93 actors. For the private industry, in the 2016-2020 period, the top 20 beneficiaries received over 92% of ESA funding, the 37 actors having received ESA funding for the first time accounted for a rather modest amount of 33.9 million euro (6.8 million yearly average, i.e., less than 5% of the ESA budget for the private sector). The newly benefitting public research institute and university together received 3.2 million euro.

Figure 3: Concentration of public funding



In what follows, the focus is on the 127 organizations having received ESA funding in the 2016-2020 period, i.e. 105 private firms, 9 universities, and 13 (semi-)public research institutes.

2. Space activities by domain

A commonly made distinction in space activities is the one between upstream, downstream, and space-related activities (ESA, 2019[2]). **Upstream space activities** include hardware and software products and service providers that permit launching and operating systems in space (including R&D, design, production, integration, and testing). These activities are further divided in a space segment, a transportation segment, a ground segment, satellite operators, launch services, and other upstream activities. **Downstream space activities** include hardware and software producers and service providers, which require the use of space systems and/or data for applications used on Earth. These activities include all commercial activities based on the use of data provided by space infrastructures, such as services in broadcasting, communication, navigation or Earth observation. These activities are further divided in hardware and other products, services, software, financial, insurance and legal services, and other downstream activities. **Space-related activities** refer to the use of space technology in other industries and include all productive, administrative or general operations relating to the production of goods and services having a substantial space component. Products or services utilizing space technology may include spin-offs or technology transfers from the space sector, which use space technology but do not depend on it (low incorporated quantities of "space" components). [3]

Over two out of three ESA funded private firms are active in upstream space activities. For the top 20 companies this even amounts to almost ninety percent. One in two companies is involved in downstream space activities (with relatively more activity in this regard outside the top 20). In upstream activities, most actors (public and private) are active in the space segment. Provision of services and software are most common in the downstream segment (especially for universities).

Table 1: Engagement in space activities by domain

	All Private	Top 20 Private	Outside Top 20 Private	Universities	Public research institutes
Upstream space activities	**76%**	**89%**	**70%**	**86%**	**67%**
Of which: Space segment	56%	67%	50%	86%	78%
Transportation segment	29%	39%	24%	0%	11%
Ground segment	31%	44%	24%	43%	44%
Satellite operators	8%	11%	6%	29%	33%
Launch services	4%	6%	3%	0%	11%
Other upstream	6%	11%	3%	43%	11%
Downstream space activities	**50%**	**39%**	**58%**	**100%**	**58%**
Of which: Hardware and other products	23%	28%	21%	43%	56%

2 ESA (2019). Measuring the space economy. https://space-economy.esa.int/article/34/measuring-the-space-economy

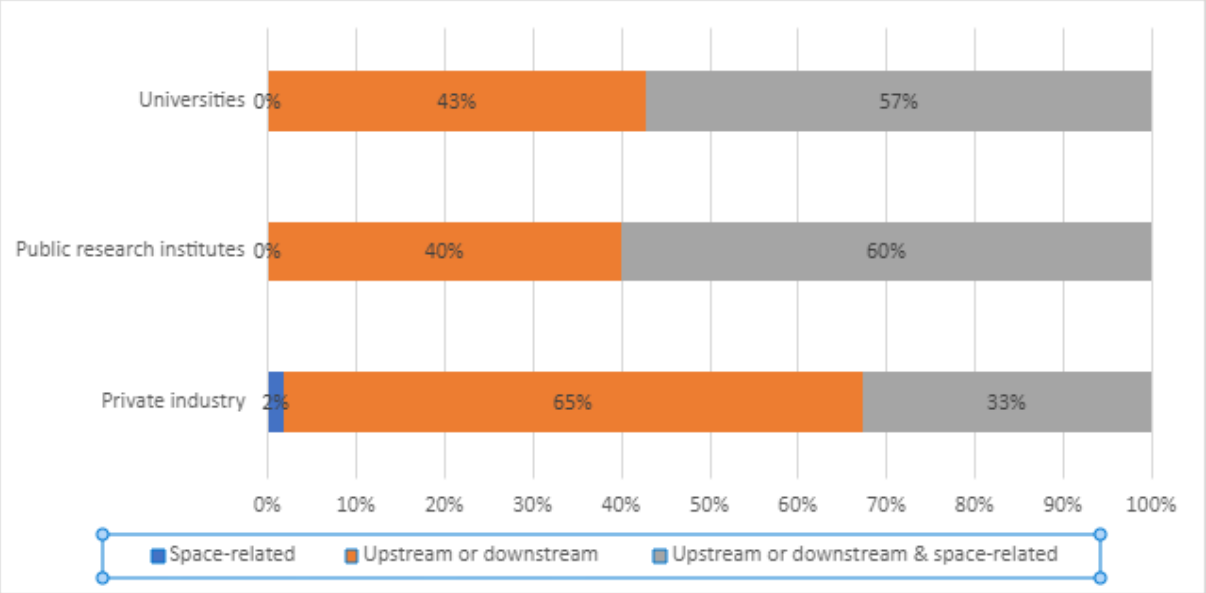
[3] OECD, 2020, Measuring the Economic Impact of the Space Sector - Key Indicators and options to improve data. OECD, Paris.

