The Emergence of Trans-Asian Rail Freight Traffic as Part of the Belt and Road Initiative: Development and Limits

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ABSTRACT: Since 2011, freight transport rail links between China and Europe have been rapidly multiplying. Against all expectations, this commercial initiative, under the aegis of the Deutsche Bahn, has expanded significantly. The number of origin-destination pairs has increased, the number of trains has risen sharply, and both Chinese and European partners have far-reaching ambitions. The railways' market share of trans-Asian freight is still low. However, rail link development projects have received a spectacular boost from the Belt and Road Initiative (BRI), resulting in the rapid expansion of volume, services offered, and the emergence of new rail infrastructure. Does this development, which needs to be examined more closely, represent a political tool for China? To what extent does the development of these rail links rely on a buoyant market? This article studies the development of rail services and infrastructure by means of a cross-analysis of a body of technical reports and publications by the transport sector's professional press.

KEYWORDS: Silk roads, Belt and Road Initiative, rail traffic infrastructure, rail, logistics.

Introduction

Since 2011, there has been a rapid development in freight transport rail links between China and Europe, Southeast Asia, and the Middle East. On the initiative of the Deutsche Bahn, the China-Europe commercial link has developed rapidly: offers of service between the town of origin of a convoy and that of its destination (origin-destination couples) have multiplied, and the number of trains has also risen sharply. Admittedly, the rail industry's share of the trans-Asian freight market remains low. In 2017, it represented around 2% of exports from China to Europe. Although marginal, however, the market share of rail freight has risen from almost zero to 2% in the space of five years (Wanderpepen 2017). Beijing hopes to increase this to between 5 and 7% in 2020, and to 25% of exports from the west and centre of China.[1]

An analysis of this expansion in rail traffic is relevant from several points of view. Firstly, it is a market, admittedly modest, that is developing very fast. Moreover, the rail infrastructure is to be found in the six corridors officially defined in 2015 by the National Development and Reform Commission (NDRC), the governmental body in charge of supervising the Silk Road project, and which constitute the framework of the Belt and Road Initiative (BRI), although the BRI project is not limited to rail. The importance of rail transport is understandable from a strictly economic point of view: since the aim is to promote trade and facilitate the reorganisation of the distribution of manufacturers in China and Asia, the railways are a more effective and economical tool, especially in relation to road transport because of the large volume of goods they are able to carry over long distances (OCDE 2011; Rodrigue 2020). Simeon Djankov, former Bulgarian minister of finance and a World Bank executive, summarised it thus: "Rail is the most important element in the new Silk Road" (Gramer 2017).

Since 2013, numerous publications have tackled the BRI project. Although many authors emphasise that this project involves the construction of a vast infrastructure linking China to the rest of the world (Lincot 2015; Thorez 2016), for which rail projects represent a major part of the investment (Pepe 2016; Jakobowski 2018), many of these publications concentrate on the international relations aspect, approaching the question from the point of view of the power bestowed upon China (Jin and Lin 2015), whilst largely leaving aside practical questions such as transport services, the construction of infrastructure, and the development of the corridors. China's aim is to strengthen trade links and improve its connectivity with its markets (Rolland 2015; Vicenty 2017) whilst at the same time selling Chinese know-how. The success of the development of these corridors should allow Beijing to confirm its new status as a regional and world power (Fasslabend 2015; Rolland 2015; Astarita and Damiani 2016).

This rapid development of commercial rail traffic, which few specialists had anticipated, reflects the conjunction of several commercial and political factors. Does this allow us to state that Eurasian trade will see a not insignificant proportion of its goods transiting by rail? Over and above the economic aspect, is China's activism in the railway sector an expression of political will?

1. "China-Europe Rail Freight continues to soar," *Rail Journal*, 18 April 2017, www.railjournal.com/index.php/freight/china-europe-rail-freight-continues-to-soar.html (accessed on 7 September 2019).

Our methodological approach fits into the theoretical framework of geo-economics, which can be defined as the analysis of the territorial deployment of the economic – notably commercial – strategies determined by a state and other players within the context of policies aimed at promoting its national economy. These strategies include support for certain sectors and help for national companies in mastering key technologies that will enable them to conquer segments of the world market in a strategic product, since achieving this objective confers on the holder – state or "national" company – an element of power and international influence (Lorot 2009; Lasserre *et al*. 2016). Therefore, since geo-economics examines the relationships between power and territory, the construction of trans-state and trans-border rail megastructures such as those of the BRI provides an excellent illustration of an issue falling within the scope of a geo-economic analysis.

The quantitative data were collected from Chinese government departments and from the official literature, professional sources, and international consignors. Many government reports, statements by railway companies, and analyses by international bodies – either financial such as the OECD or technical such as the UIC – were also used in this research.

This article will first analyse the boom in trans-Asian rail traffic and infrastructure projects. It will be observed that these projects are not all recent nor did they all originate in China, but that China has brought together and taken over projects that in some cases already existed. Issues of economic policy and the commercial strengths and weaknesses of these rail projects will then be discussed.

Chinese railway activism

Rail services for the transportation of goods between China and Europe have expanded rapidly and are beginning to develop between China and the Middle East. In 2013, 80 trains ran between China and Europe, rising to 815 in 2015, 1,752 in 2016, 3,673 in 2017, and 6,363 in 2018.[2] The volume of traffic between China and Europe rose from 114,000 tonnes in 2013 to 511,000 tonnes in 2016,[3] whilst the volume of containerised rail freight has also expanded significantly (Table 1).

The UIC has estimated the potential for growth at 15% per annum reaching 636,000 EVP in 2027, that is, 21 trains a day (Berger 2017). Kazakhstan Railways takes an optimistic view and expects 2 million containers by 2020.[4] The development of these trade links is not limited to trade between Western Europe and China: links have also been established with Russia and Iran, and China also hopes to develop rail services to Southeast Asia. Although projects for the construction of new rail tracks exist, China-Europe services rely mainly on the existing network.

