A Qualitative Cost-Benefit Analysis of the Maritime Silk Road in Europe: Who Benefits from the Initiative and Who Does Not

Enrique Martínez-Galán and
Francisco José B.S. Leandro

Abstract: China has traditionally been regarded as a continental power. However, the 21st Century Maritime Silk Road (MSR), launched in 2013, shapes China's intention to become a global maritime power. The initiative is the most significant contribution to increasing global maritime connectivity in recent decades. The volume and impact of Chinese investments in Europe's seaports are remarkable. This article proposes a fundamental framework to assess who benefits from the initiative. Since quantitative cost-benefit analyses (CBA) hardly apply to multifaceted and partially unquantifiable phenomena, we suggest assessing the MSR by means of a comprehensive qualitative CBA. We opted for a qualitative CBA due to ontological and epistemological reasons: on the one hand, the complex and multilayered nature of the problem is difficult to monetize, and, on the other hand, our argument is not final, as it attempts to assess a given policy before its implementation is sufficiently mature. In this vein, we apply the problem-solving methodology 'analytic hierarchy process'. While the media have disproportionately stressed the negative effects of the MSR, we conclude under this framework that (i) for China, MSR benefits largely outweigh associated costs; (ii) for participating countries, MSR benefits outweigh the associated costs only after cost-mitigating measures are incorporated; and (iii) for non-participating countries, MSR costs outweigh associated benefits.

Keywords: China, 21st Century Maritime Silk Road, maritime trade, cost-benefit analysis, connectivity, realism, analytic hierarchy process.

MAHAN EMPHASIZED IN THE 19TH CENTURY THAT NATIONAL GEOSTRATEGIC greatness relies on a successful maritime strategy built on four main pillars: (i) well-situated seaports, (ii) secure routes, (iii) a modern commercial fleet, and (iv) the right commercial attitude backed by right policies (Mahan 1890, 1892). China's 21st Century Maritime Silk Road (MSR) has them all. It is difficult to think of any other recent global venture that has simultaneously generated such optimism, criticism, and debate. Most of the questions raised when the initiative was launched still remain unanswered: (i) its specific geographical scope,[1] (ii) its institutional setup, (iii) the size of its financing sources, (iv) the final goals of the Chinese government, and (v) impact of the MSR in participating countries, in non-participating countries, and in China itself. The latter is the object of study in this paper, divided into five sections.

The first section frames this paper into the current empirical, methodological, and theoretical literature. The second and third sections assess the potential benefits and costs of the MSR, respectively, for China, for BRI participating countries, and for BRI non-participating countries. The third section also debates MSR cost-mitigating measures implemented by the Chinese government. The fourth section carries out a comprehensive qualitative CBA of the MSR. The final section draws conclusions and suggests avenues for further research.

Literature Review

CBA is a practical method for measuring costs and benefits in supporting binary decision-making, i.e., choosing between acceptance and refusal of a given option. Therefore, the majority of the CBA methods rely on quantitatively predicting, quantifying, and sometimes monetizing impacts in primary and secondary markets. However, the CBA could also be applied to qualitative analysis.

We use a qualitative CBA in this paper based on the theoretical framework of realism in international relations. This theory defends that states are self-centered and power-seeking, so their actions are driven either by a logic of anticipated consequences and prior preferences or by a logic of appropriateness and a sense of identity (March and Olsen 1998). Sovereign states are the unit actors of this paper, as the BRI is a state-led policy mainly directed to other state partners.

Following Weimer and Vining, we apply a qualitative CBA (i) as an *ex-ante* exercise, assessing policies before they are adopted, (ii) offering a framework for further studies under the format of program evalua-

tions, designed to evaluate the performances of the policies, after they had been implemented, (iii) that seldom involves a single goal: it takes the form of multi-goal analysis, and (iv) that is applicable when the analyst is mainly concerned with equity rather than with efficiency (Weimer and Vining 2011, 354 and 357).

There is a limited number of peer-reviewed publications in the literature assessing the geostrategic role and the consequences of the MSR. First, Blanchard and Flint, discussing the geopolitical causes and consequences of the MSR, concluded that the 21st Century Maritime Silk Road is not another deliberate step in confrontation for hegemony, either regional in the Asia Pacific region with Japan or global with the United States (note that both countries are not members of the BRI), but a "political-economic project with territorial consequences situated somewhere in between the poles of a geopolitical spectrum that extends from peaceful collaboration to global conflagration" and "a geopolitical project with the potential to transform space and decisions" (Blanchard and Flint 2017, 238). Second, Koboević, Kurtela, and Vujičić (2018, 113) assess the security concerns raised by the MSR and conclude that "it does not have political or military aims." Finally, Sun and Zoubir (2017, 47) take stock of the deep-water ports being constructed and managed under the MSR and discuss their relationship with rival infrastructures, concluding that "as in a KFC-McDonald's relation, they are competitive in function but mutually interdependent in the long run."

With these few contributions in mind, we argue that the MSR deserves further attention. Our paper seeks to shorten the gap found in the literature, promoting a better understanding and further research on the MSR as a multi-layered contribution of maritime infrastructure to interstate competition.

Methodologically, a CBA relies on the identification, analysis, and prediction of both quantitative and qualitative costs and benefits, which are essential for the selection of the preferred alternative. It is important to realize that monetary units are not the only way to assign value to outcomes and priorities to make decisions. In fact, a known limitation of CBA is that some outcomes are rarely ever priced or traded in the economy, making it difficult to assign monetary value to some types of costs and benefits. Van Der Bergh (2004) criticizes in this same vein the dominance of quantitative CBA and optimality concepts in the economic analysis of complex systems. In this regard, Rogers, Stevens, and Boymal (2009) thoroughly discuss the challenges observed in the qualitative cost-benefit evaluation of complex, emergent programs. Although qualitative methods are not a substitute for collecting accurate

information to develop realistic cost estimates, their use is advised when quantification is not practicable, provided that the qualitative methods are applied transparently and with objectively structured criteria.

We argue that the MSR provides a good example of a situation where the quantification of costs and benefits is not practicable, so it is advisable to proceed with a qualitative CBA. The methodology we apply is a 'modified CBA', which applies when the analyst is mainly concerned with equity rather than efficiency (Weimer and Vining 2011). We follow in this paper Azar and Schneider's proposal to "step away from a complete quantitative CBA," and "judge the relative magnitude of the cost and of the benefits" (Azar and Schneider 2003) also bearing in mind the impact of mitigating factors and sovereign political and social sensitivity judgment. From the several methods of qualitative CBA, we use the 'analytic hierarchy process' method, as proposed by the US Nuclear Regulatory Commission 2018.

The Benefits of the MSR

The potential of the MSR to facilitate trade, accelerate growth, and increase regional cooperation and economic integration is sizeable. World Bank points out three major opportunities of the BRI, namely (i) its tremendous size and scope, (ii) the large unexploited potential existing in the region, and (iii) its impact in improving connectivity (Ruta 2018).

We will assess in this section the main benefits of the MSR, as found in the literature, disaggregated for China, for BRI participating countries and for BRI non-participating countries.

Benefits for China

We found in the literature six main benefits of the MSR for China (B_C), namely: (i) promoting domestic economic growth (B_{C1}), (ii) increasing supply security (B_{C2}), (iii) nurturing maritime technological dominance (B_{C3}), (iv) strengthening foreign policy (B_{C4}), (v) reinforcing recognition as emerging global superpower (B_{C5}), and (vi) increasing military presence and protects claims of sovereignty (B_{C6}).