Services	31%	33%	29%	86%	44%
Software	31%	28%	32%	71%	44%
Financial insurance legal services	4%	0%	6%	0%	0%
Other downstream	13%	11%	15%	57%	22%
Space-related activities	**35%**	**39%**	**32%**	**60%**	**57%**

Note: Based on response rate to the survey of 50% for the private sector (90% for top 20 companies), and 89% for universities and public research institutes.

Spillover activities to other than pure upstream or downstream space activities is an important target for the space sector socio-economic contribution. Figure 4 gives an indication of combined involvement in upstream or downstream activities and in space-related activities. It demonstrates that about one third of private industry actors is involved in space-related activities, whereas two-thirds of the (ESA publicly funded) space actors solely focus on upstream and/or downstream space activities. Being the case for close to three-fifth of the actors, engagement in combined upstream/downstream and space-related activities is more prominent among public research institutes and universities.

Figure 4: Engagement in upstream or downstream and in space-related activities



Some examples of space-related activities in the private sector include (non-exhaustive list):

- Activities around life support services - water technology and treatment
- Aircraft actuation systems
- Equipment for quality and process control used in the production of ophthalmic lenses
- Earth observation used in security for critical infrastructure
- Use of two-phase heat transfer technology for aircrafts, datacenters, and other high added value applications
- Promotion, technology transfer, incubation, and acceleration services
- Medical and industrial X-ray and EUV (extreme ultraviolet) imaging
- Germanium substrates for vertical-cavity surface-emitting lasers and microelectronics
- Usage of actuation and control technology from space to nuclear

- 3D metal printing
- Engineering software

Some examples of space-related activities in the public sector include (non-exhausting list):

- Microgravity induced cerebral changes
- Geographic Information Systems
- Drone based remote sensing
- Copernicus (= EC Earth and climate monitoring satellites and services)
- Galileo (= EC satellite navigation system)
- Development of cooling technologies used for satellites and earth applications
- Use of nitrogen monoxide (NO) and ballistocardiography to monitor and understand the influence of microgravity on the respiratory and cardiac functions of astronauts
- Influence of gravity on complex phase changes for industrial applications such as the manufacture of heat exchangers or solar panels
- Radiation hard electronics
- Virtual space weather modelling
- Technology transfer to fundamental and clinical research
- Space education
- Material development for 3D printing
- Traceability tools to follow up production quality and part performance applied in a larger industrial context

3. Employment and turnover in the space sector

Private actors

The 105 private firms with ESA funding in the 2016-2020 period had an employment in 2020 of 17,143 full time equivalent employees, of which 2,779 active in space activities. Space turnover in these companies amounts to 710 million euro. In the 2011-2020 period, space employment in these organizations increased with 40% (13% in the period 2016-2020). Space turnover almost doubled in the period 2011-2020, with a 37% increase in the last five years. The share of space turnover in total turnover increased from 9.1% in 2016 to 12.2% in 2020. The share of space employment in total employment increased from 15.8% to 16.2% in the same period.

As we only consider companies that received ESA funding in the 2016-2020 period, the numbers for 2011-2015 are an underestimation of space employment in ESA funded companies in that period. If we include companies with ESA funding in that period, the numbers increase to 2,047 (year 2011); 2,098 (2012); 2,119 (2013); 2,219 (2014), and 2,423 (2015)[4]. For space turnover this is respectively 368 (2011); 379 (2012); 381 (2013); 401 (2014); and 416 (2015) million euro[5]. ESA funding respectively amounted to 106, 91, 136, 149, and 123 million euro for the years 2011-2015[6].

