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Institutional patterns in the Austrian space sector

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ABSTRACT

This paper employs the institutional logics perspective to understand how space policies and regulations influence entrepreneurship and innovation. We conducted interviews with entrepreneurs, ESA policy makers and governmental representatives in Austria and identified six prevailing institutional practices: geographical return, the SME-initiatives, the national support pattern, the size pattern, the consortium pattern and the experience pattern. Together, these patterns make up the semi-governmental logic of the space sector. We find that space actors adhere to these patterns to earn legitimacy, which is a condition for support and access to resources. This study adds to our understanding in the consequences of policies and contributes to the design of new space policies and programmes.

1. Introduction

Space technologies play an important role in our daily lives. They cover many domains ranging from agriculture and climate change to national security and health care. A study conducted by the European Commission reveals that the majority of Europeans consider the space sector highly meaningful, since the industry fosters job creation and contributes to scientific progress in a variety of ways, including medical advancements, more efficient agriculture, environmental protection, and environmental and climate management [1]. Yet, the impression is that the innovation potential of the space sector is not fully exploited [2]. To foster innovation and growth in the space sector, it is necessary to understand the industry. In this study, we draw on institutional logics theory to understand better how governments and firms interact in the European space sector.

The institutional perspective has been widely employed by scholars to enhance our knowledge about organizational activities and how internal and external forces influence organizational patterns. Institutional theory states that organizations operate within social structures that are continuously altered over time [3]. They are bound by social, political, economic and legal contexts that ascertain the basis for production, exchange and distribution of goods and services [4]. Conforming to socially constructed rules and requirements is needed to receive acceptance by others [5,6]. Therefore, organizations adapt to their environment by changing their structure in order to align with the institutional pattern [7]. This process is also known as coercive isomorphism [3] and is more

likely to occur when there is financial reliance, centralized resourced with few alternatives and when the dependent organization has ambiguous goals [3]. The space sector displays many of the aforementioned elements. It is characterized by a large number of actors, complex technologies, budget shortfalls, time constraints and uncertain outcomes. Organizations are highly dependent on external funding, as space activities require high up-front investments and long development times.

The European Space Agency (ESA) is an important player in the space sector as its purpose is to draw up and implement the long-term European space policy. ESA coordinates the European space programme and integrates national space programmes, such as satellite developments, in the European space programme as much as possible [8]. As of 2017, ESA has twenty-two member states [9], each having their own strategic agenda and governance structures. Some conduct space activities primarily through ESA programmes, while others operate mainly via their national space programme [10]. The main idea of these programmes is to provide resources and foster entrepreneurial activities and innovation in space. Since companies have a high degree of financial reliance and resources are centralized, it is expected that actors in the space industry are isomorphic to their environment. As a result, they might miss out on opportunities for true innovative entrepreneurship. Due to the dynamic and complex structure of the industry, organizations might also be subject to conflicting institutional logics, meaning that complying to one logic might violate another.

The goal of this study is to show how an institutional theory lens can serve to understand innovation and entrepreneurship in the space sector.

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We specifically focus on Austria. This research examines how ESA's policies and Austria's national space programme influences entrepreneurship and innovation in Austria. The research question is as follows: 'How do institutional patterns and logics enable or constrain entrepreneurial action of existing companies and new entrepreneurs in the Austrian space sector?' This study provides insights in the consequences of policies in the space sector on entrepreneurship and innovation and aims to make a contribution towards the design of new policies and programmes.

2. Institutional logics

Alford and Friedland [11] introduced the concept of institutional logics to portray the beliefs and conventions inherent in the institutions of modern western societies. They believed that capitalism, state bureaucracy and political democracy are the three contending institutional orders that shape how actors react. Even though definitions of institutional logics vary among scholars, the main idea is that behaviour occurs within socially constructed, taken-for-granted prescriptions of appropriate conduct [12], which are useful for understanding individual and organizational behaviour located in a social and institutional context, which frames behaviour and brings opportunities of agency and change [13].

Complying with institutional logics is crucial for gaining legitimacy. Legitimacy is the process where an organization justifies to the general public or elite organizations its right to exist [14]. It refers to the general perception that the actions of an organization are desirable within the socially constructed norms, values and beliefs [15]. Legitimate organizations are perceived as more trustworthy, more meaningful and predictable [15]. This contributes to their survival and growth [16,17] and access to resources [17,18]. Legitimacy is not a resource that can be possessed, but a fundamental state that reflects that organizations align with normative values and cultural-cognitive frameworks. Therefore, the importance of legitimacy is often not apparent but only becomes visible when the legitimacy of a firm is threatened or challenged [19]. Established organizations have fewer problems than new firms in accessing resources because past performance provides legitimacy [20]. New firms on the other hand must act proactively to win confidence and support of the environment [21].

Since the late 1980's the issue of institutional change received increased interest. If actors are conditioned by institutional prescriptions, how is it possible for actors to change the institutions in which they are

embedded? Seo and Creed [22] named this contradiction "the paradox of embedded agency". This paradox can be solved when we do not regard institutional logics solely as constraints but also as a platform to unfold activities and actors as skilled individuals who can theorize action. Individuals do not necessarily behave in line with prescribed rules and have an ability to deviate from the normal course of action [23]. Through habit, imagination and judgment, actors can both reproduce and transform structures in an interactive response to the problems posed by changing historical situations [24].

The act of altering institutional structures is also known as institutional entrepreneurship. This notion was first mentioned by Eisenstadt [25], referring to actors who initiate action, lead and give direction to structural change. Institutional entrepreneurs have the necessary resources to implement new institutions in which they see an opportunity to pursue their interests [26]. However, institutional entrepreneurship is not merely the act of one single individual or organization. This image has often been portrayed in the entrepreneurship literature, where it has been related to individual agency. Change can come from multiple individuals or organizations. Evidence shows that firms mimic each other, especially those with whom they have systematic ties [27]. Therefore, change can be a result of multiple actors exhibiting different components of new practices. Passive actors tend to transform in institutional entrepreneurs when there is social upheaval, technological disruption, competitive discontinuities or regulatory changes [28], or when problems arise that might cause crisis (e.g. scarcity of resources) [29] and when institutional arrangements cause internal contradiction [30].

There are four strategies to change institutional logics, namely open advocacy, private persuasion, making a case of exceptions and ex ante investments with ex post justification [31]. Open advocacy is the process of openly advocating for changes to existing regulations or laws, for example through the media. When an actor chooses to approach a relevant decision maker privately for changes, this is referred to as private persuasion. When an actor argues that he is in an exception to the existing rules, this is known as making a case of exceptions. The prevailing rules remain unchanged in this situation. Ex ante investments with ex post justification refers to the process where the actor evades existing rules. If the operation proves to be successful, the entrepreneur tries to use the success of its operations to persuade the authority to make changes in existing rules.

Drawing from the literature review, this paper uses the theoretical framework displayed in Fig. 1.