First, regarding economic growth, the MSR is one centerpiece of the Chinese economic foreign policy. It allows maintaining demand for Chinese goods and services, à la Keynes, particularly for state-owned banks and construction and maritime firms, which are among the MSR's

strongest proponents and most active participants. The international shipping industry is responsible for around 90 percent of world trade (International Chamber of Shipping 2020). With nearly 60 percent of its trade being traveling by sea, maritime trade is also a primary driver of China's domestic growth (CSIS 2017). The MSR uses infrastructure to create more efficient sea trade links. In a context of gradually slowing Chinese domestic annual gross domestic product (GDP) growth rates (from 10.6 percent in 2010 to 6.0 percent in 2019, before the COVID-19 pandemic, BRI countries markets accounted for 38 percent of China's total trade in 2019. This totaled US$1.1 trillion, 16 percent higher than observed in 2018 (World Bank 2023). The MSR can potentially develop these trade relations further, meaningfully reducing time transportation. It takes about 30 days to ship goods from China to Central Europe. De Soyres et al. (2018) estimate that, for the world, the average decrease in shipping time caused by the BRI ranges between 1.2 percent and 2.5 percent across country pairs and that the BRI reduces aggregate trade costs between 1.1 percent and 2.2 percent. For the BRI economies, the change in trade costs will range between 1.5 percent and 2.8 percent. In addition, Djankov, Freund, and Pham (2006) estimate that a one-day delay in getting an item from the factory to the consumer reduces trade by one percent.

Nevertheless, distance, time, and transportation costs are not the only variables that matter. Ports efficiency is also an important determinant of shipping costs and, consequently, of maritime trade. Clark, Dollar, and Micco show that (i) improving port efficiency from the 25th to the 75th percentile reduces shipping costs by 12 percent, (ii) bad ports are equivalent to being 60 percent farther away from markets for the average country, and (iii) reductions in country inefficiencies associated to transport costs from the 25th to 75th percentiles imply an increase in bilateral trade of around 25 percent (Clark, Dollar, and Micco 2004). Finally, MSR projects also have the potential to promote the use of Chinese standards abroad, which could further lock in preferences for Chinese manufacturers. All considered, the MSR seeks to transfer China's current domestic growth model to foreign markets by relying both on state-owned enterprises and on state-owned banks (Qi and Kotz 2020). A former EU diplomat in China described the initiative as "a domestic policy with geostrategic consequences rather than a foreign policy" (Hancock 2017).

Second, the MSR contributes to China's supply security. It is important to note that nearly 80 percent of China's imported oil passes through the Malacca Strait (Thorne and Spevack 2017). This is a major

vulnerability for China. The global maritime network has five primary chokepoints (Bab-el-Mandeb Strait, Malacca Strait, Ormuz Strait, Panama Canal, and Suez Canal), the closure of which would seriously impair global trade, and Chinese firms are investing or have ownership stakes in ports near all of them. If shipping is disrupted, China's broader network of ports provides flexibility to adapt and redirect trade (Hillman 2019).

Third, regarding maritime technological dominance, the MSR deepens the strategic plan 'Made in China: 2025', approved by China's State Council in May 2015 and estimated to be worth US$300 billion (Fang and Walsh 2018). The plan seeks to move the country's manufacturing up the value chain from low value-added to high value-added and innovative goods and services. 'Made in China: 2025' identifies "ocean engineering equipment and high-tech ships" as one of the key priority industries to seek an increase in their domestic components of value-added and innovation.

Hillman (2019) argues that China is "increasingly dominant not only in individual links of that such as operating ports but also in production activities behind this chain, such as building ports and manufacturing related equipment." This author describes the scope of China's control of the maritime global supply chain: "China has the world's largest shipping lenders, shipbuilder, shipping fleet (number of vessels), seafarer workforce, port construction firms, and container port operator. It also dominates a wide array of related maritime products and services, including having the world's largest shipping container producer, dredging fleet, ship-to-shore crane producer, and crane truck producer, among other areas" (Hillman 2019). In 2018, China led the world in "all three categories of shipbuilding (largest order book, most newbuilding orders, largest number of deliveries)" (Hillman 2019).

The industry of shipping financing is not an exception: "there were no Chinese banks among the top ten shipping finance providers in 2008. A decade later, Chinese banks were the world's two largest" (Hillman 2019). 'Made in China: 2025' is expected to further increase the dominant role of the Chinese contractors and suppliers in port-related areas, with the explicit goals of capturing at least 50 percent of the global market for high-tech ships and 80 percent of those ships' critical systems and equipment.

Fourth, the MSR provides China's foreign policy with geostrategic and political leverage to influence regional and bilateral relations. More importantly, the MSR also seeks to mitigate political risks for Chinese contractors and firms operating on the ground through high-level polit-

ical dialogue. We note that political risk tops all others when it comes to firms operating in BRI countries (Deloitte 2018). In this regard, managing the political risk of foreign direct investment (FDI) by a firm becomes easier when a country has a good bilateral relationship with the recipient of that investment and, particularly, when the country of the investing firm plays a creditor role.

Fifth, the MSR increases the recognition of China as an emerging global superpower, leveraging on China's maritime infrastructure and routes to build an enhanced geostrategic greatness, *à la Mahan* (Mahan 1890, 1892). Voon and Xu (2020) concluded that investments in BRI countries bring significant gains for China's soft power, both overseas and domestically. Overseas, estimated global awareness of the BRI tripled between 2014 and 2017, increasing from 6 percent to 18 percent in a survey of 22 countries, including France, Germany, Italy, the Netherlands, Russia, Spain, Turkey, and the United Kingdom in Europe (Guo 2018). On the other hand, positive public opinion about the initiative increased from 16.5 percent in 2013 to 23.7 percent in 2017 (State Council of the People's Republic of China 2018). Interestingly, no statistically significant difference is found in perceptions about the BRI between countries that officially participate in the BRI and those that do not (Garcia-Herrero and Xu 2019).

Finally, the MSR contributes to China's (i) sovereign claims and (ii) military presence overseas. A deeper maritime foundation brings commercial advantages during peacetime, but it could also offer strategic advantages in the event of conflict. See the example of the Chinese expansion in the South China Sea atolls.

Benefits for Participating Countries

We found in the literature four main benefits of the MSR for participating countries (B_{PC}), namely: (i) increasing international connectivity (B_{PC1}), (ii) increasing domestic connectivity (B_{PC2}), (iii) creating domestic demand (B_{PC3}), and (iv) generating additional fiscal revenues (B_{PC4}).

First, the MSR will increase China's international connectivity and that of participating countries. MSR participating countries will benefit from new infrastructure, higher connectivity, lower transportation costs, and better access to international markets to increase their regional and global trade competitiveness. Participating countries will ultimately benefit from the associated economies of scale and technology transfer and their integration into the global value chains. In fact, some countries

could benefit more than China. De Soyres et al. (2018) estimate that 17 BRI participating territories, out of a list of 71, benefit more than China from the initiative when considering the relative decrease in their trade costs.

Second, better connectivity and a continuous decrease in transportation costs will also promote trade domestically due to the reduced price of imported final and intermediate goods (World Trade Organization 2023).

Third, MSR investment will generate direct benefits for the country's economic growth based on the increase in demand for domestic jobs and intermediate goods. Chinese officials estimate that, for jobs alone, the 82 industrial parks and the 20 special economic zones (SEZs) created along the BRI, most of them located in port areas, were responsible until 2018 for the creation of around 300 thousand jobs in participating countries (Ministry of Foreign Affairs of the People's Republic of China 2019). In addition, the lower price of imported and intermediate goods will also indirectly produce positive spillovers and multiplier effects, with gains in economic growth.