[4] Results of the 2016 survey: https://meri.belspo.be/site/docs/StatisticsInBrief/SiB_4.pdf
[5] Results of the 2016 survey: https://meri.belspo.be/site/docs/StatisticsInBrief/SiB_4.pdf. The space turnover calculated based on the previous survey has been corrected from 402 million euro to 416 million euro, based on more accurate data for one company in the 2021 survey (data for 2015).
[6] Results of the 2016 survey: https://meri.belspo.be/site/docs/StatisticsInBrief/SiB_4.pdf

Table 2: Total and space (including space-related) employment and turnover in the private space sector, period 2011-2020

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Total employment (FTE)	15,759	15,893	14,871	15,269	16,432	15,651	16,441	16,743	17,288	17,143
Space employment (FTE)	1,983	2,009	2,036	2,139	2,272	2,465	2,573	2,587	2,691	2,779
Share of space employment	12.6%	12.6%	13.7%	14.0%	13.8%	15.8%	15.6%	15.5%	15.6%	16.2%
Total turnover (million euros)	3,228	4,154	4,099	4,088	5,182	5,694	5,889	5,749	6,437	5,824
Space turnover (million euros)	357	362	367	399	412	520	555	584	707	710
ESA funding (million euros)	101	86	133	141	121	127	191	90	117	186
Share of space turnover	11.1%	8.7%	8.9%	9.8%	9.1%	9.1%	9.4%	10.2%	11.0%	12.2%

Note: FTE = full time equivalents. Euros in current prices. Numbers for firms with ESA contracts in the period 2016-2020.

These average shares mask large differences between private firms, as most largely ESA funded companies have a much higher concentration of space employment and space turnover (Figure 5 and Figure 6 show cumulated figures for employment and turnover). The six largest ESA beneficiaries (50% of the total budget), accounting for the bulk of space employment and turnover, are nearly exclusively space oriented.

Figure 5: Cumulative space and total employment in decreasing order of ESA funding, average period 2016-2020

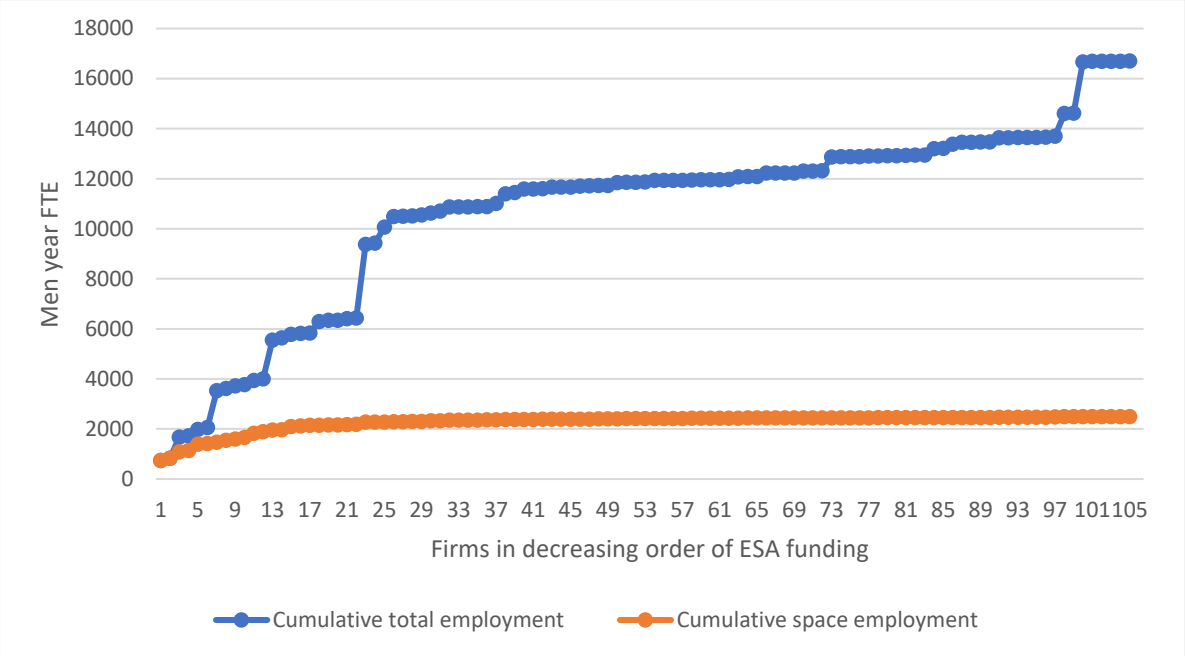
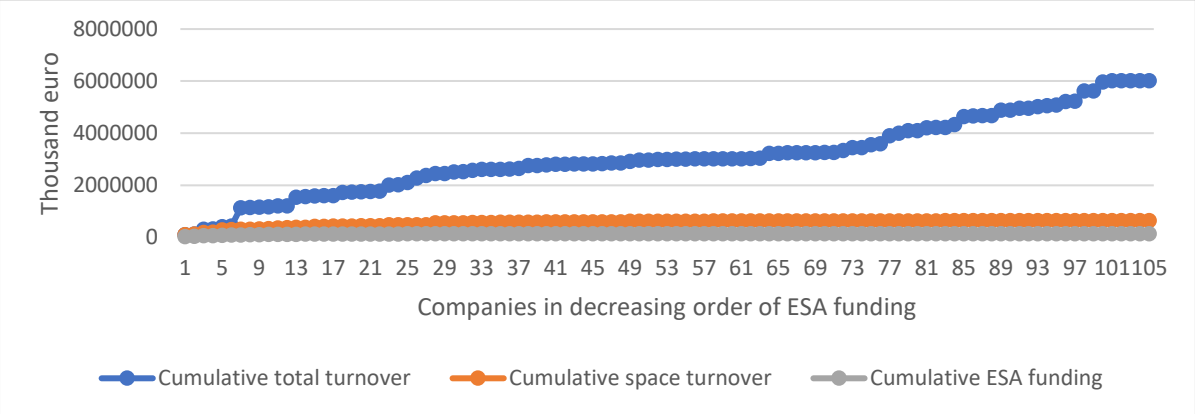


