Chapter 8
Power Games in Space: The German High-Tech Strategy and European Space Policy

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8.1 Introduction

In 2006, the German government published a national High-Tech Strategy (HTS) aiming at a better coordination of its research and innovation policy, and to increase its financial support to research and development in high-tech sectors. The new government, from 2005 to 2009 a "large coalition" between the Christian Democratic Parties (CDU/CSU) and the Social Democrats (SPD), announced an increase in public research spending to 3% of GDP until 2010 and planned to also create 1.5 million new jobs. Its most spectacular component was to concentrate research spending on 17 particularly defined economic sectors which, in the long run, would strengthen Germany’s international competitiveness (BMBF 2006).

Among these strategic areas, the space sector plays a prominent role, since the largest share of the HTS budget (25% of the total programme budget during the government’s 4-year legislative period, equivalent to Euro 3.9 billion) was devoted to space technologies (see Fig. 8.1). This is almost twice the amount of resources devoted to energy, and triple the money spent on information and communication technology. This concentration on large scale technology indicates that one of the major traditional facets of Germany innovation policy, in which governmental decisions are essential in the selection and the support of specific technological fields, still plays an important role, despite the strategy paper’s rhetoric emphasizing clusters, networks, and entrepreneurship.

The policy formation of the German High-Tech Strategy appears thus as an interesting riddle. Does it really represent a significant change in German innovation policy, or is it more a case of selling old wine in new bottles through

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Fig. 8.1 Funding of space technology and other high-tech sectors within the new German innovation strategy (million Euros)

8.2 The German “High-Tech Strategy”: A New Role of the State?

On August 29, 2006, the cabinet of the new government of Conservatives and Social Democrats approved a High-Tech Strategy (HTS) to implement an integrated approach to innovation policy in which a dozen of ministries were involved. The collective strategy would be coordinated by the Ministry of Research and Education. Although the HTS could be seen as a policy adjustment of the new government, the idea first emerged in 2004 when the two major players, the research ministry and the ministry of economics, announced they were going to coordinate their activities via a “high-tech master plan” (Dohse 2005).

Based on an enlarged funding budget, the HTS involved a detailed plan for a broad spectrum of events and policy measures. The major components and sequences are depicted in a milestone that was published in the strategy paper (see Fig. 8.2).

If one compares the strategy paper with the various research and development reports of the Federal Ministry of Research and Technology (BMFT), it becomes evident that the HTS was not a completely new approach to innovation, in which older policy instruments were replaced by newer ones, but rather an “integrated

...
programme marketing" in which a complex combination of existing and planned activities was presented as a new and coherent programme.

An innovative facet was undoubtedly the extension of purely distributive measures (research funding) by a series of regulatory and institutional components. The strategy thus combined increased R&D funding with reforms of tax law and the introduction of a law facilitating private equity to attract venture capital. Also an overhaul of Germany’s Law Pertaining to Companies with Limited Liability would reduce the regulatory and financial burden on small and medium companies. The strategy thus integrated a diverse spectrum of policy measures related to the general conditions of innovation, but also to the private and public demand for innovative products. The ultimate goal was to accelerate development, market access and the diffusion of innovation.

From a relational perspective, the German HTS consists of a complex network of actors and policy measures related to a variety of high-tech sectors and to some cross-cutting activities. Figure 8.3 visualises the multiple actors and technological fields that are involved in the HTS with methods borrowed from political network analysis (Brandes et al. 1999; Schneider et al. 2009). Actors are depicted with points, and squared grey areas denote the 17 high-tech sectors. Links between the points and areas indicate the joint involvement of actors in these fields of R&D. The geometric position of actors indicates the closeness of actors to the various R&D fields in which they are involved. The size of the areas is relative to their financial support in the 4-years high-tech budget.

Fig. 8.3 Participation of governmental actors in sectoral high-tech measures

The most prominent actors in this respect are the Federal Ministry of Education and Research (BMBF, “research ministry”) and the Federal Ministry of Economics and Technology (BMWI, “economics ministry”). In the overall programme, space technology covers the largest amount of resources, but in relational terms it is rather peripheral. Only three actors – the ministries of economics, of justice (BMI) and of transportation (BMVBS) – are involved in this subfield.

A major challenge in this complex network of actors and activities is coherence and integration. To improve the coordination of this heterogeneous complex, the German government created two institutional platforms for information exchange and policy advice: On the one hand, there is the Industry-Science Research Alliance, composed of representatives from the industrial and science sectors, while on the other hand, there is the Council for Innovation and Growth as an advisory body to the chancellor. It is composed of prominent scientists (for an in-depth analysis of these bodies see Orłowski, Chap. 7).