These links therefore use existing networks, some of which are relatively well-established, such as the Trans-Siberian (1916), the Trans-Manchurian (1903), and the Trans-Mongolian (1961) for the northern route. The central route passes along the Lanzhou-Urumqi line, completed in 1962 and extended from Urumqi to Alashankou in 1990 by a single line, to connect, at the time, to the USSR in Druzhba/Dosty (1990). The current service continues through Kazakhstan on the ex-Soviet network via Astana. China intends to complete and modernise this often inadequate network to enable it to cope with the considerable increase in traffic. Besides the possibility of doubling the single-line sections and completing the electrification of the networks, several projects have recently been successfully completed or begun (Map). In the west, for example, several recent developments have emerged to complete the connections: the high-speed (HS) rail link (50 km/h in commercial speed) Lanzhou-Urumqi (1,776 km), completed in 2013 and which frees the traditional route from passengers, and the Jinghe-Yining-Khorgos line (286 km), finished in December 2009.[5] In December 2011, a rail track between Khorgos and Zhetigen, near Almaty, was completed in Kazakhstan,[6] connecting it to the Kazakh network. China is counting on the development of the Khorgos multimodal station to increase its capacity in the direction of Europe, Central Asia, and the Middle East. A Kashgar-Osh rail link via the Torugart Pass is planned, where it will continue on to Tashkent and the Central Asia network.[7] In June 2016, the Pap-Angren line was opened, linking the Ferghana Valley network to the Uzbek network, doubling the track running through Tadjikistan via Khujand.[8] Lastly, the Kunming-Dali railway track was completed in 1998, and work on its extension to Ruili, on the Myanmar border, began in 2011.[9]

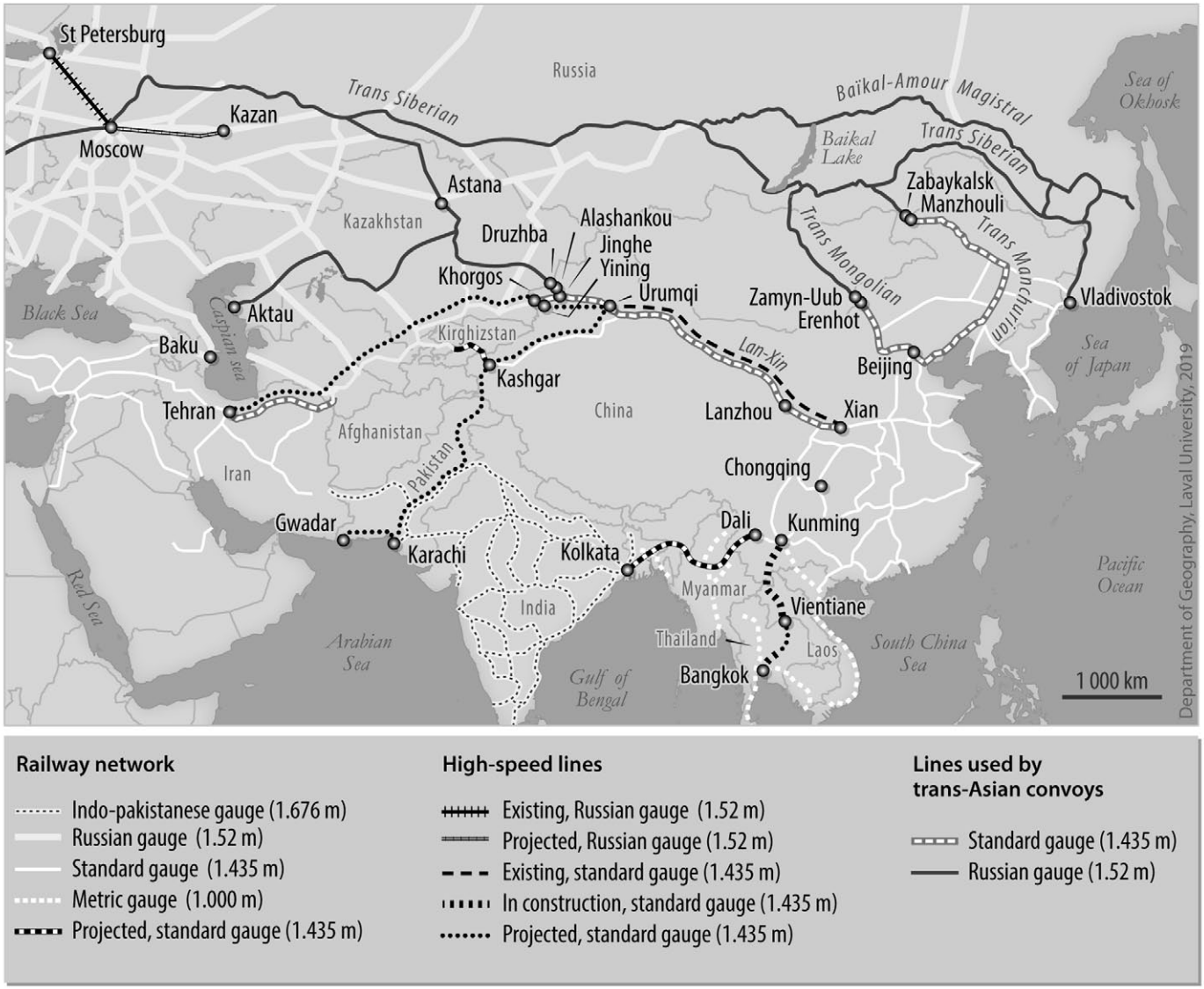
Table 1. Volume of containerised rail freight between Asia and Europe

	2011	2012	2013	2014	2015	2016	2017	2018	2019
China-Europe	1,100	3,500	5,600	21,000	47,400	104,500	175,000	370,000	393,000 (est.)
Asia-Europe				25,000	65,000	145,794	277,000		

Traffic via the network of Russian, Kazakh, and Belorussian operators. In TEU (Twenty-foot Equivalent Units).

Sources: "New Silk Road in 2019: More trains, less empties and lots of politics," *RailFreight.com*, 30 December 2019, https://www.railfreight.com/specials/2019/12/30/new-silk-road-in-2019-a-wrap/ (accessed on 16 March 2020); "Faster speed and lower costs – the China-Europe freight success story," *The LoadStar*, 19 March 2019, https://theloadstar.com/faster-speed-and-lower-costs-the-china-europe-rail-freight-success-story/ (accessed on 26 April 2019); "Eurasian rail traffic in 2018: Heading to a million TEUs," *RailFreight*, 24 December 2018, www.railfreight.com/specials/2018/12/24/eurasian-rail-traffic-in-2018-heading-to-a-million-teus/ (accessed on 3 January 2019); Greg Knowler, "Central Asia containerized rail freight rocketing," *JOC.com*, 6 February 2018, www.joc.com/rail-intermodal/central-asia-rail-freight-surges-2017_20180206.html (accessed on 15 February 2018); "Tenfold growth in 5 years: everybody focused on this market," *Rail Turkey*, 31 October 2017, https://railturkey.org/2017/10/31/tenfold-growth-in-5-years-everybody-focused-on-this-market/ (accessed on 15 January 2018); Berger (2017).