Finally, these gains in economic growth will also generate fiscal and tax revenue for the participating countries. In this regard, Chinese high-ranking officials and diplomats often include in their statements reference to estimates on this impact, such as that the 82 industrial parks created along the BRI, most of them located in port areas, were responsible until 2018 for around US$2.2 billion in tax revenue in participating countries (Ministry of Foreign Affairs of the People's Republic of China 2019).

Benefits for Non-Participating Countries

We found in the literature three main benefits of the MSR for non-participating countries (B_{NPC}), namely: (i) increasing international connectivity (B_{NPC1}), (ii) increasing connectivity with regional trade partners if the latter participate in the MSR (B_{NPC2}) and (iii) higher exports via increased demand for equipment and goods of firms of non-participating countries (B_{NPC3}).

First, the MSR will not only increase the international connectivity of China and of the MSR participating countries. The new infrastructure, higher connectivity, decreasing transportation costs, and better access to international markets will also benefit non-participating countries' firms, exporters, and importers. These firms will also be able

to use the maritime infrastructure and routes created by the MSR in third countries. In fact, the connectivity provided by the MSR fulfills the characteristics of a global public good (He 2018).

Second, non-participating countries benefit from having regional trade partner countries that participate in the MSR. The firms of these non-participating countries have privileged access to the markets of their regional partners (under sectoral bilateral, free trade, or customs union agreements), so they will particularly benefit, both directly and indirectly, from the improved connectivity of regional trade partners. In fact, creating and improving free trade blocks and facilitating commerce between these blocs and with other countries is an explicit objective of the BRI (OECD 2018).

Finally, the equipment, goods, materials, and consultants of non-participating countries are also used in constructing the maritime infrastructure and routes of the MSR. Firms like ABB (Switzerland) and Siemens (Germany) reap significant benefits from BRI projects (De-loitte 2018).

The Costs of the MSR

We will assess in this section the main costs of the MSR, as found in the literature. In addition, we will also discuss policy measures implement-ed by China in recent years, which have been mitigating some of the potential risks and costs associated with the initiative.

Costs for China

We found in the literature two main downside risks and potential costs of the MSR for China (C_C), namely: (i) increasing indebtedness (C_{C1}), and (ii) increasing reputational risk (C_{C2}).

First, unsustainable indebtedness is recurrently listed in the liter-ature as the main downside risk of the MSRI. The main cause for this potential financial unsustainability is political interference in project se-lection, which could fail to ensure the minimum commercial return and maximum bearable risk for the institutions providing the funding. We refer to official and quasi-official state-owned institutions, which are intrinsically permeable to political interference. Financial stress could end up ultimately affecting private institutions as well. The base level is

already a concern. First, private debt has climbed in recent years. European Central Bank 2022 estimates that China's private debt (households plus corporates) has grown from nearly 145 percent of China's GDP in 2015 to around 220 percent in 2022. Second, the lack of transparency observed in the official statistics of domestic non-performing loans (NPLs) subtracts credibility from the Chinese financial system. While the official level of NPLs has been relatively stable in recent years at around 1.7 percent of total loans, rating agency Fitch estimates that the real ratio of NPLs to total loans could be as high as 20 percent, amounting to a total of US$3 trillion (Osborn 2017). A systemic risk exists. Higher refinancing, solvability, and liquidity risks would put significant pressure on the Chinese financial markets, negatively impacting the Chinese real economy. In this regard, China's Central Bank Governor warned that "the reliance of cheap loans raises risks and problems, starting with moral hazard and unsustainability" (Zhang and Miller 2017). The rating agency Fitch stated that "Chinese banks do not have a track record of allocating resources efficiently at home, especially in relation to infrastructure projects, so they are unlikely to have more success overseas" and that, consequently, "the lack of commercial imperatives behind BRI projects means that it is highly uncertain whether future project returns will be sufficient to fully cover repayments to Chinese creditors" (Wells and Weinland 2017). Fitch indicated that "some China-backed infrastructure projects along the BRI were previously written off as financially unfeasible by traditional lenders or private investors" (Fitch 2018). The International Monetary Fund (IMF) also called for stepping up transparency and paying due attention to the debt sustainability of projects (IMF 2018). Finally, Moody's downgraded China's credit rating in May 2017 for the first time in nearly 30 years, concerned with slowing growth and rising debt, highlighting systemic risks for the country with respect to further credit growth, particularly if directed for political non-commercial reasons into BRI projects (Moody's 2017).

Second, the MSR increases China's reputational risk, associated with project failure, to social and environmental negative spillovers, and the disproportionate appropriation of the MSR benefits. The Financial Times notes that the BRI "exports the worst aspects of the Chinese economy while increasing the strains on its already stressed financial system" (Financial Times 2017). Regarding project failure, the proportion of BRI projects that have encountered significant problems, such as public opposition to projects, objections over labor policies, delays caused by land acquisition, financial irregularities, and concerns about national security, has been estimated at 14 percent (Kynge 2018). In

addition, the design and preparation of Chinese-financed projects have consistently resulted in underestimated costs and poorer resource allocation than in advanced economies.[2] Finally, MSR critics often assume that China will disproportionately reap most benefits. This is precisely one of the questions we aim to answer in this paper.

Costs for Participating Countries

We found in the literature four main downside risks and potential costs of the MSR for participating countries (C_{PC}), namely: (i) increasing debt distress (C_{PC1}), (ii) lacking the creation of domestic jobs (C_{PC2}), (iii) presenting low environmental and social standards (C_{PC3}), and (iv) brings excessive Chinese influence and sovereignty erosion (C_{PC4}).

First, the MSR may bring along debt distress in those countries with initially high levels of public debt. In these cases, the additional MSR debt. It is not clear for these countries that the increase in trade and the economic development originated by the initiative will generate and secure sufficient revenues to service the carrying costs of projects. One example is Montenegro. The country is one of the four MSR countries currently at risk of debt distress (Hurley, Morris, and Portelance 2018). The potential debt distress does not come only from their high level of public debt but also from the extreme concentration of their debt in one creditor. Montenegro took a EUR 1 billion loan from the Export-Import Bank of China to build a highway. Today, the road has not been concluded, and Montenegro cannot pay the loan back. To make matters worse, the contract states that "if Montenegro ends up being unable to repay the loan, it will have to give up some of its territory to China" (Bizot 2021).

Second, the MSR lacks the creation of domestic jobs. The literature consistently describes MSR projects as making low or no use of the local labor force (Chandran 2018).

Third, the MSR presents relatively low environmental and social standards, which, associated with soft transparency and anti-corruption requirements, as reported often in the literature, could result in serious biodiversity loss, environmental degradation, forced displacement of population, and the capture of unproportioned economic benefits by the country's leading economic classes.

Finally, the MSR could bring excessive Chinese influence and sovereignty erosion. This occurs when limited financing alternatives put borrowing countries in an unfavorable position to negotiate good terms, as is the case of Montenegro (referred to above). In fact, the terms asso-

ciated with MSR projects are not only financial. MSR financing requires arising disputes to be settled in Chinese courts, a condition that clearly favors Chinese firms.[3]

Costs for Non-Participating Countries

We found in the literature three main downside risks and potential costs of the MSR for non-participating countries (C_{NPC}), namely: (i) weakened supply and military positions (C_{NPC1}), (ii) relative losses to China of strategical and bilateral influence with BRI members (C_{NPC2}), and (iii) lacks a level-playing field of business opportunities for firms (C_{NPC3}).

First, the MSR weakens the security positions of non-participating countries relative to those of China and its allies in terms of both supply security and military positions. It is estimated that two-thirds of world's container traffic passes through Chinese-owned and invested ports (Kynge 2017). In addition, five Chinese-owned overseas ports have a confirmed dual (military and commercial) use, including the Piraeus port in Europe. MSR projects could be used in due time to threaten supply routes or military positions, particularly of BRI non-participating countries.