Fig. 1. Theoretical framework.

Institutional logics set the rules of the game. These logics can either be defined by law (e.g. policies, regulations and/or treaties) or socially constructed, and shape the interactions, relationships and behaviour of actors. Actors conform to institutional logics to gain legitimacy. Legitimation is needed to access resources and receive public support, both essential for an organization's survival and growth. When an actor does not conform to these logics, two possibilities exist: the first possibility is that the actor exits the game, because there is no access to resources. The second possibility is that the actor chooses for institutional entrepreneurship and changes the rules of the game; either by introducing new institutional logics or change the existing ones. The cycle then begins again. This conceptual model will provide guidance for analysing the institutional setting in this research: the Austrian space sector.

The findings of this research are based on 14 interviews conducted in the year 2015; comprising 10 companies, 2 ESA policy makers and 3 Austrian government officials. All, but one interview where two governmental officials were present, were conducted one-to one. The specificities of the companies are displayed in Fig. 2 and Table 1.

3. The Austrian space sector

3.1. background information

Austria's involvement in space began in the 1950's when research institutes added space research activities programmes to their curriculum [32]. Between 1961 and 1964 Austria was involved in COPERs, a committee that prepared the establishment of a European space research organization. The Austrian Space Agency came into existence in 1972, established to coordinate Austrian space activities on behalf of the Austrian government [33]. Duties encompassed the coordination of projects in space research and coordination of relationships with space agencies from other countries. Austria has been a member of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS)

Note: The bullets A to G represent companies, while I and J represent research institutions.

Fig. 2. Companies and research institutions included in the sample based on turnover and number of employees as of 2015.

since 1958, which employs space science for sustainable economic and social development [34]. Austria has taken part in ESA's programmes since 1975, joined ESA as an associated member in 1981 and became a full member in 1987 [33]. Austrian space activities are mainly carried out through ESA programmes or their national programme the Austrian Space Applications Programme (ASAP). Austria, as a member of the European Union (EU), participates in the EU framework programmes for Research and Technological Development since 2002, concentrated on scientific and technological developments and improving international competitiveness [35]. Austria has been a member state of the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) since 1993, which provides the national meteorological service of Austria, the Zentralanstalt für Meteorologie und Geodynamik, with weather and climate-related satellite data. The European Space Policy Institute (EPSI) is also located in Vienna. This is an independent platform that informs decision-makers about relevant space activities in Europe, which can be used in the development of the European space policy.

Austria belongs to the midsized European countries that are active in space. The Austrian space industry constitutes more than 120 space organizations and is characterized by a few big players and a large number of SMEs. The Austrian space sector has no primes [37] (i.e. large system-level integrators [36]) and comprises research institutes (49%), service providers (46%), manufacturing operations (31%) and software manufacturers (23%) (multiple mentions) [37]. The Austrian direct employment rate in the space sector is about 350–400 fulltime equivalent [37]. Main Austria ESA contractors are RUAG Space GMBH and Siemens Convergence Creators in addition to multiple SMEs and research institutes (see Fig. 4).

Space activities are only a small part of total business for most firms. Space is considered 'the core business' for only 21% of the organizations ($\geq 75\%$ of total turnover), including one of ESA's main contractors RUAG Space [38]. Space activities are considered as a 'primary activity' for 15% of the firms (50–75% of turnover) and 5% of the companies indicate that space is 'one field amongst several' (25–50% of turnover). Finally, 59% of the companies and research organizations fall into the category "also active in space" (<25–50% of turnover) [37].

Space industry and research are predominantly located in Vienna and Styria. Vienna has the largest number of space sector employees and it also realizes the largest space turnover. Vienna has relatively more space companies than research institutes while Styria has more research institutes than companies. Space companies are well distributed over all provinces, with the only exception being Burgenland [37].

Approximately 75% of the organizations enter into collaborations. Cooperative partners include universities, national and international research institutions and space organizations such as the German organization DLR, ESA and the American NASA [37].

The export rates for the Austrian space industry are growing. Mainly within ESA-programs and networks, Austrian space products are exported to other European countries, but there are also exports to Asia and North America [37]. To increase its international activities, Austria will focus on the expansion of its space operations to the emerging markets in Asia and Latin America for the next five years [34].

Table 1
Companies categorized according to involvement in ESA contracts.

	High involvement	Low involvement
Big sized companies (>250 employees)	COMP F COMP G	–
SMEs (≤ 250 employees)	COMP H COMP I	COMP A COMP B COMP C COMP D COMP E COMP J

Fig. 3. Austria's Space governance (ESA, 2015).

3.2. Government structure and priorities

The Federal Ministry of Transport, Innovation and Technology (BMVIT) finances Austria's space activities. This government entity is responsible for defining and implementing the Austrian space strategy and policy. The Austrian Research Promotion Agency (FFG) provides a supporting and advising role to the BMVIT in carrying out the Austrian space policy. It supports via its Aeronautics and Space Agency (ALR) the involvement of Austrian researchers in international and bilateral

aerospace partnerships and encourages the establishment and expansion of international networks. It is also the coordinator of space activities in Austria and the Austrian link to international space activities and foreign space agencies. FFG is the interface to the European Space Agency as well as to the European Commission (as far space related matters are concerned) and other international and national organizations [38]. International organizations include, but are not limited to: the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), a supplier of weather and climate satellite data to users worldwide [39] and the International Astronautical Federation (IAF), whose aim is to facilitate dialogue between researchers around the world and to promote international cooperation in space [40]. An example of a national organization is the Association of Austrian Space Industries and Research Institutions (AUSTROSPACE) [41]. AUSTROSPACE represents the Austrian space industries and research institutions. FFG provides recommendations to the BMVIT concerning the participation in the different optional programmes, such as what programmes to participate in and the amounts committed to the different programmes. Within the FFG, the ALR implements the space policy on behalf of the Ministry and represents Austria in various ESA, EUMETSAT and EU committees and programme boards. Other ministries involved with space are the Ministry of Defence, the Ministry of Finances, the Ministry of Foreign Affairs, the Ministry of Economy, Family and Youth and the Ministry of Science, Research and Economy. Non-profit space and aeronautics industry associations that are active in Austria include the Austrian Aeronautics Industries Group (AAI), which represents the interests of organizations with activities in the aeronautics industry [38] and AUSTROSPACE. An overview of Austria's space governance is displayed in Fig. 3 [38].

Main ESA Contractors

Fig. 4. : Participation in ESA Tenders (ESA, 2015).

3.3. Space activities

Austrian space organizations are active in both downstream sector and upstream sector. Downstream refers to developing commercial services and products that use technology and knowledge developed for activities in space (the latter type of technology and knowledge is

referred to as ‘upstream’, with a focus on space exploration and sending objects into space) [42].