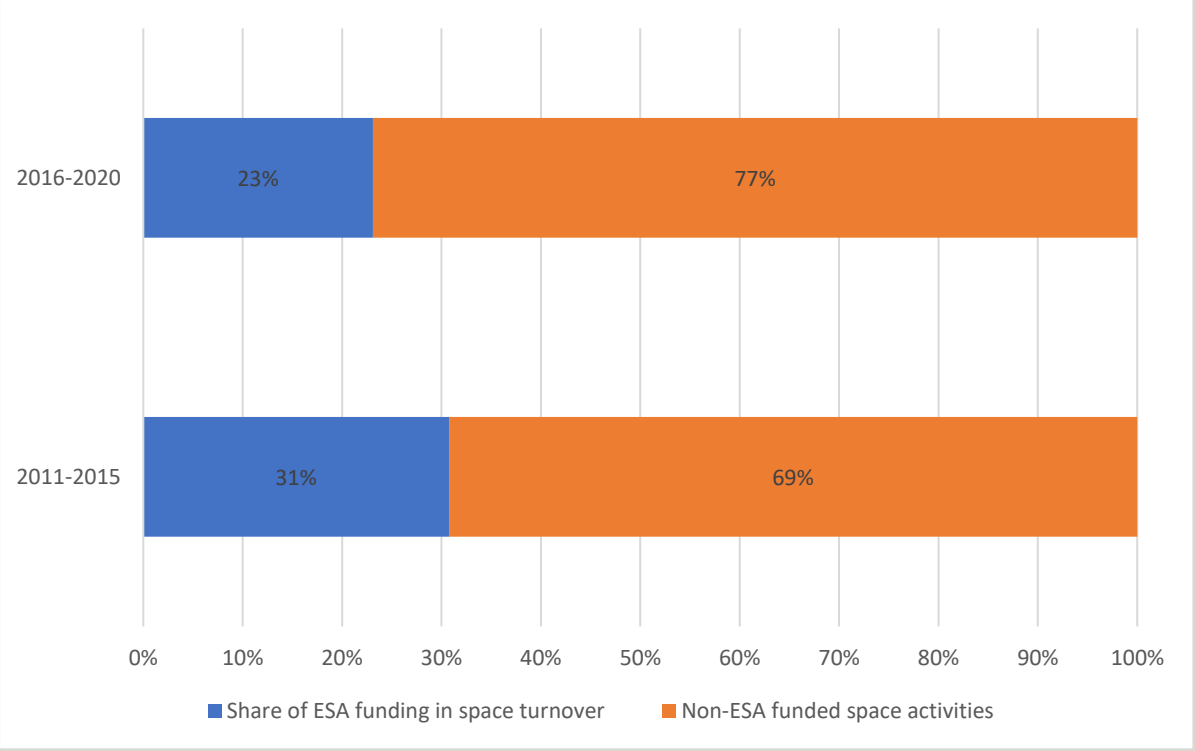
Figure 6: Cumulative space and total turnover in decreasing order of ESA funding, and ESA funding, average in the period 2016-2020



If we further divide employment and turnover by upstream or downstream versus space-related activities, the largest concentration of employment can be found in upstream-downstream activities (81% on average in the 2016-2020 period). The share in turnover is nearly the same (82%).

For companies in the target population, the share of ESA funding in a firm's space turnover decreased from 31% in the 2011-2015 period to 23% in the 2016-2020 period (Figure 7). This implies that for every publicly funded euro via ESA, companies generated 2.23 additional euros in turnover in the 2011-2015 period, and an additional 3.35 euros in the 2016-2020 period. This implies that space turnover outside ESA funding is gaining in importance, both in absolute as well as in relative terms.