2. "China-Europe Rail Freight Transport Market 2019-2024," *Mordor Intelligence*, 2019, www.mordorintelligence.com/industry-reports/china-europe-rail-freight-transport-market (accessed on 26 April 2019).
3. "New rail routes between China and Europe will change trade patterns," *The Economist*, 16 September 2017, https://www.economist.com/news/business/21728981-new-silk-railroad-will-challenge-airlines-and-shipping-firms-new-rail-routes-between-china (accessed on 8 February 2018).
4. "Tenfold growth in 5 years: Everybody focused on this market," *Rail Turkey*, 31 October 2017, https://railturkey.org/2017/10/31/tenfold-growth-in-5-years-everybody-focused-on-this-market/ (accessed on 15 January 2018).
5. Government of the People's Republic of China, "新疆首條電氣化鐵路-精伊霍鐵路18日正式通車運營" (Xinjiang shou tiao dianqihua tielu – Jing-Yi-Huo tielu 18 ri zhengshi tongche yunying, The first electrified railway from Jinghe-Yining-Khorgos to Xinjiang was officially opened to traffic on 18 December), 18 December 2009, www.gov.cn/jrzg/2009-12/19/content_1491194.htm (accessed on 22 September 2017).
6. "Zhetygen-Korgas Railroad to start operating on December 9," *TengriNews*, 5 December 2011, https://in.tengrinews.kz/industry_infrastructure/Zhetygen-Korgas-railroad-to-start-operating-on-December-9-5981/ (accessed on 22 September 2017).
7. "Railway: Kyrgyzstan and the southern corridor of Eurasia," *Times of Central Asia*, 4 October 2016, https://www.timesca.com/index.php/news/26-opinion-head/17183-railway-kyrgyzstan-and-the-southern-corridor-of-eurasia-part-3 (accessed on 2 February 2018).
8. "Uzbekistan's new railway to isolation," *Radio Free Europe*, 25 February 2016, www.rferl.org/a/qishloq-ovozi-uzbekistan-tajikistan-railway-angren-pap/27574309.html (accessed on 15 February 2018).
9. "大瑞鐵路保瑞段奠基" (Darui tielu baorui duan dianji, Inauguration of the railway line from Dali to Ruili), *Xinhua*, 31 May 2011, http://news.163.com/11/0531/08/75CDDAJS00014AED.html (accessed 16 March 2020).



Map. Belt and Road Initiative rail links: Network (2018) and rail track construction projects. Department of Geography, Laval University, 2018.
Sources: Huang *et al*. 2018; ESCAP; *South China Morning Post*; China Railway Corp.; UIC; Russian Railways; Kazakhstan Railways; *Rail Professional*; *Rail Turkey*.

Lastly, projects have been developed for the construction of new infrastructure (Map). High speed lines are rarely designed for transporting a mixture of passengers and heavy freight, but instead free ordinary tracks from passenger traffic and therefore give greater flexibility to freight convoys. The Moscow-Kazan high-speed line project with the participation of China, but with a Russian gauge (1.52 m), was agreed and signed in 2015 as part of the major Moscow-Beijing high-speed project put forward in 2014.[10] It was suggested that a mixture of passenger and freight use this high-speed line,[11] provided the final financial package was approved.[12] Work was to have begun in 2018,[13] but at the beginning of 2019, this did not seem to have been the case.[14]

The construction of a high-speed line towards Southeast Asia is planned, and work on the Kunming-Vientiane (Laos) track began in December 2016. A metric track was initially planned, in conformity with the gauge prevalent in Southeast Asia, but the line under construction will have standard gauge as in China (1.435 m) and will be single-track. In Thailand, after many delays, work on the Bangkok-Nakhon Ratchasima high-speed line began in December 2017, with a contract awarded to the China Railway Construction Corporation, as part of an agreement concluded in November 2014,[15] then confirmed and extended in December 2015 for the construction of a double line of 845 km,[16] work on which was to begin early in 2019.[17] Chinese norms have also prevailed

10. "China to Design New Russian High-Speed Railway," *The Wall Street Journal*, 19 June 2015, https://www.wsj.com/articles/china-to-design-new-russian-high-speed-railway-1434729400 (accessed on 8 October 2017); "Russia & China to invest $15bn in high-speed rail link from Moscow to Kazan," *Russia Today*, 1 September 2015, https://www.rt.com/business/314003-russia-china-railways-putin/ (accessed on 8 October 2017); "Will the Moscow-Kazan High Speed Train Route Connect Through To Beijing?", *Russia Briefing*, 6 March 2017, https://www.russia-briefing.com/news/will-moscow-kazan-high-speed-train-route-connect-beijing.html/ (accessed on 8 October 2017).
11. "Russia and Kazakhstan agreed on route of Eurasia railway corridor," *EurAsia News*, 17 November 2017, https://eadaily.com/in/news/2017/11/17/russia-and-kazakhstan-agreed-on-route-of-eurasia-railway-corridor (accessed on 23 May 2018).
12. "Russian Officials Voice Concerns about Chinese-Funded Rail Line," *The Epoch Times*, 1 January 2019, www.theepochtimes.com/russian-officials-voice-concerns-about-chinese-funded-rail_2753913.html (accessed on 25 April 2019); "Putin Approves $16bn High-Speed Railway Mega Project," *Russia Business Today*, 16 April 2019, https://russiabusinesstoday.com/infrastructure/putin-approves-16bn-high-speed-railway-mega-project/ (accessed on 16 March 2020).
13. "Moscow-Kazan high speed rail construction to be launched in 2018," *Railway Pro*, 17 August 2017, www.railwaypro.com/wp/moscow-kazan-high-speed-rail-construction-launched-2018/ (accessed on 8 October 2017).
14. "Russia Green-lights First Section of Moscow-Kazan High-speed Railway," *Russia Business Today*, 21 January 2015, https://russiabusinesstoday.com/economy/russia-green-lights-first-section-of-moscow-kazan-high-speed-railway/ (accessed on 25 April 2019).
15. "High-speed rail project finally gets on track," *China Daily*, 22 December 2017, www.chinadaily.com.cn/a/201712/22/WS5a3c4675a31008cf16da2bdc.html (accessed on 16 May 2018).
16. "Bangkok set to be China's rail hub," *Bangkok Post*, 28 December 2015, https://www.bangkokpost.com/news/general/808364/bangkok-set-to-be-hub-of-pan-asia-rail-routes (accessed on 19 May 2018).
17. "Construction of Thai-Chinese high-speed rail to start fully next year," *Xinhua*, 3 June 2018, www.xinhuanet.com/english/2018-06/03/c_137226904.htm (accessed on 25 April 2019).