Activities in the downstream sector have increased in recent years and there is a shift towards the development of commercial services and products for users. Austria concentrates on the areas Earth observation, navigation and satellite communications technology. Main activities include water and land use management and monitoring, emergency management, weather and climate research, as well as a focus on transport, energy, environment and space weather. The industry also makes much use of remote sensing data in making downstream applications [38].

With regard to upstream work, space organizations are involved in space exploration activities, such as human spaceflight (but limited) and the development of launchers [38]. Furthermore, Austrian organizations act as suppliers for the development of satellites and launchers. Main Austrian space technologies capabilities include development and qualification of materials and components for space systems, mechanical and electrical ground support equipment, on-board signal processing and thermal control and protection, in addition to the development of lightweight composites [38].

3.4. Space programmes

The Austrian Space Applications Programme (ASAP) exists since 2002 and is carried out by the Federal Ministry of Transport, Innovation and Technology (BMVIT). The ASAP is a national funding programme that promotes the development of Austrian aerospace technology and applications. The programme comprises three parts: the scientific-, technological- and applications part. The ASAP is intended to help stimulate new scientific knowledge, the realization of pilot projects to test space applications potential, and support the development of commercially successful products and the diffusion of it to other sectors. Finally, ASAP helps companies to build up their networks by involving them in multi- and bilateral projects. One of the main purposes of ASAP is to strengthen the international position and competitiveness of the Austrian space sector, and to prepare them for ESA, EU and international space programs [43,44].

Also outside ASAP, companies engage in ESA and EU programmes to get contracts. With regard to the ESA programs, Austria participates in both mandatory and optional programmes. The total contribution to ESA was 48 million euros in 2016. Approximately 90% of the contributions are awarded to Austrian research institutions and companies in terms of contracts. Hereof, 18 million euros were contributed to mandatory ESA programmes such as General Activities, Space Science, Technology Development, Technology Transfer. About 30 million euros were contributed to optional programmes, including Earth observation, Telecommunication, Navigation, Space Transportation, Space Situational Awareness, Technology Programmes and Science and Exploration.

In 2016 the Austrian total space budget (including EUMETSAT, ESA Programmes and National Programmes) amounted to 65 million euros [45].

4. Institutional patterns and logics in Austria

We have identified six institutional patterns that underlie the overall logic of the Austrian space sector. The patterns are categorized under either the state level or the corporation level, as prior research argues that levels of institutional logics and their consecutive patterns have to be clearly defined [13]. The state level comprises the geographical-return pattern, the SME-policy pattern and the national-support pattern. The role of the State is central in this sphere and organizational behaviour is influenced by means of policies and regulations. The corporation level encompasses the size-pattern, the experience-pattern and the consortium pattern. Opposed to the ‘written rules’ on the State level, these norms are socially constructed.

4.1. The state level

4.1.1. The geographical-return pattern

The geographical-return pattern refers to the influence that ESA's georeturn policy has on the participation of companies in certain ESA programmes. The geographical-return has been at the basis of the cooperation in space in Europe. It was developed and adopted 40 years ago in order to gather interest and funding from European countries. Together with the industrial policy (i.e. the set of rules relating to achieving a fair return), the geographical-return adopted in ESA programmes guarantees that the contributions made to ESA are refunded. According to the ESA Convention, the geographical return ratio is calculated as “the ratio between its percentage share of the total value of all contracts awarded among all member states and its total percentage contributions”. The return coefficient is calculated quarterly and shown cumulatively [8]. Also, different contracts have different weighting factors on the basis of a member's state technological interest [8]. Ideally, a member state would have an overall return coefficient of 1 (i.e., 100% return). ESA aims to redistribute at least 94% of the budget collected from its member states through contracts awarded to their national space industries [46]. The geographical-return constraint may be imposed on optional programmes and on mandatory activities [36].

Austria (contribution of 48 million euros in 2016) is a relatively small player in comparison with countries such as Germany (contribution to ESA of 873 million euros in 2016) and France (contribution to ESA of 845 million euros in 2016) [47]. Most interviewees perceive the geographical return as positive since it allows Austrian companies to cooperate and compete with larger international players and strengthens Austria's position in the space sector.

The geographical-return pattern shapes how organizations work together and partnerships are established. Austrian companies look strategically for partners to increase chances of winning the contract:

“ESA sometimes put in ITT's [Invitation To Tender] certain preferential clauses, for instance for Denmark or Sweden or whatever country or member state is in that strategic ITT preferred. If this is the case, then we try to in order to increase our chances of winning, we try to collaborate with companies from such country.” [COMP F]

Firms seek partners from specific countries if preferential clauses related to the geographical-return are included in calls. There is a top-down approach and a bottom-up approach. The top down approach refers to the process in which large Austrian companies look for SMEs in under-returned countries. The bottom-up approach refers to the process in which Austrian SMEs approach primes to include them in the value chain. Small companies cannot bid directly for big tenders as they lack the capacity to carry out the project by themselves. These calls are exclusively targeted at primes that are responsible for finding sub-contractors. When Austria is under-returned, Austrian SMEs have a greater likelihood to be selected as business partners.

The Austrian government officials mentioned a geographical return-rate of 1.01 for Austria. This is the cumulative overall return coefficient over the period 2000–2014. Thus, Austria has achieved the ‘ideal’ coefficient of 1. But this slight over-return could only be achieved with special measures, which has been set up in order to balance the industrial return. Every five years, ESA reviews the geographical distribution of contracts for each member state, with an interim review in the third year [8]. If a member state deviates too much from the norm of 1, measures will be taken to restore this imbalance. This might mean that certain organizations or member states are excluded from competing for a contract (with the agreement of that member state) [8]. COMP F expressed that it lost offers because Austria was over-returned, despite the firm submitted the best proposal. Next to the quality of a proposal, industrial policy considerations are taken into account during the evaluation. COMP F added that the status of the geographical return influences their decision to submit a proposal or not. An over-return means a small

chance of winning the contract, which is not worth the time and money that goes into preparing a proposal.

To conclude, the geographical return pattern gives companies access to contracts and promotes bilateral partnerships, which strengthens the international market position of Austria in space. Yet, once the return rate is even close to 100% this enabling mechanism turns into a constraining mechanism. Other under-returned countries are favoured in this case and the incentive to join ESA programmes decreases, yielding a lower degree of competitiveness. This pattern imposes a cap on free competition and might lead to country-over-quality thinking.

4.1.2. *The SME-initiative pattern*

At both European level and national level the SME-initiative pattern applies. Initiatives have been put in place to support SMEs in their business activities. These initiatives are aimed to ensure a balanced industrial policy covering all categories of industries, including small and medium sized companies.

At the European level, ESA promotes the participation of SMEs in ESA procurements as they are characterized by great flexibility and a high degree of specialization. Specific initiatives have been put in place since the early 2000s to encourage SMEs. In 2015 and 2016, ESA discussed the evolution of the SME policy with its member states and SME's representatives. This resulted in an updated SME policy and also an 'SME Initiative Programme' that was approved at the ministerial level in 2016 [48].