Figure 7: Share of ESA funding in firm turnover



Universities and public research institutes

The public sector had a total of 841 full-time equivalent jobs in space(-related) activities in 2020, an increase with 15% compared to 2015[7]. Given the diverse activities undertaken by universities and some of the public research institutes, it makes less sense to show results as a share of total employment.[8]

Table 3: Space employment in the public sector (FTE)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Public research institutes	452	451	456	457	441	439	509	512	530	533
Universities	263	279	285	280	289	308	318	312	302	308

Even though – compared to private enterprises – more public research institutes are involved in space-related activities (Table 1), the share of employment in space-related activities is comparable to the one in the private sector (a 19% average for the 2016-2020 period).

The concentration of space employment in the top three public research institutes amounts to 48%, for universities this is 71%.

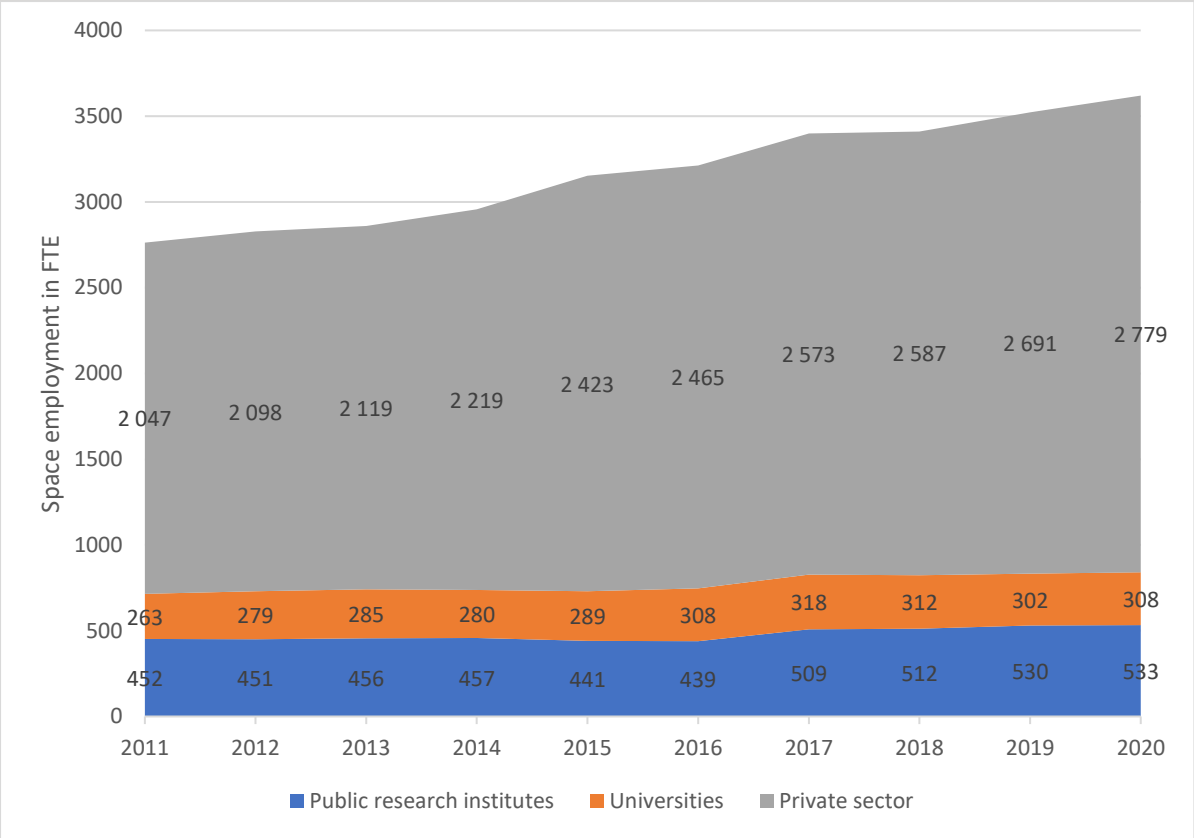
Total private and public sector

Adding up space employment in the private (Table 2) and in the public sector (Table 3) leads to a total employment in ESA funded organizations as presented in Figure 8. Total space employment in ESA funded organizations in Belgium is estimated at 3,620 full-time equivalents in 2020, compared to 3,153 in 2015, and 2,762 in 2011. In the period 2011-2020, the largest increase in employment took place in the private sector (plus 732 full-time equivalents or an increase of 36%), followed by public research institutes (plus 81 jobs or a 18% increase), and universities (plus 45 jobs or a 17% increase).

[7] Compared to the previous survey, there is an important shift because the largest space center was counted as a public research institute, although it is part of a university. The totals were respectively 662 (2011); 699 (2012); 733 (2013); 729 (2014); 730 (2015) full-time equivalents in the space industry. A more accurate measurement at department level revealed a slight underestimation in space employment (715 for 2015 instead of 730 based on survey results 2021) and more stable numbers. Results of the 2016 survey: https://meri.belspo.be/site/docs/StatisticsInBrief/SiB_4.pdf

[8] Space and overall turnover for the public sector are not reported as these indicators turned out to lead to inaccurate measurement as reporting of turnover is not in line with the financial reporting principles of some of these organizations.