here, and the tracks will have standard gauge. After 2021, further work should create a link to the Kunming-Vientiane-Nong Khai line (Mottet 2018).

Certain projects have faced setbacks. According to Chinese state media, work on a high-speed line between Kunming and Yangon, for instance, was expected to begin in 2011,[18] but the Myanmar government cancelled the project in July 2014.[19] Similarly, a project for a new rail track between Kunming and Dacca as part of the BCIM (Bangladesh-China-India-Myanmar) corridor, officially still ongoing, has not progressed as a result of strong reservations on the part of India. The projected Kashgar-Karachi-Gwadar rail link in Pakistan, notably through Kashmir, a region disputed by India and Pakistan and which is part of the China-Pakistan Economic Corridor (CPEC), does not seem to form part of any short or medium-term projects. At present, Sino-Pakistan cooperation is focusing on the modernisation of the Pakistan rail network.[20]

From a commercial point of view, trans-Asian rail transport development projects are nothing new. What is new is the setting up of regular services offering door-to-door links from China to Europe. In 2008, on the initiative of Deutsche Bahn, a trial was carried out on the Beijing-Hamburg link. The service was abandoned, however, following the financial crisis of the same year. A further attempt was made in April 2011 on the Chongqing-Duisburg link, that is, a distance of 10,300 km in 16 days, on the initiative of a Trans-Eurasia Logistics partnership between Deutsche Bahn, Kazakhstan Temir Joly (KTZ), the China Railway Corporation, and Russian Railways (RZD).

China often revives existing projects

Although these projects are now described as being part of the far-reaching Chinese policy for the New Silk Road (One Belt, One Road, 一带一路 *Yidai Yilu*) launched in 2013 and renamed the Belt and Road Initiative in 2015 (NDRC 2015), in fact, this Chinese programme has revived many older projects.

The idea of developing rail (and/or road) infrastructure connecting Europe and Asia can be traced back to 1959, when the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and its opposite number for Europe, the United Nations Economic Commission for Europe (UNECE), suggested creating a "Trans-Asian rail network" (Fedorenko 2013; Perelman 2015), or Trans-Asian Railway (TAR). Several components of the TAR project still exist, such as the North-South Corridor between India and Saint Petersburg via Iran and the Caucasus, which Iran, Russia, and Azerbaijan agreed to build in 2016 (Dayal 2017; Alterman and Hillman 2017).

In 1993, the European Union (EU) put forward a plan for a Europe-Caucasus-Asia Transport Corridor (TCECA) for the development of transport between the European Union, the Caucasus, and Central Asia. China was not included in this framework agreement. In 1996, the EU started investigating the possibility of a common European rail policy, the Trans-European Rail Network (TERN). The aim of the project was to facilitate the interoperability of various networks. TERN played the role of catalyser in transport unification procedures in Europe, then later in the development of common standards that would allow Eurasian lines to run.

In 1997, Russian Railways (RZD) decided to promote their rail service offerings. In the early 2000s, RZD originated the idea of an "Asia-Europe rail silk road" (Wanderpepen 2017). Once again, this was not a new idea. As early as 1967, the Swiss transporter Mat-Transport was trying to organise a rail service between Japan and Western Europe via the Trans-Siberian in collaboration with a Soviet partner (Helle 1977).

CAREC 2020 (Central Asia Regional Economic Cooperation Programme) was set up in 2011 with the support of international financial backers (the European Bank for Reconstruction and Development, the Asian Development Bank, the Islamic Development Bank, the IMF, the World Bank, and the UNDP). The prime objective of the Programme is to favour the development of development corridors.

In 2011, the United States launched their US New Silk Road Strategy, the implicit aim of which was to structure the regions around Afghanistan at a time when Washington was planning its exit from the war.[21]

In September 2013, in a speech given in Kazakhstan, Chinese President Xi Jinping launched the One Belt, One Road (OBOR) project made up of two components; the Silk Road Economic Belt (SREB), and the Maritime Silk Road (MSR). The OBOR project has been renamed the Belt and Road Initiative in order to underline the multiplicity of possible routes. Unlike many former initiatives, China is supporting this project with major funding: the Asian Infrastructure Investment Bank (AIIB), with a capital of 100 billion US$, was created in October 2014 (Weiss 2017), and in November, the Silk Road Fund was unveiled, with a capital of 40 billion US$.[22]

Contrary to a deep-rooted idea, therefore, China was not the originator of trans-Asian rail transport projects, either on a conceptual level or in matters of commercial initiative, since it was the Deutsch Bahn that initiated the first China-Germany train. The realisation of the project is, however, the work of China.

A major development lever in the eyes of the Chinese government

In the eyes of Chinese provincial and central governments and businesses alike these rail services bring countless advantages, even though, for the government, they are not limited to economic advantages, but also comport political dimensions that accompany the development of closer economic relationships. These rail links open up the possibility of establishing production sites for the re-exportation of goods in the interior regions of the country, which would be beneficial since the cost of labour and land and rates of taxation are much lower than in the coastal provinces (Pantucci and Lain 2017; Mayer 2018). However, this strategic option only makes sense if transport costs remain low. From this point of view, the construction of an efficient infrastructure allows production sites in the interior of China to be developed, sites which have long been at a considerable disadvantage as a result of the huge transport bottlenecks encountered on routes to the Chinese Pacific coast. It also creates the possibility of developing production sites in Central Asia, Pakistan, and Southeast Asia (Pantucci and Lain 2017).