ESA launched the Leading-Edge Technologies (LET) programme in 1998, a programme that allows SMEs to develop their skills. The LET programme constitutes announcement of opportunities that are targeted at SMEs only [49]. LET encourages the 'spin-in' activities of innovative technologies from SMEs and development of capabilities for use in other space programmes. Additionally, ESA offers technical support through training and workshops and access to ESA facilities and laboratories. Participants can follow workshops such as proposal writing; a skill that particularly new entrants and SMEs perceive as challenging due to the extensive amount of money and time involved. Another measure entails the C1 to C4 clauses [50]. These measures were introduced in 2001 and have been revised by ESA's Industrial Policy Committee in 2005. These clauses are included in tenders to foster cooperation between large companies and/or research institutes and SMEs. The C1 and C3 clauses are actions that are reserved for non-primers and SMEs only. Whereas the C2 and C4 clauses are enclosed in open calls, where a significant participation of non-primers are requested [49]. The SME-initiative affects the choice of business partners. One large company mentions that collaboration with SMEs are based on two premises, namely the technical expertise of SMEs and political reasons:

"We have two reasons for collaborating with midsize companies – small, mid-sized companies. One is technical excellence, we believe to have the know-how and the technical competence to do what we offer, and on the other hand political reasons that certain countries are, let's say, advantaged for certain offers." [COMP F]

Finally, the SME initiative helps SMEs to get the relevant knowledge in bidding and executing ESA contracts, to increase their visibility by hosting networking events and to increase their awareness about business opportunities with ESA [48].

There are also initiatives at the national level to stimulate SMEs. The FFG occasionally organizes events for potential newcomers (which are mostly SMEs) in which working procedures with ESA are explained and bilateral sessions are arranged with ESA programme managers. Smaller companies sometimes also receive a higher funding rate.

The SME-initiative pattern fosters entrepreneurial activities & innovation particularly for SMEs. This pattern encourages the involvement of SMEs in space projects and creates networking opportunities. It allows companies to widen their set of skills, which is necessary to be perceived as legitimate by large players. Through workshops and easier access to

information, ESA and the Austrian government tackle barriers that SMEs and new companies encounter in the procurement process. In addition, this pattern shapes the behaviour of large organizations. SMEs should be included in the composition to gain legitimacy, which will help a company to access resources (in terms of contracts).

4.1.3. *The national support pattern*

This pattern refers to the support that Austrian companies get from their national government. Companies mention that governmental support is essential to succeed in ESA programmes. Foremost, companies receive financial support through the ASAP, which acts as a leverage programme to prepare Austrian companies for larger projects at the international level. Companies use ASAP funding mostly in the pre-development and testing phase, in which they collaborate with research institutes to develop technology to a specific level of maturity:

"The target for us is to make somehow pre-developments. We are using this money to develop, in our case to develop test devices, so test methods which we can use then in ESA programmes. So ESA programmes will not enable us to develop new methods and we don't have enough own money, so we use this national programme to develop new test devices, which we then sell into ESA programmes." [COMP A]

Companies also benefit from non-financial support. This includes the opportunity to approach national delegates about issues in the procurement process and/or requests for support letters that are required for some ESA programmes. Firms perceive delegates as influential actors in fostering the cooperation between ESA and the industry:

"When I have the feeling for example that the division to get a project is stuck at ESA or is taking too long, then I go to the Austrian delegate and ask if they can speed up the process or something." [COMP G]

Yet, some firms perceive the national-support pattern as constraining. BMVIT published a space strategy for Austria in 2012. The BMVIT received input from stakeholders of the Austrian space community, which includes the FFG and the inter-ministerial group for space policy and the space association AUSTROSPACE. BMVIT's space strategy guides the scope of action until 2020 [44]. Companies perceive it is hard to receive national support, in terms of funding, when business activities fall outside the scope of BMVIT's space strategy:

"Maybe I am a bit too critical, but they are making a plan for five years and they are defining the topics. If you succeed to get your topic into the Austrian space plan, then this is the direction, which is the input, how do you call it? 'The status of work.' Once you get your topic in the documents, then you get funding for the next five years." [COMP C]

The same issue is observable with regard to optional ESA programmes. Companies can apply for programmes to which Austria has contributed only, which are mostly in the areas of Earth observations, telecommunications and technology developments. Contributions to these programmes are based on the existing competencies in Austria. However, a number of companies think that this constrains innovation and makes it difficult to develop new ideas. They feel that this is a result of the risk-averse attitude of the government, which might harm Austria's international position on the long term. One interviewee shared the following view about innovation in big companies:

"There is not a major incentive for them to innovate, they know that because of the geographical return they will get you know, several isolation contracts for the next generation of what – satellites or so for sure, and that is bad, because it also drives out the high risk funding for the smaller organizations and I think that is dangerous, especially for smaller economies like Austria." [COMP J]

Austrian government officials state that in order to be eligible for national funding, the organization has to meet two requirements. There

should be a potential market for the product and likelihood of business continuity. This is often difficult to estimate for high-risk domains and with limited funds available, priorities have to be made.

To conclude, actors view the national support pattern differently. On the one hand, this pattern works enabling for organizations as issues can be discussed with national delegates, who might help in the procurement process. Additionally, companies receive financial funding through ASAP that allows them to develop technologies in order to compete at international level. On the other hand, firms perceive that the Austrian government defining the boundaries of the playing field will lead to a weaker market position in the long run.

4.2. The organizational level

4.2.1. The size pattern

The size pattern refers to the principle that large organizations have a number of inherent advantages over smaller organizations. Large organizations usually have a greater access to funds and resources and are more established. The size pattern influences a company's product portfolio, how it deals with bureaucracy, way of cooperation, size of its network and approach to innovation.

Austria's space sector constitutes a few large organizations and a large number of SMEs. Large and small firms have different product portfolios. Large organizations are more likely to have a diversified product portfolio, while space is usually core business of a SME [37]. Interviewees view portfolio diversification as an advantage for big companies since it reduces market risks.

However, large organizations also come with more complexity and bureaucracy. Many companies view ESA as a big system with large inertia:

"They were a smaller company, they got a contract to build the first Galileo satellite and the ESA came to look, to look at the project programme and they came and said: ok, so we want to see this document and this document and this other document and please show us that document, and one of the people of the company said: do you want to get the documents or do you want the satellite?" [COMP B]

Working with ESA means that you are dealing with many procedures, formal rules and hierarchical structures. Firms mention the proposal drafting process as an example of dealing with bureaucracy. Writing a good proposal takes a considerable amount of time, effort and money. Big companies experience less difficulties as they have more financial assets and human resources, and are often more familiar with the process. Notwithstanding, both big and small firms think that writing a proposal is a learning process that becomes easier with time, implying that size does not necessarily have to play a role. Secondly, bureaucracy is reflected in the lead times for payments and time-to-contract. While ESA officials recognize these problems they argue that bureaucracy is needed to guarantee a fair and transparent process. Large companies are affected less because they have a diversified product portfolio. In case of delayed payments, they are able to continue business operations because of incoming cash flows from other domains. Small companies have limited resources, which can be a threat to survival:

"But sometimes when you finally are getting a contract even when the work has been done for quite a long time, it is not – I think it is not a big issue for bigger companies because they have more cash power there, but of course for small companies, sometimes it is difficult, because then you have expenses, you don't get advance payment in time, you have to pay the people and then if more or less all the work has been done and then you finally get a payment, sometimes it could be a big issue". [COMP D]

Company size plays a role in the establishment of partnerships. Small companies assert that motives for cooperation include the ability to

combine expertise and creation of synergies. One firm mentioned that smaller companies join forces in order to compete against large players.