Similarly, non-participating countries lose strategic and political influence to China's 'no-questions asked' turnkey joint financing and infrastructure offer.

Finally, the MSR is far from being a level playing field for the procurement of public works, equipment, goods, and services by firms of non-participating countries. Chinese projects are less open to local and international participation than those financed by Multilateral Development Banks (MDB).[4]

Mitigating Costs

The Chinese government has incorporated some of the criticism raised to the BRI in China and overseas. In response, Beijing has implemented measures that mitigate the costs initially associated with the initiative.

For China, we identify two main mitigating factors in the literature. First, the success in project selection by Chinese financiers of MSR projects has improved in recent years, mainly due to two factors: (i) better portfolio management practices, which include country limits, controls to the concentration of loans, higher diversification and down-

sizing of operations[5;] and (ii) higher government scrutiny of prospective deals, with managers of state-owned banks being now held responsible for bad investments (including pay cuts, disciplinary action and judicial hearings), following a 2016 ruling by China's State Council (Thomas and Price 2016). These developments act as mitigating factors for C_{C2}. Second, the increase in the resources available by Chinese banks, which held US$22.6 billion in deposits and US$3.1 trillion in foreign exchange reserves in August 2018, is nearly 9 percent of the world's total. Liquidity is, therefore, rapidly available for the financing of MSR projects (Trading Economics 2016). These developments act as mitigating factors of C_{C1}.

Regarding participating countries, we observe two mitigating measures. First, the increasing competition for financing from other financiers, such as MDBs, has reduced the potentially negative impact of the MSR in the debt distress of participating countries by forcing the Chinese financiers to offer more favorable financial terms in their lending (mitigating C_{PC1}). Second, the improvement observed in recent years in the environmental and social standards of Chinese-financed projects overseas (mitigating C_{PC3}), due to the increasing experience of Chinese promotors in better dealing with social and environmental issues and to the increasing awareness of these potential risks in participating countries (Holzmann and Grünberg 2021; Sun, Ho and Pei 2022). Regarding the latter, data shows that, although noting the higher interest rates in Chinese loans, "of a few percentage points," when compared to those provided by the World Bank, the increasing competition between Chinese financiers and the World Bank has led to finding no significant evidence for the 'debt trap' narrative in recent years (Morris, Parks, and Gardner 2020). We note that the competition among financiers is gradually transforming into partnerships and co-financing, further increasing the impact of the cost-mitigating factor introduced in our model.[6] Finally, we note four formal commitments of the Chinese Government: (a) first, launching guiding principles on financing the development of the BRI, including the "need to strengthen social and environmental impact assessment and risk management of projects"; and to "take into account debt sustainability" (Ministry of Finance of the People's Republic of China 2017a); (b) second, bringing all major MDBs to collaborate with China on matters of common interest under the BRI (Ministry of Finance of the People's Republic of China 2017b); (c) third, to create, together with all major MDBs, a Multilateral Cooperation Center for Development Finance focused on increasing transparency, capacity building, and project preparation (Ministry of Finance of the People's

Republic of China 2019); and (d) lastly, agreeing to sign the G20 principles for quality infrastructure investment promoted by the 2019 Japanese Presidency of the G20 (Ministry of Finance of Japan 2019). This approach allows China to incorporate in the MSR decades of experience and international best practices, particularly in project design and implementation.

Finally, regarding non-participating countries, we observe two mitigating measures. First, the increasing number of initiatives created to counteract the MSR such as the Global Gateway in Europe, which have reduced the potentially negative impact of the MSR in the security positions of non-participating countries (C_{NPC1}). Second, the improvement observed in recent years in the level-playing field of the MSR for the firms of non-participating countries (C_{NPC3}) is due to higher participation of co-financiers in MSR projects.

A Comprehensive Qualitative Cost-Benefit Analysis of the MSR

We will consolidate in this section the assessment of the costs and benefits discussed so far. Qualitative considerations about the importance of each factor will be introduced following the US Nuclear Regulatory Commission's 'analytic hierarchy process', including the mitigating measures discussed (US Nuclear Regulatory Commission 2018). This methodology allows the conversion of subjective assessments of relative importance to a set of overall objective weights. For a detailed discussion of the 'analytic hierarchy process', see originally Saaty (1980); more recently, Vargas (1990), Wijnmalen (2007), Saaty (2012), Mu (2016), Mu and Pereyra-Rojas (2017), and, lately, presenting the state-of-the-art of this methodology from 1980 to 2022, Madzík and Falát (2022). In addition, see Govindan et al. (2014), Luthra et al. (2016), Vieira et al. (2017), and Luthra and Mangla (2018) as examples of empirical applications of this methodology on works related to economic integration, trade, and investment.

For each pair cost-cost, benefit-benefit, and cost-benefit, we ask the general question, '*How important is X relatively to Y?*' or, in a more applied format, '*Is given more importance in the literature to the impact of X relatively to the impact of Y in absolute terms?*' The answer is given on a nine-point scale of (1) equal, (3) moderate, (5) strong, (7) very strong, and (9) extreme, as proposed in more detail in Table 1. However, instead of being a purely judgemental answer, we based the answer on

the magnitude of their impact according to the literature, as discussed in previous sections of this paper. The nine-point scale allows, therefore, expressing the intensity of the importance of one factor versus the other. This occurs in absolute terms, meaning that the importance of benefits can also be compared with the importance of costs. Methodologically speaking, it is important to notice that the impact magnitude attributed to each judgment results from bilateral qualitative considerations of the non-monetized impacts between costs and costs, benefits and benefits, and benefits and costs, as recommended by Weimer and Vining (2011).

Table 1   Nine-point scale to express the intensity of preference or importance

Points	Is given more importance in the literature to the impact of X relatively to the impact of Y in absolute terms?	Based on the literature, applicable when…
1	equal or parity	X and Y have the same or similar importance
3	moderate	X is slightly more important than Y
5	strong or essential	X appears to dominate over Y in terms of their relative importance
7	very strong or demonstrated	X overwhelms the importance of Y
9	extreme	X indisputably vital in relation to Y

Source: Authors, based on US Nuclear Regulatory Commission.

Let F_{XY} be the value obtained by comparing X to Y in absolute terms, with X varying from 1 to m and Y varying from 1 to n. Because our values are assumed to be consistent in making judgments about any pair of factors and since all factors will always rank equally when compared to themselves, then (i) $F_{XX} = 1$ and (ii) F_{XY} produces as reciprocal that the value obtained by comparing Y to X is F_{YX} such that . We will then obtain a comparison matrix of size (m+n) x (m+n). While there is complete consistency in the (reciprocal) judgments made about any one pair, consistency of judgments between pairs (i.e., F_{XY} x $F_{KY} = F_{XK}$) for all X, Y and K, is not guaranteed and needs to be further ensured when attributing values.

We will produce the next three qualitative CBA, differentiating (i) China, (ii) BRI participating countries, and (iii) BRI non-participating countries.