With this in mind, the objective of reducing, by means of delocalising production capacity, the excess capacity resulting from the slower growth China has been experiencing since 2011 also makes sense if efficient transport infrastructures are set up (Cai 2017; Pantucci and Lain 2017), since this infrastructure gives products from re-localised production centres access to the markets.

18. "High-speed rail between Yunnan and Myanmar on agenda," *People's Daily*, 22 November 2010, http://in.people.cn/90001/90778/90862/7205918.html (accessed on 19 May 2018).
19. "Stalled $20bn Myanmar railway project a setback for Asia-Mideast trade," *Gulf Times*, 28 July 2014, www.gulf-times.com/story/402209/Stalled-20bn-Myanmar-railway-project-a-setback-for (accessed on 19 May 2018).
20. Pakistan Government site, "China-Pakistan Economic Corridor," 2017, http://cpec.gov.pk/progress-update (accessed on 5 September 2019).
21. "The Rise and Fall of America's New Silk Road Strategy," *EconoMonitor*, 12 May 2017, www.economonitor.com/blog/2017/05/the-rise-and-fall-of-americas-new-silk-road-strategy/ (accessed on 2 September 2019).
22. See the Silk Road Fund website: "About Us," 2015, www.silkroadfund.com.cn/enweb/23775/23767/index.html (accessed on 7 November 2017).

The boom in these new rail links, coupled with the creation of duty-free zones in the interior, has also allowed the central government to breathe new life into the China Western Development plan (1999) and the Central Development Strategy of 2004 (*Zhongyang fazhan zhanlüe* 中央發展戰略), which were struggling to redress the considerable imbalance in economic development between China's coastal and interior provinces (Lai 2002; Mayer 2018). In this respect, the BRI constitutes a tool for renewal and for balancing development between the Chinese regions (Cai 2017; Pantucci and Lain 2017). Economic rebalancing is an important political issue, because for the Communist Party, the legitimacy of its power now lies solely in its capacity to ensure growth and to distribute it to the population as a whole, since the continuation of significant regional inequalities represents a political risk. In particular, ensuring the development of Xinjiang, which has been prey to severe instability for several years now, is a major objective for the Chinese government since it associates, in part, terrorism with poverty and economic stagnation (Lu 2016; Cai 2017; Pantucci and Lain 2017; Lincot 2018). Each of these major rail link projects represents a potential opportunity for the Chinese rail industry, which is certainly expanding on the domestic as well as on the export market (Clerc-Renaud 2016). Beijing would like to facilitate the transition of its economy towards industries with strong added value, so the construction of high-speed lines and equipment abroad represents a major export objective, hence rivalry with Japan in this market, giving rise to real diplomatic efforts intended to support the Chinese offers (Cai 2017; Rolland 2017).[23]

These rail services provide a means of opening up regions and countries that are currently poorly served, in particular from China's interior, notably Laos, Iran, and Central Asia, and to open up these markets (Rastogi and Arvi 2014; Pepe 2016), an objective that the leaders of the states concerned share, since they see them as a means of reducing their isolation and thereby increasing their economic attractiveness (Carcanague 2017).

Lastly, the challenge does not lie in these services' turnover, since the 5,000 trains a year the Chinese government is aiming for do not even represent 1% of the volume transported in the country. In 2014, Chinese rail companies transported 2,300 billion tonnes-kilometres (t-km), and RZD transported 1,200 billion t-km, so turnover is not an issue in this respect. However, the rapid expansion of a competitive transport service and efficient rail companies and logistics capable of measuring up to international companies may represent a major economic objective (Li *et al*. 2015; Wanderpepen 2017).

From the announcement effect to regular traffic: The economic advantages of the rail Silk Road

The expansion of a diversified offer

On account of the distances between the centre of China and Western Europe (more than 11,000 km), existing services on the market currently offer unit-trains that take between 14 and 18 days to cover the distances, that is, around 15 days less than the time taken by maritime transport between China and Europe. This advantage in terms of transport times is useful in optimising just-in-time production and reducing the costs of stocking items such as textiles, electronic goods, and automobile parts. However, the nature of the products exported (Table 2) has diversified, and these now include foodstuffs, lumber, and machinery. The profitability of trains mainly depends on the simplification of operations, which explains the offer of unit-trains that limit transhipments. Such trains have succeeded in achieving a high fill rate in the direction China-Europe, a sign that a real demand exists. Between China and Germany alone, for example, traffic has risen from 35,000 containers in 2015 to 40,000 in 2017, and 100,000 are planned for 2020. The Chinese government anticipates 5,000 trains in 2020 (State Council of the People's Republic of China 2016), an objective already achieved in 2018 with 6,363 trains.

Operators now offer several rail links (Table 2). Their services run towards Russia and Europe, in times varying from 10 to 22 days, depending on the itinerary. The bulk of the offerings come from regions in central China. The goods transported are mainly electronic goods, machinery, and small electrical household goods, all products with relatively high added value.

Table 2. Typology of the links offered on the market of freight rail links between China and other countries.

Region of China	Number of links offered Chinese border	Point of passage to the	Length of journey (days)	Products
Southwest	5	Alashankou	13 to 16	Computers, electronic goods, textiles, coffee
Centre	20	Alashankou Erenhot Manzhouli	12 to 22	Electronic goods, machinery, information technology, small electrical household goods, automobile parts
Northwest	8	Alashankou	12 to 15	Machinery, automobile parts, carpets, agricultural products
Southeast	6	Alashankou Manzhouli	12 to 19	Electronic goods, machinery, small electrical household goods
Northeast	6	Manzhouli	10 to 15	Electronic goods, automobile parts, machinery

As of 1 September 2017, most of the services listed here are links between China and Western Europe. Source: Huang and Lasserre (2017).

23. "High-speed rail link expands beyond borders," *China Daily*, 19 December 2014, www.chinadaily.com.cn/world/2014livisitkst/2014-12/19/content_19123994.htm (accessed on 21 May 2018); "李克强的'高鐵外交'成績單" (Li Keqiang de 'gaotie waijiao' chengji dan, Report on "the diplomacy of high-speed rail links" by Li Keqiang), *Xinhua*, 26 November 2015, http://news.xinhuanet.com/finance/2015-11/26/c_128469565.htm (accessed on 22 May 2018).

What are the economic advantages of these rail routes?