"We call ourselves a little bit – and you probably don't hear that expression very often but I am happy to say that: 'the Space Underground in Austria'. The 'Space Underground' pretty says it all. There is a community of I would say, about of dozen of organizations which are usually the core of this very loose network or so, where we are you know, cooperating, bidding together, there is an exchange of ideas, and you know support, one can use the work from the other, it is almost like of a bit of a guerrilla technique or so." [COMP J]

Big companies state that they like to work with SMEs as they have specific know-how and competences. Additionally, political motives might play a role in establishing partnerships, such as access to foreign markets and the geographical return policy.

SMEs indicate that ESA's feedback on proposals is limited which does not promote learning and growth and think that big companies have more accessibility to information through better political connections:

"It is a disadvantage for small companies because big companies always have someone with whom they can talk to, an employee who works in ESA. As a small company, if you would like to obtain information it is very difficult, but I am sure that large companies do have a lot of information." [COMP C]

None of the large companies thought that ESA's feedback was insufficient.

Smaller players argue that large organizations get contracts for activities that they have been doing for a long time, which reduces the incentive to do things differently. They also feel that it is difficult for SMEs to do things differently, because it is unsure whether the government will support these activities. One SME shared the following:

"They only go for the safe areas of space and that is Galileo or satellite, you know communications and geo-information systems and that kind of systems. It serves what is out there, but there is no mechanism to come up with new things and we have in our company. We have an engineer who own a lot of patents, and who is an inventor too and it is very difficult to have the Austrian government kind of be supportive of these kind of human capital capabilities." [COMP B]

GOV 2 said that the available amount of funding plays a critical role in this area. When funding sources are decreasing existing projects are privileged, but in general the Austrian government is very open to new activities. Some SMEs propose that the government should set aside a small amount of money to invest in riskier projects and to adopt a longer-term view, as established technologies might become obsolete one day and developing new technologies takes time.

The size pattern was overly present during the interviews. Large companies have fewer difficulties with the procurement process whereas small companies experience more obstacles. Large companies seem to be perceived more legitimate as they receive a large part of the available funding. Opposed to large companies, SMEs are more likely to operate outside the established areas. This also entails that they more often focus on disruptive innovation while large companies concentrate on incremental innovation. Hence, large companies are viewed as less risky, which is favoured in a sector where financial resources are limited.

4.2.2. The consortium pattern

The consortium pattern refers to the principle that in order to survive in a highly competitive sector, an organization should be part of a strong team (or 'consortium'). Austria has no prime, therefore Austrian space companies always work within a team or supply chain. Companies collaborate with other firms or research institutes. Main reasons for collaboration include complementing expertise, economies of scale, operational synergies and being a stronger force against other players in the market. Additionally, working together is necessary to cover the

whole process of finishing the product, as none of the Austrian companies is large enough to do everything by themselves (opposed to a prime):

“Inside projects we have sometimes a material producer, you have someone who is testing the materials, someone who is making a component out of it. So the essence of cooperation in most cases is to put together, to create things: there is a supplier for material, someone who can test it, and someone that will use it afterwards for a kind of mechanism or component or whatever.” [COMP A]

Universities are the most common partners in the research and development stage [37]. Research institutes usually provide companies with the newest scientific knowledge or go up to the prototype level while companies are the ones who develop it further to end products and commercialize it.

Being part of a consortium with strong technical skills and scientific knowledge is an important requirement to win ESA contracts. Additionally, the country of origin plays a significant role due to the geographical return. For example, GOV 1 and GOV 2 state that collaborating with newer member states is perceived as favourable by ESA.

Austrian companies can be highly dependent on a prime. Some contracts are only limited to primes. These are often large projects, such as building a satellite. Even though primes can carry out a project entirely, they must hire subcontractors from other countries because of the geographical return stipulations. To be included in projects, Austrian companies have to put effort in selling their capabilities to the prime. Established players or firms that have worked with a prime before are preferred because of familiarity and experience issues. Getting into a project is challenging for new players, as they do not have track record:

“I think for a prime it's easier to get somebody in the structure who is already known than someone who is not yet known in that sector. I think that this part can be complicated.” [ESA B]

Small companies cooperate to a lesser degree with other organizations than is the case with large companies. This is particularly evident in the areas of production, training and certification. Companies often lack the financial resources that are needed to subsidize the long-term joint research projects. Small companies also do not like to deal with the rigid procurement structures of large companies and the absence of a network makes it difficult for them to enter a partnership [37].

To conclude, the consortium pattern fosters partnerships between companies and defines how teams are composed. Technical synergies, economies of scale and sharing of development costs are reasons for collaboration. Political motives, such as the geographical return, are also of importance. Established players are more likely to be included in consortiums; they have proven themselves in the past whereas newcomers have not proven whether they are legitimate or not. Lastly, small companies are less likely to be involved in partnerships as they lack the necessary resources.

4.2.3. The experience pattern

The experience pattern is the belief that older firms encounter fewer barriers in the space sector than new firms. Experience is an important factor when one applies for funding and contracts in space. The procurement process is perceived as time consuming with many rules and strict requirements. Newcomers are less familiar with the guidelines as it takes time to digest the information. Big companies, who have been in the market for a longer period, understand better how to deal with it.

One of the main challenges in the procurement process is writing a winning proposal; this is especially true for new players. With so many requirements, it can be a challenge to meet the deadline of a tender when an organization is not familiar with the process. COMP H states that it took five years before it finally got its first contract from ESA. Earlier proposals were not sufficient and it takes time to understand how to write a good proposal. Companies agree that drafting up a good proposal is a learning process and that it will become easier with time. Additionally,

companies that have submitted proposals to ESA before already have documentation in place, which can be used again in bidding for the next tender.