CBA for China

Table 2 shows the six main benefits and the two main costs identified for China after mitigating measures have been considered, producing a comparison matrix of values F_{XY} of size (6+2) x (6+2), i.e. 8 x 8. This matrix includes 64 pairs, divided into: (i) eight values one for the diagonal of the matrix, by definition, since we are comparing the same benefits and same costs; (ii) 28 unique pairs, under the formula ½ (m+n) (m+n-1), that constitute the upper right corner of the matrix, highlighted in grey shadow in Table 2; and (iii) 28 pairs simply obtained by applying to the 28 unique pairs in the grey triangle. Therefore, we need only to discuss 28 unique pairs, and the remaining 36 pairs are just derived. In addition, we also note that only the first line of the grey triangle, relating BC1 individually with all the other benefits and costs identified (shown in darker grey in Table 2) is made of truly unique valuations. The other valuations in lower lines are also derived from the first line, based on the rule of consistency of judgments between pairs (i.e., F_{XY} x $F_{KY} = F_{XK}$) for all X, Y, and K. For example, if $FB_{C1}B_{C3}$ equals $FB_{C1}B_{C4}$, then $FB_{C2}B_{C3}$ equals $FB_{C2}B_{C4}$, or, analogously, if the difference between $FB_{C1}B_{C5}$ and $FB_{C1}B_{C4}$ equals one notch, then the difference between $FB_{C2}B_{C5}$ and $FB_{C2}B_{C4}$ should also equal one notch.

Table 2   Comparison matrix for the qualitative CBA of the MSR for China (after mitigation)

	B_{C1}	B_{C2}	B_{C3}	B_{C4}	B_{C5}	B_{C6}	C_{C1}	C_{C2}	Total
B_{C1}	1	3	5	5	7	5	5	7	38.0
B_{C2}	1/3	1	3	3	5	3	3	5	23.3
B_{C3}	1/5	1/3	1	1	3	1	1	3	10.5
B_{C4}	1/5	1/3	1	1	3	1	1	3	10.5
B_{C5}	1/7	1/5	1/3	1/3	1	1/3	1/3	1	3.7
B_{C6}	1/5	1/3	1	1	3	1	1	3	10.5
C_{C1}	1/5	1/3	1	1	3	1	1	3	10.5
C_{C2}	1/7	1/5	1/3	1/3	1	1/3	1/3	1	3.7

Source: Authors.

Carrying an exhaustive discussion in this paper of the seven truly unique pairs would be lengthy. We will therefore discuss two truly unique pairs as examples, comparing (i) benefit with benefit, e.g., $FB_{C1}B_{C2}$; and (ii) benefit with cost, e.g., $FB_{C1}C_{C1}$.[7] Both are highlighted in

italics in Table 2. The discussion on the other unique pairs is available upon request.

First, for $FB_{C1}B_{C2}$ (valuation '3' in Table 2), we argue that the importance of the benefit of the economic growth brought to China by the MSR (B_{C1}) when compared to the benefit of increasing China's supply security (B_{C2}) is '3', i.e., one notch, or 'moderate'. This is acceptable, bearing in mind the 'very significant' potential impact of the MSR on the economic growth of China and the 'significant' potential impact of the MSR on China's supply security (both discussed above in this paper).

Second, for $FB_{C1}C_{C1}$ (valuation '5' in Table 2), we would have argued that, before cost mitigating measures, the importance in absolute terms of the benefit of the economic growth brought to China by the MSR (B_{C1}) when compared to the risk of increasing domestic debt (C_{C1}) is '3', i.e., one notch, or 'moderate'. This is acceptable, bearing in mind the 'very significant' potential impact of the MSR on the economic growth of China and the 'significant' potential impact of the MSR on China's level of indebtedness (both discussed above in this paper).

However, we should also include in the valuation model the cost-mitigating measures of C_{C1} taken by the Chinese government (explained in the previous section), namely (i) the amount of resources available in China for investment and (ii) the limits, controls, and best practices recently established in the MSR's portfolio management. Methodologically, we account for these cost-mitigating measures by increasing one notch the valuation of unique pairs involving C_{C1}, but also C_{C2}, since we also consider as cost-mitigating factors of reputational risks the observed higher reliance in co-financing and partnering with other co-financiers, as well as with higher diversification of projects and the decreasing size of the Chinese participation in projects.

Consequently, $FB_{C1}C_{C1}$, i.e., the difference between the specific benefit B_{C1} and the specific cost C_{C1}, increases from '3', i.e., one notch or 'moderate', to '5', i.e., two notches or 'strong' , by reducing one notch the value of C_{C1}. In terms of cost mitigation, since both the values of C_{C1} and C_{C2} reduce by one notch, then $FC_{C1}C_{C2}$, keeps the same level with or without cost mitigating measures.

Overall, we conclude that the benefits of the MSR for China (totaling 96.6) largely overcome costs (14.2). Net gains, i.e., the difference between benefits and costs, total therefore 82.4. Without cost-mitigating measures, benefits would have totaled 79.8 (down from 96.6), while costs would have totaled 27.2 (up from 14.2). Gains without mitigating measures, i.e., the difference between benefits and costs, would have been 52.6 (significantly lower than the 82.4 observed with mitigating

measures). These figures mean nothing individually but provide a useful reading of their relative importance when compared among themselves.

CBA for Participating Countries

Table 3 shows four benefits and four costs for MSR participating countries, as well as associated cost-mitigating measures, together with the comparison matrix of values F_{XY} of size (4+4) x (4+4), i.e., 8 x 8. This matrix will also include a total of 64 valuation pairs. We will only discuss in this paper a benefit-cost comparison, namely $FB_{PC1}C_{PC1}$ (valuation '3', highlighted in italics). The discussion on the other unique pairs is available upon request.

We argue that, before cost mitigating measures, $FB_{PC1}C_{PC1}$, i.e., the importance of the benefit of increased international connectivity brought to BRI participating countries by the MSR (B_{PC1}) could be considered as having a valuation of '1' or 'similar' when compared to the potential risk and cost of increasing debt distress (C_{PC1}) of MSR participating countries. This relationship will depend on the initial international connectivity before MSR (initial benefits would be higher, with decreasing marginal benefits) and on public debt (with increasing marginal costs for higher levels of initial debt than 60 percent of GDP). A valuation of (1) 'similar' for the impact of the benefit of increased international connectivity over the risk and cost of increasing domestic debt levels is acceptable, on average (discussed in previous sections of this paper). With cost mitigating measures, namely that the Chinese lenders need to apply more favorable financial conditions, $FB_{PC1}C_{PC1}$ would move from (1) 'similar' to (3) 'moderate', bringing some net gains to the MSR participating countries.

Table 3   Comparison matrix for the qualitative CBA of the MSR participating countries (after mitigation)

	B_{PC1}	B_{PC2}	B_{PC3}	B_{PC4}	C_{PC1}	C_{PC2}	C_{PC3}	C_{PC4}	**Total**
B_{PC1}	1	3	5	7	*3*	7	3	7	**36.0**
B_{PC2}	1/3	1	3	5	1	5	1	5	**21.3**
B_{PC3}	1/5	1/3	1	3	1/3	3	1/3	3	**11.2**
B_{PC4}	1/7	1/5	1/3	1	1/5	1	1/5	1	**4.1**
C_{PC1}	1/3	1	3	5	1	5	1	5	**21.3**
C_{PC2}	1/7	1/5	1/3	1	1/5	1	1/5	1	**4.1**
C_{PC3}	1/3	1	3	5	1	5	1	5	**21.3**
C_{PC4}	1/7	1/5	1/3	1	1/5	1	1/5	1	**4.1**

Source: Authors.

Overall, we conclude that the benefits of the MSR for participating countries (totaling 72.6) overcome costs (50.8). Net gains, i.e., the difference between benefits and costs, total therefore 21.8. Without cost-mitigating measures, benefits would have totaled 66.9 (slightly down from 72.6), while costs would have totaled 71.9 (up from 50.8). It is interesting to note that net gains without mitigating measures would have been negative: - 5.0. We conclude, therefore, that the MSR is only beneficial for participating countries due to the improvements recently observed in social and environmental standards by Chinese promotors and to the better financial terms offered by the Chinese lenders due to the increased competition from other financiers operating in the region.