The trans-Asian rail services under development have a reserve of productivity at their disposal. Indeed, theoretically, the fastest time for a journey of 13,000 km is nine days, travelling at an average speed of 60 km/h. The possibility of improving the offer and offering faster services therefore exists, the question being at what cost and the amount of investment needed. Conversely, since vessels with the capacity to carry more than 20,000 containers were introduced, the productivity reserves of maritime transport have shrunk because the size of these ships cannot be increased indefinitely without endangering the safety of the structure of the vessels themselves (Tourret 2007).

Although the price of rail transport is far lower than air transport (four times less expensive), it nonetheless remains higher than sending goods by sea (+100% to + 30%, even + 6% depending on the origin/destination and according to the estimates), and the literature frequently mentions prices that are four to five times higher.[24] For all that, estimates and more recent real offers show that the differences are decreasing (Table 3). Major subsidies from Chinese provincial governments mean that prices can be lowered (Huang and Lasserre 2017), but these subsidies are of varying duration and create intense competition between provinces besides raising the question of their permanence: how long will provincial governments continue to subsidise rail links? The Chinese government has recently indicated that it wants to limit the subsidies granted by provincial governments.[25] It is certain than the deeper the town of origin is situated in the interior of China, the more the cost of the maritime link is offset by the cost of the overland journey required to reach a port, thereby increasing the total cost of the maritime option.

However, the price of transporting goods is not the only issue. The length of the journey and its regularity are also important factors, especially for companies producing products with high added value and working within a just-in-time logistics system. This type of production system tries to reduce stock and impose lean management of both components and finished products. Rail represents a competitive offer in the face of a maritime transport market that is sometimes saturated and suffers from delays. Moreover, longer transport times represent, in a quantifiable manner, more stock than if the transit time between China and Europe is reduced by several days, as shown in Table 3. Rail transport is thus more expensive by container, but for very large cargos it can represent economies linked to the reduction of stock in terms of the movement of components and finished products.

Table 3. Price differentials, China-Europe link. Cost per standard container

Source	Size of the Container	Itinerary	Rail	Journey time	Sea	Journey time
Rodemann and Templar 2014	20'	Northern route (Trans-Siberian)	2,500 euros		2,350 euros	
	20'	Central route (Lan-Xin)	3,250 euros		2,300 euros	
Verny and Grigentin 2009	20'	Trans-Siberian	1,400-1,800 US$		1,800-2,200 US$	
Mooney 2016	20'	Central route	Approx. 3,500 US$	23-25 days	720 US$ Shanghai-Rotterdam	50 days
Pepe 2016	20'	Lanzhou-Duisbourg, Central route	Freight car only: 6,730 US$ Unit-train: 3,300 US$	15-16 days	1,000-4,000 US$, On Shanghai-Rotterdam maritime section for 40.	?
JOC.com 2017	40'	Central route	Approx. 4,000 US$	12-25 days	Approx. 3,000 US$	33-35 days
Wanderpepen 2017 and *China Daily* 2016	40'	Wuhan – Lyon, Central route	7,000 euros	16 days	4,500 euros	50 days
JOC.com 2017b	40'	Korea – Poland	Approx. 7,000 US$	18-23 days	Approx. 4,000 US$	35-40 days
DSV 2018	40'	Chongqing-Munich	7,387 US$ via Duisbourg		3,950 US$ Via Hamburg	
iContainers 2018	40'	Chongqing-Munich, Central route (Alashankou)	4,596 US$	18 days	4,319 US$ Via Bremen	31 days
DB Schenker 2018	40'	Chongqing-Munich, Northern route (Erenhot)	6,440 US$	24 days		
TBN Group 2018	40'	Chongqing-Munich	6,184 US$	18-20 days		
Maersk 2018	40'	Chongqing-Munich			3,245 US$	46 days

Sources: Rodemann and Templar (2014); Tom Mooney, "New Asia-Europe rail services added amid weak ocean rates," *JOC.com*, 31 May 2016, https://www.joc.com/rail-intermodal/international-rail/asia/china-europe-rail-routes-continue-add-services_20160531.html (accessed on 18 September 2017); "HMM, SJ Logistics launch Asia-Europe rail service," *JOC.com*, 12 December 2017, www.joc.com/rail-intermodal/international-rail/asia/hmm-sj-logistics-launch-asia-europe-rail-service_20171212.html (accessed on 2 February 2018); "First freight train links China's Wuhan, France," *China Daily*, 6 April 2016, www.chinadaily.com.cn/business/2016-04/07/content_24341830.htm (accessed on 8 September 2019). Data from shippers and transporters: 2018, collected directly by F. Lasserre.

24. Tom Mooney, "New Asia-Europe rail services added amid weak ocean rates," *JOC.com*, 31 May 2016, https://www.joc.com/rail-intermodal/international-rail/asia/china-europe-rail-routes-continue-add-services_20160531.html (accessed on 18 September 2017).

25. "China to scale down subsidies for Europe-bound cargo trains," *GBTimes*, 19 October 2018, https://gbtimes.com/china-to-scale-down-subsidies-for-europe-bound-cargo-trains (accessed on 26 April 2019).

The profitability of these convoys therefore depends on the target market, which is currently mainly manufactured products with high added value for which shorter delivery times justify the higher price of transport by sea (Huang and Lasserre 2017; Huang *et al*. 2018). Profitability could be improved, however, by diversifying the markets, increasing the fill rate on Europe-China routes, improving the efficiency of the services offered thereby reducing costs, and by enhancing the offer. There are several aspects of the transport logistics that could be addressed in order to improve the service offer. These involve measures with varying costs and include improving infrastructure (doubling the tracks, electrification, refurbishment to increase the average speed); improving signalling, which would allow for higher speeds and frequency of convoys, even using engines on several different networks; improving transhipment operations in the stations where the gauge of the tracks changes, and facilitating customs procedures (Rastogi and Arvis 2014; Rodemann and Templar 2014; ADB 2017a; Pomfret 2018; Jakóbowski *et al*. 2018). Regarding the latter, RZD recently announced the implementation of a customs declaration system exempting convoys from any form of inspection in the transhipment station of Manzhouli/Zabaykalsk.[26]

What factors have enabled the arrival of such services?

Just a few years ago, it would have been difficult to imagine the rapid development of commercial lines between China and Europe. Their rapid expansion is the result of the conjunction of several factors.