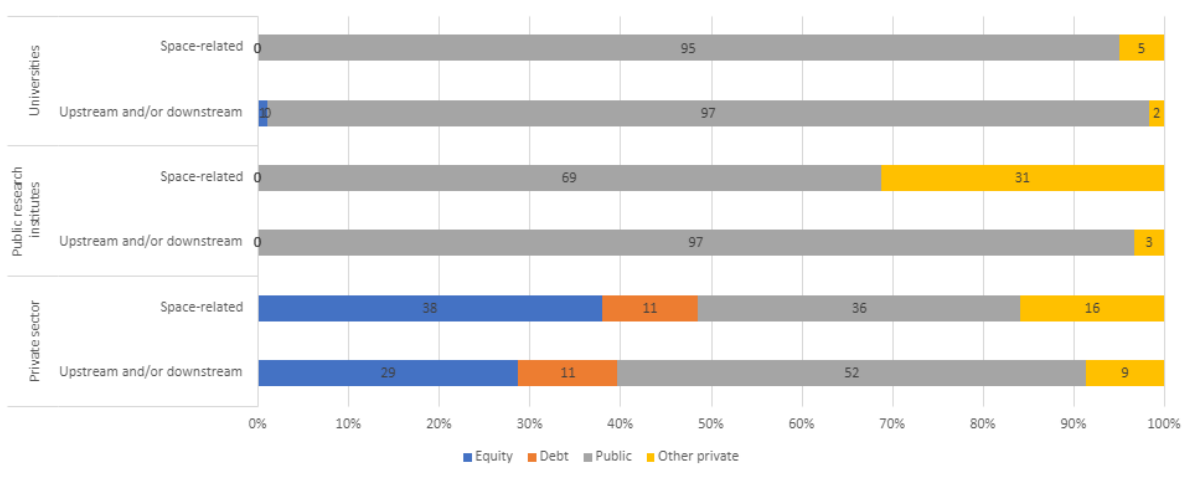
Figure 8: Total space and space-related employment in the period 2011-2020



Note: FTE = full-time equivalents. The numbers take into account all organizations having received – at least once (i.e., in one year) – ESA funding in the 2011-2020 period. This explains the differences with the numbers in Tables 3 and 4 for the 2011-2015 period.

Figure 9 offers insights in the source of funding for space activities. Not surprisingly, space activities at universities are nearly entirely publicly funded. This also is the case for upstream and downstream space activities in public research institutes. Although space-related activities in these institutes are financed for close to one third with private means. For the private sector, public funding accounts for over half of upstream and downstream space activities and over one third of space-related activities. For space-related activities, equity funding is the most important financing source. Debt funding for space activities in the private sector is limited to about 10%, which could be an indication that these companies face difficulties to attract debt funding for their (high-risk R&D – see further) space activities.

Figure 9: Source of funding for space activities



4. Scientific activities in the space industry

Engagement in R&D activities

The space sector is a high-tech sector characterized by substantial efforts in terms of research and development. **Research** comprises creative work undertaken on a systematic basis in order to increase the stock of knowledge. **Development** refers to a systematic effort, based on existing knowledge from research or practical experience, directed towards creating novel or improved materials, products, devices, processes, systems, or services[9].

Space R&D includes R&D allocated to upstream or downstream space activities, and to space-related activities up to a Technology Readiness Level (TRL)7, and to a more limited extent even operational space activities up to TRL9[10]. TRL 7 is defined as "model demonstrating the element performance for the operational environment. Performance is demonstrated for the operational environment, on the ground or if necessary, in space. A representative model, fully reflecting all aspects of the flight model design, is build and tested with adequate margins for demonstrating the performance in the operational environment."

ESA funding largely targets R&D activities, it is therefore not surprising that all organizations with upstream or downstream space activities have R&D in said activities. As can be noted in Table 4, besides space R&D, close to three out of four private enterprises at the same time undertake R&D in non-space activities. This is the case for all public actors. If we only take into account those actors that

[9] OECD (2020). The Measurement of Scientific and Technological Activities. Frascati Manual, OECD, Paris. https://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2002_9789264199040-en?msclkid=abac6818cf5611ec8a3f9bd1a867b03b

[10] Technology Readiness Levels (TRL) are different points on a scale used to measure the progress or maturity level of a technology. The scale ranges from 1 to 9, where TRL 1 is the lowest and TRL 9 is the highest. When a technology is at TRL 1, scientific research is beginning and those results are being translated into future research and development, while at TRL 9 the technology has already been proven to work during a flight mission in space (https://www.esa.int/Enabling_Support/Space_Engineering_Technology/Shaping_the_Future/Technology_Readiness_Levels_TRL)

engage in space-related activities (see also Table 1), four out of five private actors and public research institutes undertake R&D in space-related activities, and half of the universities.