CBA for Non-Participating Countries

Table 4 shows three benefits and three costs for MSR non-participating countries, as well as associated cost mitigating measures, together with the comparison matrix of values F_{XY} of size (3+3) x (3+3), i.e., 6 x 6. This matrix will also include a total of 36 valuation pairs, but just five truly unique valuation pairs must merit deep consideration. We will only discuss in this paper one of them, comparing benefit with cost, namely $FB_{NPC1}C_{NPC1}$ (valuation '1', highlighted in italics). The discussion on the other unique pairs is available upon request.

We argue that, according to the literature, $FC_{PC1}B_{PC1}$, i.e., the importance of the potential negative risk of supply security and military risks posed by larger Chinese presence in key strategic locations worldwide (C_{NPC1}) could be considered as having a valuation of '3' or 'moderate' when compared to the benefit of increased international connectivity brought to BRI non-participating countries by the MSR (B_{NPC1}). This relationship is acceptable according to the rationale presented in previous sections of this paper. Note also that if $FC_{PC1}B_{PC1}$ equals 3, then $FB_{PC1}C_{PC1}$ equals 1/3.

Table 4   Comparison matrix for the qualitative CBA of the MSR non-participating countries (after mitigation)

	B_{NPC1}	B_{NPC2}	B_{NPC3}	C_{NPC1}	C_{NPC2}	C_{NPC3}	**Total**
B_{NPC1}	1	3	5	*1*	1	7	**18.0**
B_{NPC2}	1/3	1	3	1/3	1/3	5	**10.0**
B_{NPC3}	1/5	1/3	1	1/5	1/5	3	**4.9**
C_{NPC1}	1	3	5	1	1	7	**18.0**
C_{NPC2}	1	3	5	1	1	7	**18.0**
C_{NPC3}	1/7	1/5	1/3	1/7	1/7	1	**2.0**

Source: Authors.

Overall, we conclude that the costs of the MSR for BRI non-participating countries (totaling 38.0) overcome benefits (32.9). Net losses, i.e., the difference between costs and benefits, are 5.0. Without cost mitigating measures, costs would have totaled 42.2 (slightly up from 38.0), while benefits would have totaled 26.0 (down from 32.9). Without cost-mitigating measures, Net losses would have been even higher (-16.0).

Table 5 summarizes our findings. We conclude that the CBA for the MSR produces (i) strong net positive results for China, with estimated benefits much higher than estimated costs; (ii) net positive results for BRI participating countries, with estimated benefits higher than estimated costs, although this finding only holds after cost mitigating measures have been introduced; and (iii) net negative results for BRI non-participating countries, with estimated costs higher than estimated benefits.

Table 5   Comparison matrix for the qualitative CBA of the MSR non-participating countries (after mitigation)

	Cost mitigating measures	Benefits	Costs	Net gains
China	with	**96.6**	**14.2**	**82.4**
	without	79.8	27.2	52.6
BRI participating countries	with	**72.6**	**50.8**	**21.8**
	without	66.9	71.9	-5.0
BRI non-participating countries	with	**32.9**	**38.0**	**-5.0**
	without	26.1	42.2	-16.0

Source: Authors.

Concluding Remarks, Limitations, and Further Research

China has been described as using the MSR to institutionalize the country's role as a global maritime superpower, disproportionately reaping most of the benefits of the initiative. We explored this claim in this paper by carrying out qualitative CBA of the benefits and costs of the MSR in China, participant countries, and non-participant countries.

In this paper, the proposed model builds on bilateral cost-cost, benefit-benefit and cost-benefit preference relations to build a comprehen-

sive qualitative CBA as an ex-ante exercise, assessing policies before implementation.

Taking this methodological argument into consideration, we conclude that the CBA for the MSR produces (i) strong positive net results for China, (ii) positive net results for BRI participating countries only after cost-mitigating measures are considered, and (iii) negative net results for BRI non-participating countries.

We also conclude that most of the risks and potential costs associated with the MSR are less severe than critics suggest due to the increasing trend of cost-mitigating measures being recently implemented, particularly by the Chinese government, and as non-participating countries and MDBs become more involved. These mitigating measures increase the Chinese agencies' expertise in international project financing, leading to better outcomes. In conversations maintained with officials from the Chinese Government, they acknowledged that the BRI (also the MSR) is also a learning process for them. Although infrastructure financing abroad is not new for many Chinese agencies, it has occurred on an *ad hoc* basis before. The MSR brings on board a significant change in magnitude and, consequently, much higher visibility, which leads to increased pressure both from the international community and the public opinion for the MSR to incorporate the best international standards in areas such as transparency, environmental and social safeguards, procurement, anti-corruption and integrity, sustainability and quality of projects at exit, among others. Our conclusion suggests, therefore, that BRI participating countries and, particularly, China should continue deepening further these cost-mitigating measures. As the IMF put it, the BRI success "would be enhanced by having an overarching framework, with better coordination and oversight, more open procurement and due attention to debt sustainability in partner countries" (IMF 2018).

Although we included in this comprehensive qualitative CBA of the MSR the benefits and costs more often referred to in the literature as those with the highest impact, it is also true that the exercise carried out in this paper significantly depends on the number of benefits and costs considered. As such, the model proposed should be understood primarily as a fundamental framework and tool for ex-ante policy decision-making for objects with a high degree of complexity, multifaceted, and partially unquantifiable. Consequently, the proposed framework's robustness needs to be assessed by carrying out sensitivity analyses.

The most challenging difficulty faced in carrying out this research was the recurrent unavailability of specific data for the MSR, disaggregated from the BRI. Avenues for further research include, globally, stud-

ies singling out the MSR and, for this specific study, testing the impact of including additional costs and benefits into the model. More importantly, the authors are preparing a set of geographically and statistically representative surveys and structured interviews with stakeholders to rank the costs and benefits identified, seeking to estimate the preferences associated to the model more soundly.

Notes

Enrique Martínez-Galán is Associate Professor and Academic Program Director at the Stephen Zuellig School of Development Management of the Asian Institute of Management, the Philippines, and Researcher at Centre for African and Development Studies (CEsA) of ISEG-Lisbon School of Economics and Management, Portugal. He works on development, international trade, foreign direct investment, international organizations, and China's foreign strategy. His academic research has appeared in *The World Economy*, *Journal of International Development*, *Applied Econometrics and International Development*, *Baltic Journal of European Studies*, *Portuguese Economic Journal*, *Portuguese Review of Regional Studies*, and *Journal of Research Administration*. He can be reached at enriquegalan@cesa.iseg.ulisboa.pt.

Francisco José B.S. Leandro is an associate professor with habilitation in international relations at the Faculty of Social Sciences of the University of Macau (China) and a member of OBSERVARE (Observatory of Foreign Relations), Autonomous University of Lisbon, Portugal. He works on China-Portuguese-speaking countries and China-Europe relations. His academic research has appeared in *Baltic Journal European Studies* and *Corporate Governance and Sustainability Review*. He can be reached at fleandro@um.edu.mo.

1. There is no official definition of what qualifies as a MSR project and there are Chinese-funded projects in countries not participating in the initiative that share many of the characteristics of MSR projects. See the investments of the Chinese firms in the ports of Antwerp (Belgium), Le Havre (France), Bremerhaven and

Hamburg (Germany), Rotterdam (the Netherlands), Algeciras and Valencia (Spain), and Felixstowe (United Kingdom). These countries are not among the 151 countries (January 2023) (27 in Europe) that signed the Memorandum of Understanding with the Chinese government associating themselves with the BRI (YidaiYilu 2023).