Firstly, some of the advantages are linked to the situation in China. For example, there is the presence of infrastructure that has allowed China to modernise and develop its network quite considerably, allowing it to transport goods more efficiently to the interior of the country, facilitating their export and import. Long considered to be a major curb to economic development, the transport sector, and especially rail, has benefitted from considerable investment over the last 30 years. From 1992 to 2011, China spent 8.5% of its gross domestic product (GDP) on infrastructure compared to Japan's 5%, 4.7% by India, and less than 3% by the United States (Mayer 2018; see Table 4). Whilst annual investment in transport infrastructure represented almost nothing in 1978, it had increased to around 200 billion RMB (31.35 billion US$) by 1998, then increased very rapidly with the development strategies of the west (1999) and centre (2004), reaching 1,570 billion in 2008 (246,1 billion US$) (Pepe 2016). More recently, particular emphasis has been placed on the development of rail infrastructure, since from 2004, the State Council has approved major investment plans with the aim of expanding the network from 79,000 km in 2008 to 90,000 km in 2010 and then to 120,000 km in 2020, of which 7,000 km are high-speed tracks. The 2009 Renewal Plan and then the 12th Five-year Plan (2011-2015) have confirmed the heavy emphasis placed on investment in rail infrastructure. Achieved as early as 2014 (121,000 km), these objectives were set at 180,000 km for 2020 with 25,000 km of high-speed lines (Pepe 2016).[27]

Table 4. Comparative investment by China in rail infrastructure *(in millions euros in current terms)*

	2007	2009	2011	2013	2015	2016	2017
China	23,935	70,183	65,834	81,347	111,893	106,800	105,084
United States	6,681	7,141	8,336	9,856	15,688		11,480
Russia	5,434	6,577	9,872	9,787	5,022	4,830	3,609
India	3,927	4,724	4,944	5,929	11,462		10,368

Source: OECD Statistics, http://stats.oecd.org/index.aspx?r=794915 (accessed on 16 March 2020).

Another favourable element lies in the desire of numerous companies to limit the steep increase in costs incurred by production units situated in the coastal provinces. The attractiveness of zones situated in the interior of the country has grown alongside increases in production costs (labour, land) in the coastal provinces and investment in the rail infrastructure in China's interior, making possible the setting up of reliable rail services. Many provincial Chinese governments support these initiatives in order to attract foreign and Chinese investment to the region.

The presence of available capital is a considerable asset. China has grown richer and now has abundant capital at its disposal to invest in the construction of new rail infrastructure thanks to the Silk Road Fund (40 billion US$) and the Asian Investment Bank for the infrastructure (capital of 100 billion US$) and the large amounts of capital invested in the modernisation of its domestic network: 503 billion US$ spent in 2016 (Hu 2016).[28]

Determined political will is also evident. First and foremost, there exists a real desire to stimulate the construction of infrastructure both within China and towards other countries, partly to compensate for the economic slowdown observable since 2013, but also because the construction of a modern transport network represents an advantage in the development of markets in Asia and as far afield as Europe. There is real economic ambition behind the modernisation of a rail network that has long been considered inefficient and that represents a curb to the development of China's interior regions. Then, we note the wish to cooperate in the simplification of customs procedures, with, for example, the Smart and Secure Trade Lanes Pilot Agreement with Russia, the European Union, and the countries of Central Asia. This has been in negotiation since 2006, and stage by stage it is enabling the setting up of simplified customs procedures (NDRC 2015; Pepe 2016; European Commission 2016).

Lastly, China is playing on the current prestige of the BRI label. By enshrining these projects in the politico-economic Belt and Road Initiative programme, the Chinese government is actively supporting them because they contribute to the reinforcement of strong economic and financial links with neighbouring countries. Very many of these long-standing Chinese projects have therefore been ascribed to the BRI label in order to increase its visibility.

Advantages specific to Europe have also favoured the rapid expansion of these services. We note, for example, the creation of large transport groups capable of coordinating complex logistics and negotiating with the Russians, Chinese, and Kazakhs. These include the German Deutsche Bahn companies, France's SNCF International, and their numerous subsidiaries, notably DB Schenker, Geodis, and Keolis. We have also noted reform in the governance of transport in the European Union with the arrival of a unified freight market (operating in open access) that facilitates the proliferation of multimodal uniplatforms to the hinterlands beyond state frontiers, dismantling the partitioning of the markets. Lastly, European companies are benefitting from recognised know-how in the management of rolling stock and multinational rail logistics.

Commercial and financial uncertainties

Are these lines profitable in the face of logistical difficulties?

The continuing expansion of rail business between China and Europe, the Middle East, and Southeast Asia corresponds to the ambitions of the Chinese

26. "Containers from China to Europe will be inspected without train stopping," *RailFreight*, 17 January 2019, www.railfreight.com/beltandroad/2019/01/17/rail-freight-between-china-and-russia-to-be-inspected-without-train-stop/?gdpr=accept (accessed on 26 April 2019).
27. Business Monitor International. 2012. *China – Infrastructure Report*. London: BMI.
28. "China Turns to $503 Billion Rail Expansion to Boost Growth," *Bloomberg*, 26 December 2016, https://www.bloomberg.com/news/articles/2016-12-29/china-to-have-30-000-kilometer-high-speed-rail-network-by-2020 (accessed on 7 November 2017).

government and is a component of economic partnerships that would seem to be extremely attractive for countries bordering China. But can this development continue at the same pace in the medium and long term? Several commercial, logistical, and technical constraints will have to be managed.

First and foremost, long-distance rail links often run into problems of load breaking as a result of differing gauge metrics. Although China, Iran, and Europe operate with the almost standard gauge of 1.435 m, this is not the case in Southeast Asia, Russia, and Central Asia (1.52 m), nor in Pakistan and India (1.676 m). Each break-of-gauge point involves either the transhipment of containers or the adjustment of the wheel gauge. Solutions exist but they are time-consuming, take several hours for each container convoy, and much longer for non-containerised goods, since they must first either be transferred or the wheel gauge or bogies changed, and require infrastructure sufficiently large and equipped to carry out the maintenance of trucks or containers. In this respect, it is not certain that Khorgos or Alashankou stations, for example, could cope effectively with a rapid increase in traffic. Over and above the political and commercial issues attendant on the exportation of rail norms, it is clear that the construction of new rail tracks built to Chinese norms represents a logistical element that favours the fluidity of rail services.