Although the programme looks eclectic and is garnished with modern rhetoric, it is nevertheless shaped by a more or less coherent background theory. Its basic philosophy was influenced by Frieder Meyer-Krahmer, the permanent secretary of both the former social-democratic minister, Edekard Balzmann, and the new Christian democratic minister, Annette Schavan. Similar to Meyer-Krahmer’s contribution to a special issue on “National policies in the age of globalization,” (Meyer-Krahmer 2005) published before the election in late 2005, the programmatically government paper called for a paradigm change in research and innovation policy. The strategy paper argued that focus should be shifted to emerging lead-markets within the context of complex technologies gaining prominence in future. Similarly, the high-tech manifest stressed this strategy as the only means to maintain and advance Germany’s competitive position in the global innovation race.

The new strategy also implied a redefinition of the role of the state. Since the 1960s, a basic feature of German innovation policy has been to support large technological projects and systems. Main examples include nuclear and space technology, high-speed trains, information technology, and others. Often, such large-scale projects were carried out by a small number of big companies (Weyer 1993b; Weyer et al. 1997). In the mid-1990s the former (conservative) minister for research, Jürgen Rüttgers, introduced a new pattern of innovation policy by the BMBF competitions “Mobility in conurbations” (1996), “BioRegio” (1996) and “InoRegio” (1999) (Conrad 2007; Dohse 2005). For the first time German innovation policy refrained from selecting particular technologies but primarily promoted regional networks and clusters to better stimulate self-organised learning processes and to spur innovation at the regional level.

The HTS of 2006 can be seen as the partial perpetuation of this new policy orientation, which was then combined with the traditional emphasis on large technology. This approach was extended to all fields of innovation policy in all federal ministries. The major governmental task was new to provide institutional infrastructures for coordination and information exchange in order to facilitate the emergence of lead-markets. This was no longer a direct governmental intervention
8.3 Bureaucratic Politics and the Industrial Policy Game

In structural terms, the German HTS indicated a major shift in research and innovation policy in three respects: (1) A change from direct subsidies for big technology to indirect incentives for regional clusters (at least at the programmatic level); (2) A further diffusion of governmental activities into different sectors of society (social policy, domestic construction policy, transportation policy and others) as a new objective of innovation policy; and (3) A change in actor positions: The research ministry was no longer the single key player in the field, but shared responsibilities with other core actors such as the ministry of economics (BMWi). The latter changes especially undermined the strategic position of the research ministry.

After the new Federal Government took office in autumn 2005, two major decisions were made that weakened the position of the BMBF. Since the 1970s, the BMBF had been the key actor in the field of research and innovation. Other ministries such as the ministry of defence or the ministry of economics only had peripheral positions, for instance in the field of military and aviation technology. Although there had been many attempts following each change in government during the 1980s and 1990s to split up the BMBF and to create a space ministry or a ministry for industrial policy, every chancellor since then had been resistant to these pressures.

However, in late 2005, the BMBF had to abandon many of its former competences in higher education as a result of the federalism reform, which aimed at a fortification of the role of the Federal States. In addition, the jurisdiction of the ministry of economics was broadened to a ministry of economics and technology by transferring the responsibility for high-tech fields such as aerospace, information technology, energy and transportation from the research ministry to the ministry of economics. This competence shift was based on the organizational directive of chancellor Angela Merkel of 5 November 2005 (BMBF 2006, 2007). The financial impact of this reorganization was that the BMBF lost a significant part of its budget in 2005. Figure 8.4 shows the evolution of the German research budget with respect to the major sponsoring institutions. Data are based on various research reports (BMBF 2007, 2010).

Above all, the BMBF lost its policy leadership in research and innovation. This had frequently been disputed during the last few decades, but was never really endangered. This reorganization thus can be regarded as a redistribution of policy responsibilities which might result in a complete dissolution of this particular research policy domain. Research policy, in this perspective, is extended to an integrated industrial policy in which research and innovation are only subfields and partial sequences of an encompassing industrial policy geared towards competitiveness and innovation. This notion of industrial policy was frequently used by Michael Glos, minister for economics 2005–2009, arguing in the tradition of Franz-Josef Strauß and Edmund Stoiber. Both were former Premier Ministers of Bavaria and strong advocates of economic statism or neo-mercantilist economic policy.

From a “bureaucratic politics” (Allison and Halperin 1972) perspective, the High-Tech Strategy can be regarded as a reaction to BMBF’s loss of competences. It served as a strategic move to regain media attention and opinion leadership in the field, and to claim the role of a programmatic think-tank for the entire federal innovation policy.