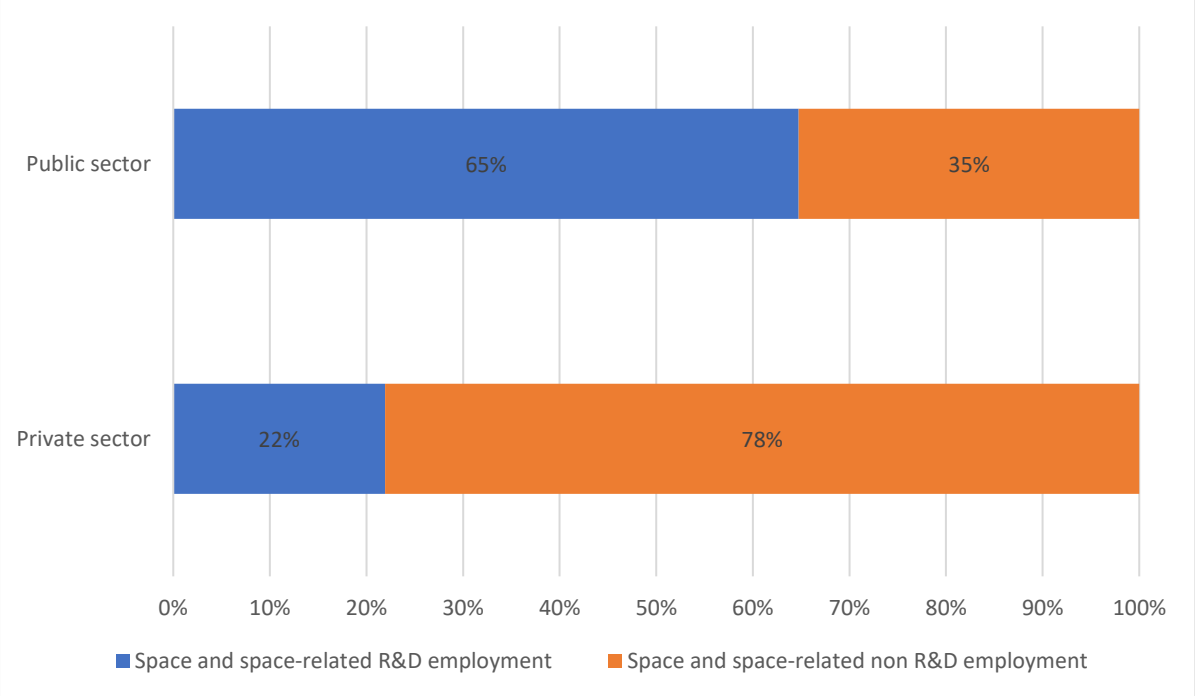
Table 4: Involvement in R&D activities among ESA funded space actors, 2016-2020 period

	Private sector	Public research institutions	Universities
Both space and non-space R&D	73%	100%	100%
Upstream or downstream space R&D	97%	100%	100%
Space-related R&D	79%	80%	50%

Note: Response rate private sector = 35%, public research institutes = 53%; universities = 70%. The percentage R&D active is a percentage of firms involved in respective upstream-downstream or space-related activities (Table 1).

In the 2016-2020 period, among ESA funded private actors, 22% of space employment can be classified as R&D jobs. For the public sector this amounts to 65% (Figure 10). The private sector's share largely corresponds to its share of ESA funding in space turnover (i.e., 23% - Figure 7). For the top 20 private actors the amount of ESA funding corresponds to 92% of space R&D expenditure. These numbers indicate that a very large majority of space R&D activities in the private sector are publicly funded. In the public sector by definition this should largely be the case as well, although it has to be noted that the amount of ESA funding for the public sector only covers close to half of space R&D expenditure.

Figure 10: Share of space R&D employment in total space employment, average 2016-2020.



Note: based on a 82% for the private sector and 79% for the public sector response rate for space employment.

Networking in R&D

Forming R&D alliances and innovation eco-systems is an important indication for knowledge spillovers and clustering of knowledge activities. Table 5 presents engagement in R&D collaboration by organizations that are active in respectively upstream or downstream space R&D and space-related R&D.