Experience is an important requirement in the evaluation process of the national programme. Yet, Austrian government officials state that newcomers get funding if they can proof the long-term viability of the technology. With regard to ESA's evaluation process, the evaluation board is not allowed to make judgments based on a firm's experience. However, an ESA interviewee explains that it is sometimes not ideal:

“Actually there is a rule for which an evaluation board cannot take into account this kind of parameter. So if you receive a proposal, which is a perfect proposal, that scores the maximum with respect to the others, and you know that that company has never worked before, you cannot take that into account. So you have to place a contract with them, for the moment. But we have bad experiences recently, and I think this has to be changed.” [ESA A]

Companies might submit a perfect proposal, but should also be able to live up to this during the implementation of the project. Taking into account experience therefore, might eliminate the danger that a firm cannot meet the expectations.

Finally, experience is an important principle for partnerships. The space sector is a particularly competitive domain. Primes get many offers from potential subcontractors, and are more likely to pick companies with whom they have worked before over firms with no heritage. Therefore, new players must demonstrate its expertise and value to other players in the field. Usually organizations participate in the ASAP programme first and then go to the General Support Technology Programme (GSTP) and the basic Technology Research Programme (TRP) to develop their competencies. An ESA interviewee explains the usefulness of the GSTP and TRP programmes:

“Technology programmes, so GSTP or TRP, that are activity based programmes let's say where smaller companies can gain experience in the sector and maybe make themselves known for other later projects where the primes are looking for expertise in very specific fields.” [ESA B]

The ASAP, GSTP and the TRP act as leverage programmes for new companies, where they can gain experience in order to prepare them for larger projects. These programmes are aimed to close the gap between new and older companies and enhance the opportunities for new players in the space sector.

Austrian governmental representatives, ESA policy makers and companies perceive that experience is crucial for an organization. Experience is needed to gain legitimacy. Through experience companies become familiar with the procurement structures. It contributes to technology developments and allows for companies to build a track record. ESA's technology programmes serve as a tool to acquire experience. This is especially important for newcomers that utilize the ASAP, GSTP and TRP programmes to get experience and build legitimacy.

4.3. Interconnectivity of the institutional patterns

Even though the identified patterns occur at different institutional levels, the patterns are not isolated but are interdependent and together make up the overall space-sector logic.

The geographical return pattern affects the size pattern. The size pattern refers to the advantage big companies have over small ones; they are usually more established and have greater amounts of resources. ESA's industrial Policy set out the rules related to a fair geographical distribution. In order to increase the competitiveness of smaller firms, ESA has developed special measures. For example, some contracts are only limited to non-primes, SMEs and R&D entities [36]. This allows Austria, a country without a prime, to compete at international level.

The following statement shows an example of how the geographical return pattern affects the consortium pattern:

“We don't have a prime industry in Austria, we don't have primes. So that means of course we always have to rely to work within a team or be in a supplier chain, which of course, politically – the tendency is that the bigger member states tends to do everything by themselves, bigger companies and bigger member states, this is a barrier.” [GOV A]

The geographical return affects the team composition in space projects. Austrian companies strategically look for partners in preferred countries and when Austria self is under-returned, Austrian SMEs are favoured over other countries. The geographical return contributes to the experience pattern as it ensures that member states will be engaged in projects, allowing companies continue to develop and enhance their skills.

The SME initiative pattern comprises a set of rules to foster the development of SMEs. Compared to big companies SMEs lack resources and experience, which makes them less legitimate. Inadequate legitimacy imposes a barrier to resources and strategic alliances. An ESA interviewee explains why it is important to support SMEs:

“So I think SMEs are essential from the point of view of the geo-distribution, you don't want to find always the same heads, you need to have good – and at the same time you cannot be just picking the companies for the sake of the nationality, it has to be really that there is an expertise behind, so you need to promote them so that they can have this expertise, it is not just the fact of saying, ah how nice, now this country, Malta, for example, they have just joined, let's show some Malta companies, is maybe not that easy. You need to allow for these countries to develop.” [ESA B]

This pattern means that SMEs can develop their skills and increase their competitive position. Additionally, the SME initiative pattern prevents that contracts are only awarded to countries with a prime industry and ensures that SMEs are included in value chains. Hence, the SME initiative pattern is related to the geographical-return pattern on the state level as well as the three patterns on the field level.

The national support pattern refers to the support that industry receives from their government. The national support initiative is connected with the SME-initiative pattern and the size pattern. The government supports smaller players through special measures. For example, smaller companies get a higher percentage of funding than big companies. Finally, the national support pattern is related to the experience pattern since companies develop technologies through the national space applications programme ASAP. Since experience is positively related to legitimacy, this pattern enables companies to find strategic alliances more easily and it is therefore related to the consortium pattern.

On organizational level, the institutional patterns portray the belief that with an increase in organizational size, experience and network the access to resources increases as well. However, these norms are subject to the institutional patterns on the State level. The societal norms in the industry sphere are not wholly aligned with the core beliefs at the governmental sphere (harmonization, peaceful cooperation and fair return) and therefore higher-level societal patterns are put in place to shape the societal norms in the industry sphere. The interconnectivity of the institutional patterns is presented in Fig. 5.

4.4. Actors' reaction to institutional patterns

4.4.1. The governmental agencies

Austrian companies working in space are subject to a number of written rules imposed by the authorized institutions. Austrian space companies are mostly dealing with the policies and regulations that are established by the EU, ESA and the national government. These institutions can therefore be perceived as institutional entrepreneurs as they have the authority to change the rules of the game.

The norms on the field level suggest: bigger companies with more experience and a better network are more likely to win a contract, because these properties are perceived as legitimate. The strengths of SMEs however lie in their specialized knowledge and a high degree of flexibility. ESA and Austria's government therefore influence the field level patterns through policies, which can be seen as a top-down approach.

Fig. 5. Interconnectivity of the institutional patterns.

On the other hand, a bottom-up approach exists in which governmental agencies are approached to influence institutional patterns. Companies expressed that the Austrian government is very open to industry's input. For example, companies sometimes approach Austrian delegates to talk about ESA procurement issue. In addition, the industry is also consulted for input about the subscriptions to optional programs. Through this relationship, actors in the field level can influence mechanisms on the political level.

4.4.2. The industry

The industry in Austria can be divided into the following groups: large companies (>250 employees), SMEs ($\leq$ 250 employees) and research institutes. It is important to make this distinction as each group responds differently to the existing space sector logic.

There are only a few large players in the Austrian space industry, other companies depict them as the 'established players'. Large players seem more positive about the procurement processes and encounter fewer problems in dealing with bureaucratic systems. They enjoy the advantages of having more resources, access to a large network and support by the national government. They are acquainted with the procurement rules and know how to deal with it more effectively. This is evident from ESA's statistics from 2015 which display that main ESA contractors are large firms (See Fig. 4). As companies need to gain legitimacy to get resources, this suggests that they are acting congruently with social laws, norms and values. Big companies have passed the stage where they have to gain legitimacy and are now in the phase of 'maintaining legitimacy', which is an easier task than gaining legitimacy. Legitimizing activities has become routinized work. This is for example the case in writing a proposal. Big companies continue to do what they excel in, and therefore strengthen their strengths. They are therefore more likely to conduct incremental innovation than disruptive innovation; since there is a higher risk of losing legitimacy in conducting the latter one. Big companies do not have an entirely free playing field, because the SME-initiative pattern excludes big companies from certain tenders and compels them to collaborate with SMEs.