However, the new policy strategy also implied some risk. Since it was aimed towards a variety of fields of application – a long-standing demand of sociological innovation research (Meyer-Krahmer and Kuntze 1992; Weyer et al. 1997) – this strategy may have unintentionally contributed to the dissipation of this particular research policy domain. This is due to the fact that other ministries, such as the ministry of economics, the ministry of environment and the transportation ministry also came into play. Furthermore, a policy without precise objectives (such as, for instance, building a nuclear plant) and a policy which predominantly has to rely on indirect incentives is difficult to evaluate. The demand for additional funds (six billion Euros for the period 2006–2009) can thus be considered as a strategic move by the BMBF to regain influence in a field where the risk to become insignificant had increased.
If we compare existing activities and the strategic plan depicted in the government high-tech paper, some interesting patterns appear. The paper itemises 17 high-tech sectors, from space technology to services, which can be seen as an inventory of existing programmes. Ironically, these programmes are in most cases presented in a rather conventional manner. For instance, the labelling of the technology field mostly corresponds to the names of the departmental division in their respective ministry. This nourishes the impression that the programmatic foreword in the strategy paper is to a great deal rhetoric and therefore expresses political marketing goals rather than substantial problem solutions. This interpretation is also supported by the distribution of money: Besides the 11.9 billion Euros dedicated to the aforementioned 17 high-tech sectors, only 2.7 billion go into the new cross-section measures (BMBF 2006).

In addition, a rough estimation of the shares of the two main ministries in the high-tech budget shows that the ministry of economic gains almost two-thirds of the funds for strategic sectors (61%), while the research ministry only receives about 22% of that amount. In contrast, one of the main measures based on the new paradigm of innovation policy (clusters and regions) is only supported with 600 million Euros (4%). Given the fact that most of the regional clusters will probably be situated within the specific high-tech fields such as biotechnology or information technology, the new components of innovation policy are almost insignificant.

Table 8.1 also shows that space and energy take the lion’s share and cover about half of the high-tech sector’s budget. We take this as a sign that the traditional big technology orientation is persisting. Ironically, it was those two sectors which gave birth to the research ministry in 1962. At that time, the ministry of nuclear energy was upgraded to work as a general ministry for research and a second division for space policy was added (Weyer 1993a, 2006). Since the identity of the BMBF had been strongly shaped by the two large divisions for space and atomic energy, the loss of these two main pillars must indicate a fundamental change in the identity of the ministry.

The current transfer of resources and competencies in both fields towards the ministry of economics reveals that, besides the modern rhetoric, traditional patterns of innovation policy are persisting and probably will be reinforced in future. A paradigmatic example for this trend is the national and European space policy, which is one of the major fields in which the new industrial policy comes into play.

### 8.4 The Space Sector Between Science and Industrial Policy

Since the 1960s, German space policy has been shaped by three major interest conflicts: (1) The clash between a national and an international orientation of space projects; (2) the contradiction between the construction of rockets and manned spacecraft as demanded by the space industry versus the participation in satellite missions as demanded by the community of space scientists; and (3) the conflict between a European and a transatlantic cooperation in space. The conflict was also

<table>
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<tr>
<th>High-tech sectors</th>
<th>BMBF</th>
<th>BMWi</th>
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<tbody>
<tr>
<td>Space</td>
<td>3,650</td>
<td>3,650</td>
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<tr>
<td>Energy</td>
<td>2,000</td>
<td>1,600</td>
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<tr>
<td>ICT</td>
<td>1,180</td>
<td>1,180</td>
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<tr>
<td>Health</td>
<td>800</td>
<td>600</td>
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<tr>
<td>Transportation</td>
<td>770</td>
<td>385</td>
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<tr>
<td>Nanotechnology</td>
<td>640</td>
<td>480</td>
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<tr>
<td>Biotechnology</td>
<td>430</td>
<td>215</td>
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<tr>
<td>Material</td>
<td>420</td>
<td>210</td>
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<td>Environment</td>
<td>420</td>
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<td>Optics</td>
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<tr>
<td>Botanics</td>
<td>300</td>
<td>150</td>
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<tr>
<td>Aviation</td>
<td>270</td>
<td>270</td>
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<tr>
<td>Production</td>
<td>250</td>
<td>125</td>
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<tr>
<td>Micro-systems</td>
<td>220</td>
<td>220</td>
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<tr>
<td>Maritime technology</td>
<td>150</td>
<td>150</td>
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<tr>
<td>Security</td>
<td>80</td>
<td>80</td>
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<tr>
<td>Services</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>Sub-total</td>
<td>11,940</td>
<td>2,625</td>
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<td>Cross-sectoral measures</td>
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<tr>
<td>SME</td>
<td>1,840</td>
<td>1,840</td>
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<tr>
<td>Clusters and regions</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Startups</td>
<td>220</td>
<td>220</td>
</tr>
<tr>
<td>Sub-total</td>
<td>2,660</td>
<td>600</td>
</tr>
<tr>
<td>Total high-tech and cross-sectoral</td>
<td>14,600</td>
<td>3,225</td>
</tr>
</tbody>
</table>

Sources: BMBF (2006, p. 101); organisation charts of the ministries. The distribution of funds between the departments is estimated on the basis of the information on the ministries related to the 17 sectors.

over peaceful missions with purely scientific objectives versus commercial aims that were mostly envisioned by big technology projects (Weyer 2006).

All important decisions – e.g., contribution to the Post-Apollo-Programme in the 1970s or the plans for the European space plane Hermes in the 1980s – were accompanied by fierce debates. The BMBF always had to find a proper balance between the Transatlanticis and the Europeans in order to maintain the identity of German space policy.

