Editorial: Structural changes in international aeronautics markets – regional, organisational and technological dimensions

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Since the early steps towards motor-operated aircrafts, aeronautics has always been recognised as an industry based on cutting-edge technology. The realisation of the ancient dream of human kind to fly has still kept its fascination, as the high public awareness on launching events for new large civil aircrafts like the Airbus A380 or the Boeing 777 illustrate. Innovation processes and location decisions, however, were seen as too specific to be discussed within general models of innovation, regional or organisational studies:

- The close linkages with the military sector caused needs for secrecy and relatively high share of internal R&D and production. Thus, the products were generated in 'black boxes' with only few data available and topics of knowledge sharing and diversity could only hardly be observed in the sector.
- The close linkage towards governmental support restricted the pressures to look for efficiency, in particular within location decisions. Politicians received influence on location decisions and in most cases the emergence of a region as location for aeronautics production was driven by historical, personal or political arguments instead of purely economic rationales.
- Research in aeronautics was assessed as high-tech with close linkages to aerospace. By that, the multitude of linkages to medium-technology engineering with their typical combinative knowledge base – applying existing experiential knowledge to concrete single problems – and their high relevance of tacit knowledge gained within learning processes along the production was almost neglected.
- The relatively high capital intensity caused market entry barriers and possibilities for predatory pricing. Hence, only governmental intervention with financial incentives could establish new competitors and locations.

As a result, four market segments with a relative small number of players emerged in civil aeronautics (Acha et al., 2007): large civil aircrafts (100 seats and more), regional and business aircrafts (less than 100 seats), jet engines and maintenance, repair and overhaul (MRO). In all markets, consolidation with a concentration of even fewer suppliers and incentives to look for alliances and networks with partners from other industries can be observed. This latter observation marks already a part of the structural changes during the last two decades. The knowledge base within civil aeronautics

becomes more and more diversified with the need to look for partners outside the traditional supply chains. Additionally, innovations are no longer almost exclusively based on engineering knowledge, but require also the integration of more science-driven knowledge, for example from nature sciences, informatics and material science, to reduce the weight of the aircraft, to reduce environmental damages and to increase the attractiveness of flying for the customers.

Consequently, the challenges for firms and other organisations at production locations in civil aeronautics are similar to the general challenges of regions with medium-technology industries, as the biggest part of the aeronautics supply chain is still within the medium-technology segment. These challenges refer to the need to build up competitive cluster structures as a precondition for successful knowledge generation, examination, adoption and diffusion. The research on clusters has just begun to leave single descriptions of cluster processes and to overcome the conceptual and theoretical weaknesses (see for the controversy on clusters inter alia Martin and Sunley, 2003). Within recent years, papers look for determinants to structure the term along typologies (Iammarino and McCann, 2006; Bottazzi et al., 2002; Giuliani, 2005), the regional or industrial dimension of clusters (Bathelt et al., 2004; Gilsing et al., 2008; Wink, 2008), the role of knowledge within clusters (Steiner and Ploder, 2009) and the life cycles of clusters (Brenner and Gildner, 2006; Menzel and Fornahl, 2007). The papers within this issue exploit experiences from aeronautics cluster to look at industry-specific as well as more general aspects of cluster structures and the organisational, regional and technological dimension of these cluster processes.

How competitive cluster structures in medium-technology industries look like, however, has still been discussed controversially. Steiner et al. provide in this issue a multi-methodological approach to investigate the driving forces for differences in regional network structures. They distinguish between technology-driven, firm-driven and regional-specific determinants to explain the differences between four regional networks in medium-technology segments.

The specificities of cluster structures in regions with production locations in aeronautics are closely related to the rationale of original equipment manufacturer and other leading firms within the supply chains (Cooke and Ehret, 2009). Niosi and Zhegu discuss in this issue the role of these anchor firms for cluster processes, in particular in Canada, and they prove the importance of anchor tenants with their industry-specific needs for the industrial development within the region. The European producer of large civil aircraft Airbus only recently adjusted its original mainly policy-driven approach to organise a supply chain and to select regions as production locations towards a more economically rational sourcing and location strategy. Kechidi and Talbot look at these changes and the specific role different types of proximities play in organising these changes. These issues along the boundaries between organisational and regional studies are also discussed in the paper by Ehret and Cooke in this issue. They analyse the lean organisational approach at Airbus UK and look for the implications on sourcing strategies.

The following three papers in this issue look more at the regional implications of structural changes in the European aeronautics sector. Benzler and Wink ask for necessary changes in aeronautics cluster policies by analysing cluster strategies in Toulouse and Hamburg. They stress the need to adjust existing industry-specific cluster strategies towards knowledge-driven cluster strategies with a stronger focus on diversified technology platforms. Alfonso-Gil and Vazquez-Barquero investigate the role

of networking for the emergence and structure of the aeronautics cluster in Madrid. They focus on the rationale for inter-firm linkages and the strong hierarchy within aeronautics value chain determining the possibilities for knowledge generation and diffusion. Cooke and Ehret analyse the interplay between the existing regional location factors and proximities used for collaboration to assess the sustainability of the Welsh aeronautics industry.

The last part within this special issue deals with the technological and knowledge dimension of the structural changes in the aeronautics sector. McGuire et al., discuss the relationship between governmental intervention, production locations and disruptive technological changes against the background of the experiences with Japanese subsidies to establish production locations for the Boeing wing production in Japan. These subsidies can help to exploit path dependencies, if now Japanese firms are better able to generate and apply new knowledge on using composites as a material for lighter large civil aircrafts, which might create exclusive competitive advantages. Finally, Wink looks at the structural adjustments of the knowledge base in aeronautics industries and the implications for the organisation of R&D collaboration and supply chains. With an increased share of formalised knowledge instead of tacit knowledge, the organisational challenges for small and medium-sized enterprises in medium-technology segments become more and more ambitious, as they need to prove formal R&D facilities as well as skills to stay within direct interactions with leading partners of the aeronautics value chain. Most of the conventional firms will not be able to cope with these requirements and can be easily replaced in the next years by competitors from low-cost countries.

The aeronautics industry might still not become a typical medium or medium-high-tech industry. The papers within this issue, however, show that many experiences in this sector and the clusters connected with this sector reveal insights on cluster structures and preconditions, which can freshen up opinions on the rationale of cluster studies and policies.

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