2. Actual costs of Chinese-funded projects are, on average, 30.6 percent higher in real terms than the initial estimates. On the contrary, Chinese-funded projects have fewer delays than those observed in those financed by OECD countries, although this might be related to a trade-off with quality, safety, social equity, and the environment, as pointed out by OECD (2018).

3. The Supreme People's Court of China established in Shenzhen an international commercial court in July 2018 to handle disputes around MSR projects (Hillman and Goodman 2018).

4. In a sample of 2,200 transportation projects in Asia, approved from 2006 to 2017, 89 percent of contractors participating in Chinese-funded projects were Chinese, 8 percent were local, and 3 percent were from third countries. These proportions changed to 29 percent, 41 percent, and 30 percent, respectively, when the projects were funded by the World Bank and the Asian Development Bank (Hillman 2018).

5. See the cases of the Export-Import Bank of China and the China Development Bank, as referred by Zhang and Miller (2017).

6. At least half the BRI funding by 2030 will be met by a combination of private capital, MDBs, and foreign governments, according to Deloitte (2018), up from the level of 12 percent of co-financing by MDBs observed so far, according to Fitch (2018).

7. Cost to cost in this table, which would be the third case, is derived, so it is not a truly unique pair in Table 2.

References

Azar, Christian, and Stephen Schneider. 2003. "Are the Economic Costs of (Non-) Stabilizing the Atmosphere Prohibitive? A Response to Gerlagh and Papyrakis." *Journal of Ecological Economics,* vol. 46, no. 3, pp. 329–332.

Bizot, Olivia. 2021. "Montenegro's Highway to Debt: Unfinished Chinese Road Comes with Strings Attached." *France 24,* August 30.

Blanchard, Jean-Marc, and Colin Flint. 2017. "The Geopolitics of China's Maritime Silk Road Initiative." *Geopolitics,* vol. 22, no. 2, pp. 223–245.

Chandran, Nyshka. 2018. "China Can Make Its Belt and Road Project More Successful if It Taps Locals, Experts Say." *CNBC,* September 14.

Clark, Ximena, David Dollar, and Alejandro Micco. 2004. "Port Efficiency, Maritime Transport Costs and Bilateral Trade." *Journal of Development Economics,* vol. 75, no. 2, pp. 417–450.

CSIS. 2017. "How Much Trade Transits the South China Sea." *China Power,* August 2. www.csis.org/analysis/how-much-trade-transits-south-china-sea.

De Soyres, François, Alen Mulabdic, Siobhan Murray, Nadia Rocha, and Michele Ruta. 2018. "How Much Will the BRI Reduce Trade Costs?" *Policy Research Working Paper* 8614. World Bank. https://documents1.worldbank.org/curated/en/592771539630482582/pdf/WPS8614.pdf.

Deloitte. 2018. "Embracing the BRI Ecosystem in 2018: Navigating Pitfalls and Seizing Opportunities." *Deloitte Insights,* February 12.

Djankov, Simeon, Caroline Freund, and Cong Pham. 2006. "Trading on Time." *Policy Research Working Paper* 3909. World Bank. https://elibrary.worldbank.org/doi/abs/10.1596/1813-9450-3909.

European Central Bank. 2022. "Financial Risks in China's Corporate Sector: Real Estate and Beyond." ECB Economic Bulletin, Issue 2/2022. www.ecb.europa.eu/pub/economic-bulletin/articles/2022/html/ecb.ebart202202_01~48041a563f.en.html.

Fang, Jason, and Michael Walsh. 2018. "'Made in China 2025': Beijing's Manufacturing Blueprint and Why the World Is Concerned." *ABC News,* April 28.

Financial Times. 2017. "One Belt, One Road – and Many Questions." May 14.

Fitch. 2018. "What Our Clients Want to Know: Belt and Road in 2018." Fitch Solutions, August 9. www.fitchsolutions.com/infrastructure/what-our-clients-want-know-belt-and-road-2018-08-08-2018.

Garcia-Herrero, Alicia, and Jianwei Xu. 2019. "Countries' Perceptions of China's Belt and Road Initiative: A Big Data Analysis." *Bruegel Working Paper Series,* no. 29318.

Govindan, Kannan, Mathiyazhagan Kaliyan, Devika Kannan, and A.N. Haq. 2014. "Barriers Analysis for Green Supply Chain Management Implementation in Indian Industries Using Analytic Hierarchy Process." *International Journal of Production Economics*, vol. 147, pp. 555–568.

Guo, Martin. 2018. *2016–2017 China National Image Global Survey*. Kantar Research.

Hancock, Tom. 2017. "China Encircles the World with One Belt, One Road Strategy." *Financial Times,* May 3.

He, Chi. 2018. "The Belt and Road Initiative as Global Public Good: Implications for International Law." In Wenhua Shan, Kimmo Nuotio, and Kangle Zhang, eds., *Normative Readings of the Belt and Road Initiative: Road to New Paradigms*. Cham: Springer, pp. 85–104.

Hillman, Jonathan E. 2018. "The BRI: Five Years Later." Statement before the US-China Economic and Security Review Commission of the US Senate. *CSIS,* January 25. www.uscc.gov/sites/default/files/Hillman_USCC%20Testimony_25Jan2018_FINAL.pdf.

———. 2019. "China's Maritime Silk Road Initiative: Implications for the Global Maritime Supply Chain." US Congressional Testimony. *CSIS,* October 17. www.csis.org/analysis/chinas-maritime-silk-road-initiative-implications-global-maritime-supply-chain.

Hillman, Jonathan E., and Matthew Goodman. 2018. "China's BRI Court to Challenge Current US-led Order." *Financial Times,* July 24.

Holzmann, Anna, and Nis Grünberg. 2021. "'Greening' China: an Analysis of Bei-
jing's Sustainable Development Strategies." *MERICS.* https://merics.org/en/
report/greening-china-analysis-beijings-sustainable-development-strategies.

Hurley, John, Scott Morris, and Gailyn Portelance. 2018. "Examining the Debt Im-
plications of the BRI from a Policy Perspective." *CGD Policy Paper Series*, no.
121. Center for Global Development.

International Chamber of Shipping (ICS). 2020. "Shipping and World Trade." http://
www.ics-shipping.org/shipping-facts/shipping-and-world-trade.

International Monetary Fund (IMF). 2018. "People's Republic of China: 2018
Article IV Consultation." July 26. www.imf.org/en/Publications/CR/Is-
sues/2018/07/25/Peoples-Republic-of-China-2018-Article-IV-Consultation-
Press-Release-Staff-Report-Staff-46121.

Koboević, Žarko, Željko Kurtela, and Srdan Vujičić. 2018. "The Maritime Silk
Road and China's BRI." *Naše More, International Journal of Maritime Science
and Technology,* vol. 65, no. 2, pp. 113–122.

Kynge, James. 2017. "How China Rules the Waves." *Financial Times,* January 12.
———. 2018. "China's Belt and Road Difficulties Are Proliferating across the
World." *Financial Times,* July 9.

Luthra, Sunil, Sachin K. Mangla, Lei Xu, and Ali Diabat. 2016. "Using AHP to
Evaluate Barriers in Adopting Sustainable Consumption and Production Initia-
tives in a Supply Chain." *International Journal of Production Economics,* vol.
181, pp. 342–349.
———. 2018. "Evaluating Challenges to Industry 4.0 Initiatives for Supply Chain
Sustainability in Emerging Economies." *Process Safety and Environmental
Protection*, vol. 117, pp. 168–179.