Despite numerous conflicts, the space policy carried out by the BMBF can be evaluated as partly successful, since the ministry succeeded in the consolidation of a supportive institutional sector in order to gain autonomy vis-a-vis the BMWi and the ministry of defence (BMVg). This even applies if some of the space projects – from Azur to Symphonie, and from Spacelab to Columbus – have to be seen as failures, at least if one compares their achievements to the initial targets and promises (Weyer 2006).
However, since the 1990s we can observe a steady transformation in German space policy in favour of extended objectives and accelerating Europeanization. Space policy has turned increasingly into a policy game that has become nested in European and global power games, particularly in the fields of industrial policy and security politics. During the last decade, the European Union (EU) gradually superseded the European Space Agency (ESA) as the major player in the field, claiming new resources and competences. A lighthouse project for this new policy is Galileo, the European system of satellite navigation. Galileo has served the interests in security and industrial policy alike, since it is expected to support new lead-markets at the global level, and at the same time has provided for technologies which the European armies need for global crisis intervention (Härpfer 2003; Geiger 2005; Weyer 2005).

The German High-Tech Strategy mirrored this new situation by claiming a “leading role” for Germany in the field of satellite navigation and earth observation (Galileo and GMES satellites). However, the international space station (ISS) and the European Ariane 5 require large amounts of funds. Strong financial support is a necessity as international competition in the launcher market is stiff, and the over-designed European high-tech rocket is difficult to market. It is most notably in the field of rockets that the German strategy paper claims to “guarantee a European access to space of its own” and to develop new launcher systems – again with German “leadership”. Apart from the activities of the ESA and the EU, a “national space programme” shall serve to “promote the enforcement of German objectives” within European programmes (BMBF 2006). This is the strategy of re-nationalizing international activities which has become a common practice since the 1960s. The German space policy thus reinforces the traditional pattern of public support of big technology in order to expand political power and prestige (Weyer 1993a).

While there are similar projects that are executed in public-private partnership, the space policy in its plurality mirrors the old paradigm, and recent developments even display a switch back to old patterns. After the failure to assure a substantial industrial participation in the Galileo project, the EU returned to the traditional procedure of state-driven construction of big technology in the summer of 2007. This “rollback” becomes manifest if we look at the planning in this policy area that is depicted in Table 8.2.

In late 2005, when the new course in space policy was set, the German space industry promoted two ideas: First, the construction of the manned and winged space plane Kipper in German-Russian cooperation, thus guaranteeing an independent access to the space station after the retirement of the US shuttle fleet in 2010 – as well as a resumption of German activities in the area of hypersonic space planes, which had been cancelled in 1996 (Weyer 1992, 2006). Second, a European mission “back to the moon and finally further” (Frankfurter Allgemeine Zeitung, Universe, 1 December 2005, p. 41) conducted “with German leadership” (Gemsa 2007), which was mainly justified through reference to the activities of space nations, as well as with arguments like “it is dangerous not to participate” (Manfred Fuchs/OHB, quoted in Frankfurter Allgemeine Zeitung, 1 December 2005, p. 42).

These two proposals can be seen as a strategy to re-nationalise space policy and to expand the budget for space research, which had to face cutbacks, particularly in manned projects, during the red-green Federal Government (1998–2005). However, it is remarkable that the German space lobby, in its attempt to demand “additional funds” (Gemsa 2007) put specific emphasis on large scale projects – mostly manned – with almost no commercial impact. The discourse in this context is strongly based on political arguments such as prestige and international competition rather than economic or business considerations. The space industry’s new advocacy displays a remarkable new self-esteem, even if most major projects in manned spaceflight during the 1980s failed. The current state of the ISS is far behind the flamboyant promises of the 1990s, where the goal was to station a crew of about 30 astronauts permanently in space. The German space industry, despite all the extra public funding, has been unable to warrant independent European access to space via its own launcher. In light of this incapacity, it seems unrealistic that the German space industry could shoulder even larger projects such as the moonshot (Weyer 2004, 2005).

The new self-esteem of the German space industry can be related to the expectation that, after the change in Government in 2005, the minister of technology, Michael Glos, would revitalise the neo-mercantilist industrial policy approach mentioned above. This approach actually was applied by Franz-Josef Strauß during the 1950s and 1960s. Strauß was the long-time head of the CSU, the Bavarian part
of the German Christian Democrats, and the former Premier Minister of Bavaria. In his early political career, he was Federal Minister of Nuclear Energy (1955) and also the German defence minister between 1956 and 1962. His economic orientation differed sharply from Ludwig Erhard’s liberal economic policy, the founder of the German social market economy. Strauß’s economic philosophy was closer to French neo-mercantilism or “Colbertisme high-tech” (Cohen 1992).

