

The New Silk Road: R&D networks, knowledge diffusions, and open innovation

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The Silk Road connected the East and West for almost 2,000 years from B.C. 300 to the 1700s. It provided a network of trade routes as well as the mechanism for the reciprocal exchange of knowledge that stimulated and diffused great innovations such as printing, textiles, and gun powder. However, with the shifting center of gravity of economic activity over recent centuries, the thriving Silk Road declined and largely faded away. And as one consequence, the knowledge flows between the East and West became intermittent and more unidirectional, with Western nations playing more central roles in the global knowledge networks and many Eastern countries became the recipients of technologies transferred from elsewhere.

This context has now changed. Recent research has identified the new trend of international technology transfer and corporate strategies, such as 'reverse' knowledge flows from the East to West, as well as the South-South technology transfers, which challenge the models of recent centuries (Hart and Christensen, 2002; Govindarajan and Ramamurti, 2011; Zhou et al., 2016, 2020). The 'Belt and Road' initiative (BRI, or so-called 'New Silk Road'), proposed by the Chinese government in 2013, has as

its overarching aim the re-connection of East Asia, Central Asia, Africa, the Middle East, as well as Europe in aspects of economics, politics, and society. In particular, innovation collaborations and technology transfer among these regions are becoming one of the key focal areas of this initiative.

This Special Issue (SI) aims to highlight the need to expand our understanding of new paradigms for cultivating innovation development along the 'New Silk Road' enabled by the BRI that connects traditional innovation leaders and those catching up in Europe and Asia. This SI attempts to develop an analytical framework to study the BRI based on six research articles focused around three different topics. The first topic is the innovation catch-up opportunities enabled by the BRI; the second is the new collaboration models of BRI, and the third is the new technology-transfer practices of BRI. These three research topics form the key dimensions for studying the BRI in this SI.

Firstly, the BRI provides opportunities for traditional technology-followers to catch up or potentially leapfrog current leaders, given the rapid development of Eastern economies (de la Tour et al., 2011; Li et al., 2015). Successful catch-up requires followers to form a local science-technology infrastructure

(Chen et al., 2012), which involves new approaches to cross-border knowledge diffusion within these regions (Häussler, 2010; Tang, 2016). Collinson and Liu (2019) recently found that the collaboration between multinational enterprises (MNEs) and Chinese firms can generate superior innovation performance because MNEs in China provide local partners with new technologies, solid intellectual property (IP) rights, and advanced capabilities for process and product development. The factors that make China so attractive for foreign investors are also explored by the works of Gassmann and Han (2004) and von Zedtwitz (2004). Back at the beginning of the 2000s, China was already the third most R&D intensive country in the world, not only thanks to its R&D investment in the percentage of GDP, which was already 1.3% in 2002 (according to the world bank, this was raised to 2.18% in 2018), but also for the many policies that the Chinese government introduced with the sole goal of attracting Western companies (von Zedtwitz, 2004). Specifically in this SI, Brem and Nylund (2021) argue that to effectively create a New Silk Road of Innovation, innovation ecosystems may need to expand across national borders taking the inherent uncertainty and newness of innovation into consideration.

Secondly, the BRI represents a formidable opportunity to explore East-West open innovation practices. The growth of the national innovation systems of Eastern economies provides new enabling factors for Eastern firms to augment inbound and outbound knowledge flows with local universities for original innovations (Gawer and Cusumano, 2014; West et al., 2014; Cassiman and Valentini, 2016). The analysis of Fischer and Farr (1985) shows how China was keen on developing more open R&D units as far back as the 1980s. Their result shows that even at that time, some Chinese R&D units within the academic world, such as the R&D unit of the Chinese Academy of Science (CAS), were more likely to show degrees of openness compared to those more associated with the industrial world. Mu and Di Benedetto (2011) found that the role of open innovation in China is of strategic importance when it comes to the networking orientation of firms. Particularly in this SI, Chesbrough et al. (2021) found that the Chinese government acts as an orchestrator of open innovation among state-owned enterprises, privately-owned companies and foreign firms in China. Additionally, Corsi, Fu, and Külzer-Sacilotto (2021) identified two new industry-based boundary-spanning roles in university-industry (U-I) collaborations, including the 'Dual Cultural Bridger' that spans organizational and national cultural gaps; and 'International Network Enhancer'

that act as trust-building and local knowledge listening posts for an MNE's global network.

Thirdly, the BRI generates opportunities to develop new R&D networks (Rothwell and Dodgson, 1991; Macpherson et al., 2004). Given the rapid catch-up in innovation, those emerging economies along the 'New Silk Road' may develop East-East R&D networks as well as East-West 'reverse' R&D flows (McDougall et al., 1994; Von Zedtwitz, 2004; Di Minin et al., 2012), and generate reverse innovation dynamics (Govindarajan and Trimble, 2012; Corsi et al., 2014). For many years, successful companies in China, as well as many universities and research institutions, appear to be embracing strategic alliances as a means to achieving competitive advantages (Turpin et al., 1996). Their strategy is to build a complex web of varying modes of relationships which is crucial for developing the approach that best suits their strategies. From this reasoning, the authors identify four main categories of research alliances. First, there are those guided by the scientific bricoleur, intending to build science-driven links oriented toward a wide range of industries. Second, there are those guided by the scientific boundary riders, intending to build science-driven links focused on specific research fields. Third, there are those guided by the industrial bricoleur, intending to build industry-driven links with large firms based on a wide range of products. Finally, those guided by the industrial boundary riders have the goal of building industry-driven links with large firms based on core technologies. By focusing on networking orientation, firms are able to access external sources of knowledge and recombining them with their own in order to better exploit both the market and the new technologies opportunities (Mu and Di Benedetto, 2011). Specifically in this SI, Crupi (2021) proposed new indices to study the technology transfer and boundary-spanning activities in China, considering the complexity of the Chinese environment. In addition, Li et al. (2021) found that knowledge transfer plays an important role in the policy effect of BRI implementation on R&D outcomes of Chinese firms that have affiliates in BRI-related countries.

Let us finally consider how the papers in this SI respond to the research questions raised in the call for papers. First, what is the role of the 'New Silk Road' to facilitate innovation collaborations and knowledge transfer? Authors support the idea that BRI is a catch-up opportunity allowing latecomers to develop a science-technology infrastructure and then use this to sustain catch up activities. Second, what are the business models and organizational designs to capture value through collaborations

and transfer between the regions of the New Silk Road? Two new industry-based boundary-spanning roles in U-I collaboration have been identified, and the Chinese government can be seen to be acting as an orchestrator in facilitating open innovation among firms in China. Third, how do companies adapt their R&D Management practices to compete and collaborate along the New Silk Road? Articles in this SI found that R&D outcomes of Chinese firms with affiliates in BRI-related countries are positively affected by the knowledge transfer activities after the implementation of BRI. However, limited transferable management practices have been proposed in this SI, which requires further investigation.

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