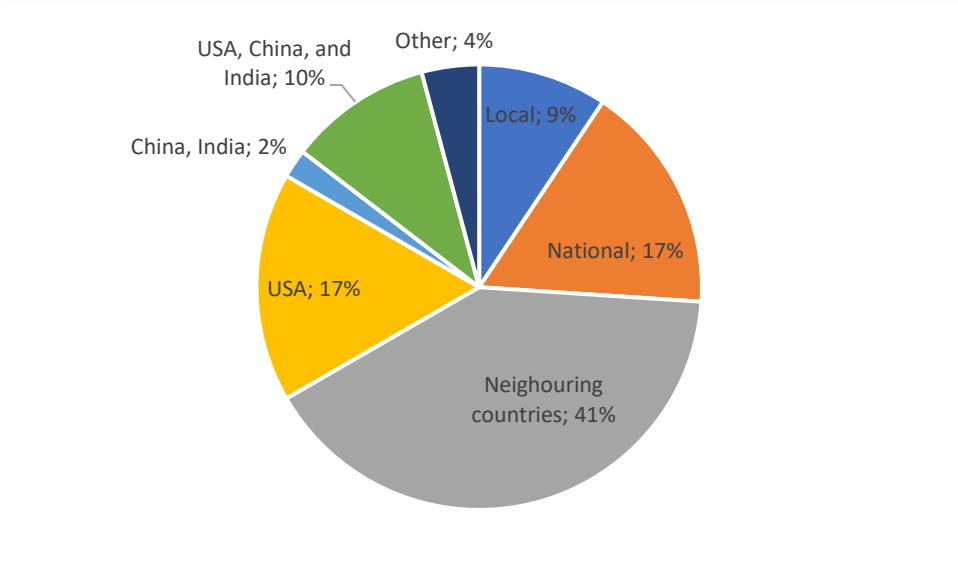
Table 5: Engagement in R&D collaboration and by type of partner, 2016-2020

	Private sector	Public research institutes	Universities
Upstream or downstream space R&D activities*	67%	100%	100%
Of which collaborated with: Clients or users	80%	57%	33%
Suppliers	50%	57%	50%
Universities	90%	100%	83%
Public research institutes	80%	100%	50%
Group°	50%	29%	33%
Space-related R&D activities**	60%	75%	100%
Of which collaborated with: Clients or users	88%	0%	50%
Suppliers	13%	67%	50%
Universities	63%	67%	100%
Public research institutes	88%	100%	50%
Group°	13%	33%	50%

*As a percentage of firms/institutes active in upstream or downstream R&D. **As a percentage of R&D active firms active in space-related activities. °For universities: other departments within the proper institution.

The geographical distribution of the space R&D network is presented in Figure 11. Of the organizations that are active in R&D cooperation, 9% restricts cooperation to the local (regional) level; 17% collaborates at a national level (outside the proper region); two out of five collaborate with partners in neighbouring countries; 27% collaborates with a partner in the USA (of which simultaneously 10% has a partner for their R&D space activities in China or India); 12% collaborates with China or India (of which simultaneously 10% collaborates with a USA partner); and 4% collaborates with a partner in a country that is located outside the neighbouring countries and outside the USA, China, or India.

Figure 11: Spatial distribution of R&D collaboration



Note: the percentages reported refer to the "furthest" geographical level. The furthest levels are outside Europe. This means e.g. that the percentage for neighbouring countries should be read as 41% of the organizations collaborates with partners in neighbouring countries and possibly also with partners at national or local level, but not with partners outside the group of neighbouring countries.

Intellectual property

Patent applications refer to a request filed at a patent office for an invention described in the patent specification. Licensing-out refers to others making use of intellectual property developed within the proper organization, whereas licensing-in refers to the use of intellectual property from third parties for proper activities. With the exception of the top 20 private firms, questions on intellectual property activities were not well answered in the survey. Therefore, we only report results for the twenty largest ESA funded companies. In the 2016-2020 period, over half of the companies applied for a patent for upstream and downstream space activities. One out of three companies licensed its intellectual property to another private organization (outside the group), and 15% to a public organization. Close to two out of five companies bought a license from another private organization and 15% did so from a public organization. As the top 20 ESA funded companies are all involved in upstream or downstream space activities, it can be concluded that close to one out of six of those companies also applied for a patent and close to one out of four was active in licensing in space-related activities (Table 6).

Table 6: Involvement in patent applications and licensing, top 20 ESA funded private actors, 2016-2020

	Patent application	Licensing (out or in)	Licensing-out (to)*			Licensing-in (from)*	
			Private	Group	Public	Private	Public
Space upstream and downstream	54%	46%	31%	8%	15%	38%	15%
Space-related activities	15%	23%	8%	0%	0%	8%	8%
Total	69%	62%					

*An organization can be involved in licensing-out or licensing-in with several other organizations at the same time. Therefore, the total percentage of companies licensing out or in (column 3) is lower than the sum of the percentages of the subcategories (private, group, public).

Statistics in Brief aims at presenting relevant data to inform a broad audience, including policy makers.
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Interested readers can find up-to-date data and analyses on the following websites

- general information: www.belspo.be
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