Franz Josef Strauß had the political standing to create the German aerospace industry, of which a major part is located in Bavaria. Other regional concentrations are in Hamburg, Bremen and Berlin-Brandenburg. Although this industry is still very small compared to other economic sectors (i.e. covering only about 1 per cent of employment in manufacturing), it acquired European dimensions during the 1980 and 1990s (Hornschild and Wieland 1997).

A first, large step in industrial restructuring was a merger of the traditional companies MBM, Dornier and others into the new corporation, Daimler Aerospace (DASA), which was established in 1989. Initially, the aim was to create a national champion for keeping up with American and French space companies. But later it was realised that only an integrated, multinational approach could face American competition. The German and French Governments thus supported a merger of DASA, the French Aérospatiale-Matra and the Spanish Construcciones Aeronáuticas S.A. (CASA) in the new European Aeronautic Defence and Space Company (EADS). The German head office of EADS is located in the Munich area. Responsibilities for space technology within EADS are concentrated in EADS Astrium. Through this politically sponsored restructuration, EADS turned into Europe’s largest aerospace corporation and the second largest aerospace corporation in the world.

Based on the new structure, the European space industries increased their world market shares during the last decade slightly, vis-à-vis the U.S. Figure 8.5 shows the evolution of export markets in the world for the U.S. and the major European space nations. The American export market share declined from 36.2% in 2000 to 33.8% in 2008 and the British share dropped from 12.2% to 9.3%. While France and Germany had similar world market shares at the beginning (13%), eight years later the French clearly performed better. The European approach to industrial restructuring is therefore not without conflicts about the distribution of gains and achievements.

8.5 European Space Policy and the Galileo Project

The shift from pure research funding in the space sector to state-directed industrial policy has its clearest expression at the European level. Space policy is one of the latest policy domains that has been “Europeanised” during the last decade (an almost complete list of Europeanised policy areas is given by Graziano and Vink 2007). While European cooperation in the space sector has existed for half a century, only the Treaty of Lisbon (decided in 2007, in force since 2009) gave the EU formal supra-national policy making competencies in this policy area (Wouters 2009). In the following subsection we will outline this Europeanisation process in more detail.

8.5.1 The New European Space Policy

European cooperation in outer space began in 1962 when the European Space Research Organization (ESRO) and the European Launcher Development Organization (ELDO) were founded. In 1975, the organizations were merged into the European Space Agency (ESA), created at that time by the 10 member states of the European Community and three other European countries. The European space programme received a new boost in the same year when the Single Market Programme was prepared in the context of the European Single Act. At the ESA’s ministerial conference in Rome in early 1985, a new and ambitious programme for the decade 1985–1995 was decided upon – to “expand Europe’s autonomous capability and competitiveness in all sectors of space activities” (Langerfeuch 1986). In budgetary terms this implied a doubling of the amount spent in the decade before.

Reimar Luest, former president of the Max-Planck-Society in Germany and ESA Director General 1984–1990, stated in summer 1986: “On the political level, I hope that Europe’s space activities will be backed more strongly than ever since European politicians now have recognised we must develop into a space power and must obtain autonomy in space” (Aviation Week & Space Technology, 9 June 1986).

Quite similar to other newly Europeanised areas such as telecommunications, major driving forces in this policy change during the 1980s were the European Commission and European industry representatives (Hayward 1994; Jones 1996). In 1986, Eurospace, the corporalist representative of the European space industry,
published an optimistic market study on the European space sector, and the European Commission published a document entitled ‘The Community and Space: A Coherent Approach’ in July 1988 (European Commission 1988). Both reports emphasised the commercial value of space. The Commission’s paper expressed it bluntly: ‘The era of the conquest of space has given way to an era of space exploitation’ (p. 1). It emphasised telecommunication and earth observation as major areas for space applications. The Commission requested that the Council accept the need for the Community to play a more active role in space matters, but at that time ESA remained the single platform of European space cooperation. Unlike the aforementioned telecommunications policy in which the Commission succeeded in its strive for extended policy competencies (Schneider and Werle 2007), space policy remained primarily a national undertaking.

The situation only changed a decade later when the European Commission tried another push. In a communication to the Council and the European Parliament it formulated a proposal entitled ‘The European Union and Space: fostering applications, markets and industrial competitiveness’ with emphasis on the strategic importance of this high-tech sector (European Commission 1996). In the following year the Council issued a resolution on the ‘reinforcement of the synergy between the European Space Agency and the European Community’ and the new push gained momentum in February 1999. The Commission proposed a European public-private partnership (PPP) to finance and build a new satellite navigation constellation called Galileo. The new system would give the EU industry a more competitive position in the increasingly lucrative satellite navigation market.

In the year 2000, the Council presented a resolution on “a European space strategy” (Council of the European Union 2000) in which the Commission was asked to set up a joint task force with the ESA to develop plans for this new policy, in which, besides industrial policy, security and defence policy perspectives should also be integrated. Starting with various recommendations and expert reports, in the following years the institutional machinery of the EU entered the new European space policy domain step by step (Mazzuolde et al. 2009). In January 2003, the Commission presented a Green Paper on “European Space Policy” which, after intense consultation with industry and other important socio-political actors, was succeeded in November the same year by a White Paper on “Space: a new European frontier for an expanding Union – An action plan for implementing the European Space policy” (European Commission 2003).