SMEs conform to a lesser extent to the institutional logic on the field level: they are smaller in size, have less experience and sometimes lack a proper network or financial resources to be included in a consortium. SMEs are more likely to encounter rejections for calls because their activities are not within the barriers of acceptable risk. SMEs in Austria seem to be more likely to be engaged in disruptive innovation than large companies. Most SMEs find themselves in the phase of 'gaining legitimacy' and the lack thereof is a barrier in attracting funding. The SME initiatives are very important as it aids in the process of gaining legitimacy. Experience is a very important asset in this context. It allows companies to become more familiar with processes and it enables them to develop technological skills. In strategic alliances, companies use experience to show its value to potential partners. Therefore, the LET programme and the workshops are mechanisms that allow SMEs to comply with the experience pattern. Additionally, due to certain SME clauses, the barriers to collaborate with large players have been reduced. This helps companies to build a network and to reduce the constraints under the consortium pattern.

One subgroup of SMEs comprises new players. It is relatively difficult for new players to enter the space industry. This is especially true for the upstream sector (e.g. flight hardware), entering the downstream sector might be easier. Entering the upstream sector requires high up-front investments, there is heavy competition and the market is characterized by high uncertainty. Space funding is limited and obtaining resources without a past performance is very difficult. In order to reduce risk and increase survival chances new players might have activities outside the space sector:

"You don't have to be a space actor to enter the market, you can also work on ground systems, you can also work for laboratories at ESTEC, you can also contribute to their testing activities." [GOV B]

Furthermore, they might join ESA's technology programmes to develop their expertise and to build experience, which prepares them for the national and international playing field.

The last group constitutes research institutes. This group does not make profit and they are fully dependent on subsidies and grants. Research institutes work in close conjunction with both SMEs and big companies. They provide companies with cutting-edge technologies and are the starting point of the value chain. Due to their long experience in research and depth of knowledge, they are popular project partners. As statistics show, cooperative partners are mostly universities and cooperative relationships exist more frequently in the domain of research and development [35]. This shows their conformity to the experience pattern and the consortium pattern. Research institutes are also responsible for promoting space through educational programmes, public relations and events. This is important as it might evoke the interests among the public and it might stimulate new players to enter the space industry.

Institutional entrepreneurship is also evident at the industry level. Entrepreneurs in Austria try to change the prevailing institutional logic in two ways. The first way is through open advocacy; the industry is involved in drawing the national strategy for space. The second way is through private persuasion; this is apparent when an entrepreneur approaches a delegate to smoothen ESA's procurement process. However, it is not an easy task to change institutional rules, and those who do not conform to existing norms might find themselves struggling with survival and growth.

5. Conclusions

The space policies implemented by ESA and the Austrian government are aimed to foster fruitful cooperation, enhance competitiveness and to stimulate innovation both on national and international level. The Austrian industry is doing well in competing for ESA tenders, and companies perceive the ASAP programme as a stimulating initiative. Notwithstanding, companies think that there is room for improvement and suggest for additional funding in the specific areas of research and new technologies. According to them, this would help to stimulate innovation and long-term competitiveness. Reduction of time-to-payment and time-to-contract in procurement processes, elaborated feedback for proposals.

This study adds to our knowledge about the consequences of entrepreneurship policies. The results give insight into how policies and space programmes can be improved. Additionally, this study is useful for countries with similar structural features as the Austrian space industry. It provides an idea of possible enabling mechanisms and the barriers companies are facing.

This study is subject to the following limitations. First of all, due to non-response from companies the sample has been primarily focused upon SMEs, inclusion of more large companies would have provided a more comprehensive picture of the Austrian space industry. Secondly, there might be a risk of interviewee bias. Interviewees were asked to give recommendations to improve ESA processes, or to put it differently – to criticize ESA processes. Even though confidentiality was ensured during the interviews, respondents might have been reluctant to share their honest opinions, as they are dependent on ESA to get industrial contracts. Thirdly, since each country has different policies and regulations on space, it is encouraged to conduct this research in other countries to identify common themes and to get a more holistic understanding of how ESA policies enable or constrain entrepreneurship in the space sector. Lastly, as institutional logics are not static but dynamic and transform over time, a longitudinal study provides additional insights on how institutional logics change and how institutional entrepreneurs operate.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.actaastro.2017.10.030>.