Madzík, Peter, and Lukáš Falát. 2022. "State-of-the-Art on Analytic Hierarchy Pro-
cess in the Last 40 Years: Literature Review Based on Latent Dirichlet Alloca-
tion Topic Modelling." *PLoS ONE*, vol. 17, no. 5, e0268777.

Mahan, Alfred. 1890. *The Influence of Sea Power upon History, 1660–1783.* Lon-
don: Little, Brown and Co.
———. 1892. *The Influence of Sea Power upon the French Revolution and Empire,
1793–1812.* London: Little, Brown and Co.

March, James, and Johan Olsen. 1998. "The Institutional Dynamics of International
Political Orders." *International Organization*, vol. 52, no. 4, pp. 943–969.

Ministry of Finance of Japan. 2019. *G20 Principles for Quality Infrastructure In-
vestment*. www.mof.go.jp/pri/research/seminar/fy2019/tff2019_s1_01.pdf.

Ministry of Finance of the People's Republic of China. 2017a. *Guiding Principles
on Financing the Development of the BRI.* http://m.mof.gov.cn/czxw/201705/
P020170515761133537061.pdf.
———. 2017b. *Memorandum of Understanding on Collaboration on Mat-
ters of Common Interest under the BRI.* https://thedocs.worldbank.org/en/
doc/412261495119092544-0260022017/original/OfficialDocumentsMemo-
randumofUnderstandingbetweentheMinistryofFinanceofthePeoplesRepubli-
cofChinaandADBAIIBEBRDEIBNDBWBGonCollaborationundertheBeltan-
dRoadInitiative.pdf.

———. 2019. *Memorandum of Understanding on Collaboration on Matters to Establish the Multilateral Cooperation Center for Development Finance*. www.aiib.org/en/about-aiib/who-we-are/partnership/_download/collabora-tion-on-matters.pdf.

Ministry of Foreign Affairs of the People's Republic of China. 2019. "Preparations for the Second BRI Forum for International Cooperation." www.fmprc.gov.cn/mfa_eng/wjdt_665385/zyjh_665391/t1650535.shtml.

Moody's. 2017. "Moody's Downgrades China's Rating to A1 from Aa3 and Changes Outlook to Stable from Negative." Moody's Investors Service, May 23.

Morris, Scott, Brad Parks, and Alysha Gardner. 2020. "Chinese and World Bank Lending Terms: A Systematic Comparison across 157 Countries and 15 Years." CGD policy paper series no. 170, Center for Global Development.

Mu, Enrique. 2016. "Using AHP BOCR Analysis for Experiential Business Education and Prioritization of International Opportunities." *International Journal of Business and Systems Research,* vol. 10, nos. 2/3/4, pp. 364–393.

Mu, Enrique, and Milagros Pereyra-Rojas. 2017. "Benefit/Cost Analysis Using AHP." In *Practical Decision Making*. Cham: Springer Briefs in Operations Research, pp. 71–78.

OECD. 2018. *China's BRI in the Global Trade, Investment and Finance Landscape*. OECD. www.oecd.org/finance/Chinas-Belt-and-Road-Initiative-in-the-global-trade-investment-and-finance-landscape.pdf.

Osborn, Ted. 2017. "Pressure on China's Banks to Report Bad Debt Is Good News for Foreign Investors." *South China Morning Post,* April 2.

Qi, Hao, and David Kotz. 2020. "The Impact of State-Owned Enterprises on China's Economic Growth." *Review of Radical Political Economics,* vol. 52, no. 1, pp. 96–114.

Rogers, Patricia, Kaye Stevens, and Jonathan Boymal. 2009. "Qualitative Cost-benefit Evaluation of Complex, Emergent Programs." *Evaluation and Program Planning*, no. 32, pp. 83–90.

Ruta, Michele. 2018. "Three Opportunities and Three Risks of the Belt and Road Initiative." World Bank Blogs, May 4. https://blogs.worldbank.org/trade/three-opportunities-and-three-risks-belt-and-road-initiative.

Saaty, Thomas L. 1980. *The Analytic Hierarchy Process*. Pittsburgh: Mc-Graw-Hill.

———. 2012. *Decision Making for Leaders: The Analytic Hierarchy Process for Decisions in a Complex World,* 3rd edition. Pittsburgh: RWS Publications.

State Council of the People's Republic of China. 2018. *Belt and Road Big Data Report*. September 20.

Sun, Degang, and Zahia Zoubir. 2017. "Development First: China's Investment in Seaport Constructions and Operations along the Maritime Silk Road." *Asian Journal of Middle Eastern and Islamic Studies,* vol. 11, no. 3, pp. 35–47.

Sun, Monica, Calvin Ho, and Yilin Pei. 2022. "China's Green Finance – Key Recent Developments." Herbert Smith Freehills. https://hsfnotes.com/fsrandcorpcrime/2022/07/12/chinas-green-finance-key-recent-developments.

Thomas, Denny, and Michelle Price. 2016. "When Deals Go Bad: China State Firm Managers Spooked by New Liability Rules." *Reuters,* September 26.

Thorne, Devin, and Ben Spevack. 2017. "Harbored Ambitions: How China's Port Investments Are Strategically Reshaping the Indo-Pacific." *C4ADS*. https://c4ads.org/wp-content/uploads/2022/04/Harbored-Ambitions-C4ADS.pdf.

Trading Economics. 2016. "China Foreign Exchange Reserves" and "Bank Deposits in China from 2006 to 2016 (in trillion yuan)." *Statista*. www.statista.com.

US Nuclear Regulatory Commission. 2018. "Qualitative Factors Assessment Tools." Regulatory Analysis Guidelines of the US NRC. NUREG/BR-0058. Rev. 5. Appendix A. www.nrc.gov/docs/ML1722/ML17221A006.pdf.

Van der Bergh, Jeroen. 2004. "Optimal Climate Policy Is a Utopia: From Quantitative to Qualitative Cost-Benefit Analysis." *Journal of Ecological Economics*, vol. 48, pp. 385–393.

Vargas, Luis G. 1990. "An Overview of the Analytic Hierarchy Process and It's Applications." *European Journal of Operational Research,* vol. 48, no. 1, pp. 2–8.

Vieira, José Geraldo Vidal, Milton Ramos Toso, João Eduardo Azevedo Ramos da Silva, and Priscilla Cristina Cabral Ribeiro. 2017. "An AHP-based Framework for Logistics Operations in Distribution Centres." *International Journal of Production Economics*, vol. 187, pp. 246–259.

Voon, Jan, and Xinpeng Xu. 2020. "Impact of the Belt and Road Initiative on China's Soft Power: Preliminary Evidence." *Asia-Pacific Journal of Accounting and Economics,* vol. 27, no. 1, pp. 120–131.

Weimer, David, and Aidan Vining. 2011. *Policy Analysis,* 5th edition. New York: Longman.

Wells, Peter, and Don Weinland. 2017. "Fitch Warns on Expected Returns from One Belt, One Road." *Financial Times,* January 25.

Wijnmalen, Diederik J. D. 2007. "Analysis of Benefits, Opportunities, Costs, and Risks (BOCR) with the AHP–ANP: A Critical Validation." *Mathematical and Computer Modeling*, vol. 46, nos. 7/8, pp. 892–905.

World Bank. 2023. "World Bank Development Indicators 2022."

World Trade Organization. 2023. "WTO Trade Cost Index 2022."

YidaiYilu. 2023. "International Cooperation: Profiles." https://eng.yidaiyilu.gov.cn/info/iList.jsp?cat_id=10076&cur_page=1.

Zhang, Shu, and Matthew Miller. 2017. "Behind China's Silk Road Vision: Cheap Funds, Heavy Debt, Growing Risk." *Reuters,* May 15.