In the White Paper, the commission “put space in Europe’s policy toolbox” (European Commission 2003) to better achieve economical, ecological and security targets. Besides satellite communication and earth observation (for civil and military use), the paper intended to “strengthen industrial performance” (p. 9). The paper also called Galileo, “the first major space project launched under the aegis of the EU” (European Commission 2003).

This approach crossed new borders since European space projects had been, hitherto, executed only with national management or within the framework of the European Space Agency (Cavallo 2000). By its charter, the ESA was bound to peacefully explore space and was therefore constrained in the pursuit of commercial or political goals – even if such considerations inevitably played a part in the planning of space missions. To implement the new policy architecture, the White Paper suggested a re-arrangement of competencies. While the EU would then support space-based solutions with technological standardization, legal harmonization of procurement, and the distribution of R&D money, the ESA would be responsible for technological and management know-how. The ESA thus turned into a service provider for an ambitious industrial policy within the European Union.

The White Paper was followed by a framework agreement between the ESA and the EU, which was passed in November 2003 and went into force in the beginning of 2004. The contractual partners agreed on an “efficient and mutually beneficial cooperation (…) to link demand for services and applications” in economy, politics and society (ESA-EU 2003).

The commitment to this kind of cooperation was a radical policy change within the ESA, since the agency had never been officially involved in industrial policy up to that point. In addition, the new EU leadership meant a loss of autonomy for the ESA. A strategy paper from 2005 outlined the new division of labour, in which the EU would “define the priorities and requirements for space based systems”, whereas the ESA was now responsible to “support the technical specification of the space segment” (European Commission 2007a).

Three points in the Framework Agreement accentuate this readjustment: (1) The participation by the EU in “optional programmes” of the ESA2 now allowed an active shaping of major projects. (2) In the case of EU financed projects this meant a turn away from the traditional “fair return” principle. ESA rules guaranteed that industrial contracts were in proportion to the budget contributions of their members. (3) The setup of a European Space Council to coordinate ESA and EU actions displaced the ESA Minister’s Council as the ultimate political authority in European space policy.

The “Resolution on the European Space Policy,” adopted by the European Space Council on its fourth meeting in May 2007 (Council of the European Union 2007), outlined major directions and corner stones of future space policy in the EU. European leadership as a space power was an important claim, and space was considered as a “strategic choice” in the quest for “independence” and “readiness to assume global responsibilities” (European Commission 2007b; see also ESA Industry Portal 2007). Such goals were embedded in an institutional framework to improve coordination (European Commission 2007b). Terms like “single, coherent framework policy” (ibid.) signaled the intention to bundle and centralize competencies within the European Commission. Its industrial policy orientation stressed the synergy between defence and civil space programmes and technologies. The Commission argued in favour of a technology-push model in

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2 In contrast to a must-agenda, which is financed pro-rata by all ESA member states, a facultative agenda (like Ariane or Columbus) offers to voluntarily participate; this makes agenda setting more flexible and helps to better meet the interest of the members.
which space is seen as a lead market where public authorities can create conditions for industry-led innovation (European Commission 2007b). In such a perspective, governments at the national and supranational level have to actively push technological development in the long-term interests of its industries.

As mentioned above, a key element in the European policy change is Galileo, which in 2007 was seen as a “strategic infrastructure” (Logsdon 2008; European Commission 2007b). In the following subsection we will outline the history of Galileo in order to understand why this project – despite its failure as a PPP – still serves as a lighthouse or “flagship” project for European space policy.

8.5.2 The Contentious History of the Satellite System Galileo

In this section we deal with the question of how a large technical project or system can be used as an instrument for the build-up and consolidation of a national and supranational policy domain (Froehlich 2010). Galileo is a satellite-based system for location and navigation, similar to the US global positioning system, GPS. The European system, which consists of 30 satellites, was planned to be launched in 2008. However, because of a number of frictions, the deadline has been postponed to the year 2014.

From its very beginning, Galileo was presented as an alternative and independent solution to the American GPS. Its signals would be of a superior quality and precision in order to be used for purposes where reliability and safety were crucial, e.g., guiding airplanes precisely during the landing (Taverna 2003). Originally the cost of development was estimated at about 3.4 billion Euros, a third of which should be provided by the EU and the ESA (Taverna and Wall 2006, Frankfurter Allgemeine Zeitung 29 December 2005, p. 11). This was a technical and institutional innovation regarding both the expected participation of the industry and the new division of labour between the two European bodies, which, for the first time, should jointly finance a large space project (European Commission 2003).