The circulation of trains on national networks also comes up against differences in signalling and traffic control. Crews must be changed, and sometimes engines as well, so that drivers and machines alike can interpret the signals and the instructions of the traffic controllers correctly. Here, too, trains can run, but increasing the fluidity of the service means that operational solutions to these technical interruptions must be found. Certain rail segments also risk rapidly arriving at the limit of their capacity. In particular, the single-track segments of the Yining-Khorgos and Urumqi-Alashankou lines have the potential to become bottlenecks.

The service, therefore, comes up against bottlenecks resulting from the differing capacity of the various transit points, as previously mentioned. The rapid increase in traffic, especially in the Asia-Europe direction, from 2017 has already led to delays at transit points on the European network, in particular at the Malaszewicze-Brest and European terminals. Operators are trying to adapt by opening new transhipment stations: Siemianówka (Poland)-Svislach (Belorussia) in March 2017, Kuznica (Poland)-Bruzhi (Belorussia) in August 2017, and Kaliningrad in October 2017.[29] It is certain that the increase in traffic will require additional investment in order to double the tracks and increase the capacity for processing the convoys.[30] The question of the possible saturation of the Trans-Siberian therefore arises, since international container transport traffic on the line rose from 70,000 in 1999 to 640,000 in 2012 and may well rise further to reach 1 million in a few years hence (Pepe 2016).[31]

Given that the modernisation of the Chinese domestic network should improve the reliability and the cost of links between China's interior regions and its ports, the differential in the prices offered and competitiveness in the face of maritime transport are two major elements that will determine the development of the trans-Asian share of the rail freight market. It is through both the scale economies achieved through an increase in traffic and improvements in reliability and transport times that the cost of rail services will become attractive for clients in the long term.

The very low fill rate for return journeys to China is contributing to driving up prices. At present, clients are mainly export companies located in China. Very few European companies are taking advantage of these services to sell their products in China, resulting in trains that are often empty on the return journey. Logistics companies are very much aware of this and are striving to identify transport markets. We are beginning to see dispatches in the Europe-China direction. These include automobile parts for BMW factories in China, Scotch whisky, French wine, Polish pork, and medicines.

The problem of finance

The question of finance also arises, since the needs of infrastructure are colossal. In 2017, the Asian Development Bank estimated that investment in infrastructure in Asia between 2016 and 2030 amounted to 22,500 billion US$ in a baseline scenario, of which 7,796 billion US$ went to transport infrastructure (BAD 2017b). As a result, although Beijing is actively promoting many construction projects, China does not intend to finance them all itself. Quite the contrary: partner countries are expected to assume their share of the investment. Beijing offers financial solutions, but the conditions offered are not always to the liking of the partners, especially since they are sometimes already deeply in debt and have a rather low rating on their sovereign debt. As a result, many Chinese financial institutions, already very exposed as a result of numerous unreliable loans and consequently erring on the side of caution, hesitate to take further risks (Cai 2017).

The contract between China and Laos, for example, hit a long-lasting stumbling-block with the interest rate offered for work on the Boten-Vientiane high-speed line (Mottet 2016). Similarly, the final green light for work on the Bangkok-Nakhon Ratchasima high-speed line was delayed by a disagreement over the financial conditions offered by the Chinese (Crispin 2016). For the Moscow-Kazan project, RZD seemed unsatisfied with the financial conditions offered by the China Development Bank, which offered 7 billion US$ over 20 years at an interest rate of 4% and a 1.9 billion US$ capital investment. The Russian side wanted a higher loan, lower Chinese participation in the assets, a lower interest rate, and a longer repayment period... A preliminary agreement was signed in October 2018, but several members of the Russian government have made no secret of their scepticism in the face of a project the estimated costs of which have risen from 14.4 billion US$ to 24.5 billion US$ (Gabuev 2017; Petrovsky 2018).

Conclusion

The rail link development projects for trans-Asian freight links date back further than the New Silk Road project, but they were certainly revived in a spectacular fashion with its launch. Although few specialists considered the development of freight rail services between China and Europe to be plausible, we are now seeing a rapid expansion (admittedly still modest) in the volume and number of services offered, all accompanied by the construction of new rail infrastructure in Russia and China connecting them to Southeast Asia, Iran, and Pakistan. Over and above the lever that these services and infrastructure represent for the opening up of China's western and central regions, the development of these rail links favours the creation of new markets and the development of trade, strengthening the economic relationships that China hopes to forge not only with its nearest foreign neighbours, but also with European partners.

These projects also offer China a powerful lever for exporting its rail standards and consequently exercising a non-negligible influence over its neighbours' transport sectors, which takes the form of Beijing's search for increased economic and political influence through the strengthening not only of its commercial weight, but also of its normative role (Seaman 2018).

29. "Eurasian rail traffic in 2018: Heading to a million TEUs," *RailFreight*, 24 December 2018, www.railfreight.com/specials/2018/12/24/eurasian-rail-traffic-in-2018-heading-to-a-million-teus/ (accessed on 26 April 2019).
30. "Rising Asian volumes choke Europe rail terminals," *JOC.com*, 9 August 2017, https://www.joc.com/rail-intermodal/international-rail/asia/rising-asian-volumes-choke-europe-rail-terminals_20170809.html (accessed on 2 February 2018).
31. "Russia invests EUR 227 Million by 2015 in developing container transport on the Trans-Siberian," *Railway Pro*, 23 April 2014, https://www.railwaypro.com/wp/russia-invests-eur-227-million-by-2015-in-developing-container-transport-on-the-trans-siberian/ (accessed on 25 May 2018).

In this respect, the promotion of rail corridors by the Chinese government as part of the BRI program carries with it an important strategic dimension. The BRI includes numerous geopolitical projects for which rail tracks are a potential tool, confirming once again the major geopolitical element of the construction of transport infrastructure (Lasserre *et al*. 2016; Carcanague and Hache 2017; Wanderpepen 2017). Although in the short term the BRI aims to favour the growth of trade, this commercial objective also covers two strategic dimensions. On the one hand, it aims to place the Chinese rail network at the heart of neighbouring countries' export routes by multiplying links, built to Chinese norms, and on the other, it serves to strengthen the privileged economic relationships that Beijing intends to develop with its neighbours both through trade and loans and investment in infrastructure, in order to increase their economic integration into China.

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