References

- [1] European Commission, Majority of Europeans Think Space Sector is a Source of Growth and Contributor to Scientific Progress, 2014. http://europa.eu/rapid/press-release_IP-14-78_en.htm. (Accessed 16 August 2015).
- [2] C. Giannopapa, Key Enabling Technologies and Open Innovation, European Space Policy Institute (ESPI) report vol. 24 (2010).
- [3] P.J. Dimaggio, W.W. Powell, The iron cage revisited: institutional isomorphism and collective rationality in organizational fields, *Am. J. Rev.* 48 (1983) 147–160.
- [4] L.E. Davis, D.C. North, Institutional Change and American Economic Growth, Cambridge University Press, 1971.
- [5] W.R. Scott, Institutions and Organizations. Foundations for Organizational Science, Sage publications, London, 1995.
- [6] T. Lawrence, R. Suddaby, B. Leca, Institutional work: refocusing institutional studies of organization, *J. Manage. Inq.* 20 (2011) 52–58.
- [7] J.W. Meyer, B. Rowan, Institutionalized organizations: formal structure as myth and ceremony, *Am. J. Sociol.* (1977) 340–363.
- [8] European Space Agency, Convention for the Establishment of a European Space Agency, 2010. http://download.esa.int/docs/LEX-L/ESA-Convention/20101200-SP-1317-EN_Extract_ESA-Convention.pdf. (Accessed 29 March 2017).
- [9] European Space Agency, New Member States, 2010. http://www.esa.int/About_Us/Welcome_to_ESA/New_Member_States. (Accessed 29 March 2017).
- [10] M. Adriaansen, C. Giannopapa, D. Sagat, A. Papastefanou, Priorities in national space strategies and governance of the member states of the European Space Agency, *Acta Astronaut.* 117 (2015) 356–367.
- [11] R.R. Alford, R. Friedland, Powers of Theory: Capitalism, the State, and Democracy, Cambridge University Press, Cambridge, 1985.
- [12] W.R. Scott, Institutions and Organizations, Sage publications, Thousand Oaks, CA, 2001.
- [13] P.H. Thornton, W. Ocasio, Institutional logics, in: Handbook of Organizational Institutionalism, Sage, Thousand Oaks, CA, 2008, pp. 99–128.
- [14] J.G. Maurer, Readings in Organizational Theory: Open System Approaches, Random House, New York, 1971.
- [15] M.C. Suchman, Managing legitimacy: strategic and institutional approaches, *Acad. Mgmt. Rev.* 20 (1995) 571–610.
- [16] M.A. Zimmerman, G.J. Zeitz, Beyond survival: achieving new venture growth by building legitimacy, *Acad. Manage. Rev.* 27 (2002) 414.
- [17] A.D. Brown, Narrative, politics and legitimacy in an IT implementation, *J. Manage. Stud.* 35 (1998) 35–58.
- [18] A. Stinchcombe, Organization-creating organizations, *Society* 2 (1965) 34–35.
- [19] W.R. Scott, Institutions and Organizations: Ideas, Interests, and Identities, Sage publications, Thousand Oaks, CA, 2013.
- [20] G.D. Bruton, D. Ahlstrom, H.L. Li, Institutional theory and entrepreneurship: where are we now and where do we need to move in the future? *Entrep. Theory Pract.* 34 (2010) 421–440.
- [21] B.E. Ashforth, B.W. Gibbs, The double-edge of organizational legitimation, *Organ. Sci.* 1 (1990) 177–194.
- [22] M.G. Seo, W.D. Creed, Institutional contradictions, praxis, and institutional change: a dialectical perspective, *Acad. Manage. Rev.* 27 (2002) 222–247.
- [23] R. Garud, P. Karnøe, Bricolage versus breakthrough: distributed and embedded agency in technology entrepreneurship, *Res. Policy* 32 (2003) 277–300.
- [24] M. Emirbayer, A. Mische, What is agency? *Am. J. Sociol.* 103 (1998) 962–1023.
- [25] S.N. Eisenstadt, Cultural orientations, institutional entrepreneurs, and social change: comparative analysis of traditional civilizations, *Am. J. Sociol.* 85 (1980) 840–869.
- [26] P.J. DiMaggio, Interest and agency in institutional theory, in: L.G. Zucker (Ed.), Institutional Patterns and Organizations, Ballinger, Cambridge, MA, 1988, pp. 3–22.
- [27] G.R. Davis, Agents without principle? The spread of the poison pill through the intercorporate network, *Adm. Sci. Q.* 36 (1991) 583–613.
- [28] R. Greenwood, C.R. Hinings, R. Suddaby, Theorizing change: the role of professional associations in the transformation of institutionalized fields, *Acad. Manage. Rev.* 45 (2002) 58–80.
- [29] R. Durand, J. McGuire, Legitimizing agencies in the face of selection: the case of AACSB, *Organ. Stud.* 26 (2005) 165–196.
- [30] B. Leca, J. Battilana, E. Boxenbaum, Agency and Institutions: a Review of Institutional Entrepreneurship, Harvard Business School, Cambridge, MA, 2008.
- [31] D.D. Li, J. Feng, H. Jiang, Institutional entrepreneurs, *Am. Econ. Rev.* 96 (2006) 358–362.
- [32] Institut für Weltraumforschung, IWF Graz, 2015. <http://www.iwf.oew.ac.at/en/menue/home/>. (Accessed 16 August 2015).
- [33] B.P. Besser, Austria's History in Space, 2004. <https://www.ffg.at/sites/default/files/downloads/page/austriashistoryinspace1.pdf>. (Accessed 16 August 2015).
- [34] Austrian Research Promotion Agency (FFG), Austria in Space, 2014. <https://www.ffg.at/en/content/austria-space>. (Accessed 20 August 2015).
- [35] European Commission, Sixth Framework Programme, 2015. https://ec.europa.eu/research/fp6/index_en.cfm. (Accessed 20 August 2015).
- [36] European Space Agency, Industrial Policy measures for non-primes, SMEs and R&D entities in ESA programmes. http://emits.sso.esa.int/emits-doc/e_support/policy.htm (Accessed 29 March 2017).
- [37] Brimatech, Austrian Space Industry and Research, Database of Market Participants, 2011. http://www.bmvit.gv.at/service/publikationen/innovation/raumfahrttechnologie/downloads/oespace_final_report.pdf. (Accessed 23 May 2015).
- [38] European Space Agency, Countries Overview: Info Notes on Member States of ESA, 2015.
- [39] The European Organization for the Exploitation of Meteorological Satellites. Who we are. <http://www.eumetsat.int/website/home/AboutUs/WhoWeAre/index.html> (Accessed 29 03 2017).
- [40] The International Astronautical Federation. About. <http://www.iafastro.org/about/> (Accessed 29 03 2017).
- [41] The Austrian Space Industries and Research Institutions. Home. <http://www.austrospace.at/> (Accessed 29 March 2017).
- [42] Space Safety Magazine. Space Economy. <http://www.spacesafetymagazine.com/space-on-earth/space-economy/> (Accessed 29 March 2017).
- [43] Federal Ministry for Transport, Innovation and Technology (BMVIT), Austrian Space Applications Programme, 2008. https://www.ffg.at/sites/default/files/downloads/asap08_08122010_fin.pdf. (Accessed 16 August 2015).
- [44] Federal Ministry for Transport, Innovation and Technology (BMVIT), Austria in Space: Strategy of the BMVIT for Austrian Space Activities, 2014. http://www.bmvit.gv.at/service/publikationen/innovation/raumfahrttechnologie/downloads/spacetechnology_brochure.pdf. (Accessed 23 May 2015).
- [45] Austrian Research Promotion Agency, Austrian ESA participation. <https://www.ffg.at/en/services/austrian-esa-participation> (Accessed 29 March 2017).
- [46] Clama Consulting, Survey of the Economic Impact of Portugal's Participation in ESA from 2000 to 2009, 2011. http://esamultimedia.esa.int/docs/industry/Catalogues/Survey_of_the_Economic_Impact_of_Portugal_s_Participation_in_ESA_from_2000_to_2009.pdf. (Accessed 23 May 2015).
- [47] European Space Agency, ESA Budget 2016, 2016. http://m.esa.int/spaceimages/Images/2016/01/ESA_budget_2016. (Accessed 29 March 2017).
- [48] Jens Kauffman. The ESA SME Initiative. https://s3-eu-west-1.amazonaws.com/media.sa.catapult/wp-content/uploads/2017/03/29172337/Jens-Kauffman_ESA-SME-Initiative.pdf (Accessed 03 April 2017).
- [49] European Space Agency. LET-SME: an opportunity reserved for SMEs. http://www.esa.int/About_Us/Business_with_ESA/Small_and_Medium_Sized_Enterprises/Opportunities_for_SMEs/LET-SME_an_opportunity_reserved_for_SMEs (Accessed 29 March 2017).
- [50] European Space Agency Procurement policy on fair access for SMEs – The C1 to C4 Clauses, http://m.esa.int/About_Us/Business_with_ESA/SME_Small_and_Medium_Sized_Enterprises/Opportunities_for_SMEs/Procurement_policy_on_fair_access_for_SMEs_-_the_C1-C4_Clauses (Accessed 30 May 2016).