From the outset Galileo was considered as a major step towards European “sovereignty and independence” (Hein 2000), since it promised to reduce Europe’s dependence on the American GPS, which can be shut down for civilian applications in case of war. Furthermore, the EU expected to expand markets in telecommunications and navigation with a number of new jobs. Industrial and social impacts were used to legitimise a mega project which never had big supporters in industry. This reluctance is understandable since GPS signals are disseminated free of charge and the

4 The main difference between the two systems is the availability of the signal, which is 99 percent (GPS) or 99 percent (Galileo) respectively (Geiger 2005).

US has refrained from jamming since 2000. From a rational perspective, neither users nor manufacturers of navigation systems could identify an urgent need for a second system. Most of the above mentioned services are also provided by the current GPS technology. Bernd Gottschalk, chairman of the German automobile manufacturers’ association, argued that he could not see any additional benefit of a European system, and that his association would not spend “a penny for Galileo” (quoted by Schilfhauser 2003).

This critique applies when GPS and Galileo services are transmitted on the same frequencies. In this case, there would absolutely no need for a second system. But if the signals are aired on different wave lengths, more powerful and expensive receivers are needed. A closer examination of this power game on frequencies is interesting, as it casts a light on the political logic of this kind of technology competition. Originally, Galileo was conceived as a “civilian system under civilian control” (Council of the European Union 2001), only complementary to the military system GPS. Such a project gained public support, especially with the German public and the former research minister Edelgard Bulmahn, who criticised the militarization of space fiercely and instead demanded commercial applications. Thus, the original marketing strategy for Galileo was a successful approach to the mobilization of political support, although some experts, even in the early years of the project, had emphasised Galileo’s importance for security policy (Häfner 2003). In this line of argumentation, Galileo and the earth monitoring system GMES appeared as ingredients to an emerging world power that were necessary for global crisis intervention (e.g., logistic support for operations in remote regions) when the localisation of people and the deployment of precision weapons and other smart devices would be required. The Kosovo war in the year 1999 was the final turning point for Europe, since it explicitly demonstrated the gaps of military reconnaissance and guidance and gave support to the idea of a European system.

The plans for a second independent system for satellite navigation was not only criticised by users and producers, but also triggered a sharp reaction from the U.S. Government. The Americans argued that precise navigation signals broadcasted by the European agencies could be misused by terrorists or rogue states. Although Galileo provided five classes of services with different signal accuracy, even the signal of the lowest, freely available class was highly precise. The German think-tank Stiftung Wissenschaft und Politik warned haughtily not to release this dual-use technique at global scale, since its misuse could “hardly be controlled” (Geiger 2005).

After a long dispute, an agreement on “interoperability” of the two systems was achieved in 2004, including the mutual recognition of both systems and the separation of the frequencies. However, this agreement also provided that the U.S. would have access to Galileo’s control centre (Häfner 2003, Frankfurter Allgemeine Zeitung 27 December 2004, p. 15). The compatibility of the two systems and the

5 The stop of the artificial distortion of GPS in 2000 was, among other game plans, motivated by the strategy to hamper Europe’s plans to establish an independent satellite navigation system. Even in the past, the U.S. had adopted this strategy to thwart European attempts of independence, generously offering cooperation, e.g. in the case of Azer (1966), Ariane (1976) or ISS (1988).
8.6 Political Logics in the Promotion of Big Technology

Although some state-driven large scale technological projects have failed (e.g., the U.S. space shuttle, the German Transrapid, and the French Concord), the promotion of big technology still seems to be an attractive option for policy makers, as the case of Galileo shows. In this section we will try to explain this tendency towards large scale technology through an “explanation sketch” that goes beyond the perspectives of “rational industrial rent-seekers” or “irrational politicians.” We will point to a complex combination of political, economic, and technical logics within the ecology of games in this type of high technology development.

In the literature on large technical projects there are a number of references to irrational governmental action and policy-making processes. For instance, John Logdon called the U.S. Shuttle a “policy failure” (1986) and Henning Klotz (1987) stressed the counterproductive effects of state intervention in fields such as science and technology in general. Our puzzle is to explain why authorities decide on such projects that are expensive, economically useless and even risky, as in the case of nuclear energy. To explain such policies simply through powerful space lobbyists or clever rent-seekers would be easy. A more complex explanation is provided by Otto Keck (1988), who assumes that there are rational decision makers, but also emphasises information asymmetries between major players, i.e. government and business. A more differentiated perspective on development problems of mega-projects, provided by Nils Bruzelius et al. (2002), specifies typical social and technical flaws, such as the insufficient reviews of project proposals and especially inter-role conflicts among governmental actors involved in the funding and the regulation of large technical projects.

In the following paragraphs we will concentrate on an explanation sketch which includes two approaches: First, a version of systems theory focusing on mechanisms of inter-systemic communication and subsystem-specific action orientations (Weyer 1993a). Second, we will apply an institution and actor-centered perspective of modernisation theory to analyse the development of large technological infrastructure systems (Mayntz 2001; Weyer 2005; Schneider and Mayntz 1995).

1. Taking the perspective of systems theory, space policy is part of the political system of modern societies. Within this particular subsystem the actors involved primarily follow the logics of politics, i.e. maintaining and expanding their particular power position in competition with other actors (mousy organizations) in the same field. Big technology projects in this perspective are useful instruments and “stakes” in power games to attract media attention and to gain public visibility. There is an indisputable relationship between the big symbolic meaning of such projects and their enormous financial needs. If an actor discovers a niche – such as space policy on the European level – a large-scale space project may be a useful symbol for the enforcement of his strategy.

In this perspective, big technology is a stake in political power games. It can be used as an instrument for the preservation of power (e.g., maintaining the American monopoly in satellite navigation) but also for the expansion of one’s own domain (e.g., establishing a European space policy motivated by security issues). This dynamic can culminate in the apparent paradox that large scale technological projects do not necessarily need technological or economic success. In contrast, more crucial are the specific side effects a project has within the political system, i.e. strengthening of actor positions and domain defence.
A prime example for such an effect is the first German satellite Azur. Although the satellite was already technologically defective when launched in 1969, it still helped to create a German space industry and expand the domain of the research ministry (in detail Weyer 1993a). Technological decision-making shaped by politics in this field is thus linked to short-term feedbacks in the political system rather than to long-term success in other social subsystems such as science and economy.

2. The second line of argumentation uses modernisation theory in the analysis of large-scale technical systems based on Reutzel Mayntz’s actor-centred and institutionalist approach. Mayntz assumes a “complex interdependence” of technology development and evolution of the modern state, in which predominantly “military technology and modern technological infrastructure played a determining part” (2001). According to Mayntz there is a certain structural morphotropism between “the modern central state and the large technical systems.” Both have not only “stimulated their respective growth reciprocally” but also “mutually promoted the trend towards centralization” (ibid.). The state did not only sponsor the development and extension of industrial monopolies but—in most cases—has also been responsible for the provision and operation of infrastructural systems. This is an indicator for the tight link between big technology and the modern intervention state.

In this perspective it is very plausible that the EU relies on the efficacy of the above-mentioned mechanisms in order to strengthen its position in the science and technology policy arena. The EU commission challenges its member states by creating supranational legitimacy for this policy domain, and it is supported by national ministries and industrial lobbyists in the pursuit of this strategy. National interests work hand in hand with actors at the supranational level in the expansion of EU competences in this policy domain, and to centralise programmes and functions in Brussels (Edler and Kuhlmann 2005; Kaiser and Prange 2002). In such a context, the EU was able to decide for an exclusive sponsorship of Galileo without much criticism from its member states. In a long-term perspective, the satellite system thus could have a similar impact on Europe’s sovereignty as the development of the railway had on the genesis of the nation state.

8.7 Conclusions

In this article we have shown that German innovation policy in the space sector is shaped by multiple processes at the national, European and international level, and by multiple action orientations related to politics and the economy, but also to technological contingencies. Innovation policy in the space sector can be seen as a “stake” in a variety of overlapping games played at national and international levels. We have shown that a major determinant at the German level is the intrabureaucratic conflict between the research and economics ministries. Each organization has its specific goals and histories, and each is connected to different supporters and stakeholders. This national game is “over-determined” by a European game, in which core institutions of the EU strive for the extension of their competences and resources. The European push in space policy itself is embedded in a game of global competition and strategic positioning with regard to emerging technologies and lead-markets. This global context is then used to bet on large-scale technical and risky projects.

The fact that the German HTS has put such a great emphasis on the space sector indicates that the orientation towards large technical projects is still prominent within German innovation policy. Big technology is always risky and in many cases inefficient in economic terms. The main message of our analysis therefore is that political calculus dominates these processes. In order to understand the implications of these findings, one has to consider the various planning intervals of politics. The potential failure of long term projects only has an impact on the following generations of politicians. Politicians can make their mark in contemporary politics while taking measures to cope with challenges at their time. A striking example of this is the reaction of the Bush administration to the Shuttle crisis in 2004. On the one hand, President Bush publicly announced the termination of the Shuttle programme in 2010, while, on the other hand, he promised to plan for manned space-flights to the Mars in the year 2024. Through such a long-term project he was able to evade a performance test of his current policies.

Large technological projects, regardless of technological, ecological and economical risks, are appealing options for politicians, as they conserve “the illusion to control and govern suchlike processes” (Weyer 2005, p. 23). The small number of actors involved, under the patronage of politicians, predominantly creates this illusion. Furthermore these projects can be protected against external disruption. Economic efficiency is often not required and, in many cases, new technologies also open up new territories and spaces. Thus politicians can create the impression of “being able to activate and to govern” (Weyer 2005, p. 24). In traditional markets and industries, where actors, networks and evaluation standards are already established, governing is much more complicated. In addition, the diversity and heterogeneity of actor constellations in innovation settings makes it very difficult to evaluate the impact of public governance.

References


