

Evolving and differentiated strategy? A network approach to understand Chinese development finance

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ABSTRACT

In recent decades China's engagement in international development has been widely studied, although the drivers of Chinese strategy are still being debated. This article searches for evidence of a differentiated strategy according to the endowment of natural resources and political stability of partner countries, drawing on AidData financial flows from 2000 to 2021. Through social network analysis, the article maps cooperation ties between China and African countries to understand which African countries are more similar as a result of their links to the same Chinese institutions. The results confirm the Belt and Road Initiative as a cornerstone in China's relations with African countries. However, evidence on country-specific factors is inconclusive: overall, political stability seems to be relevant, while natural resource endowments do not emerge as a driver of specific behaviours. The findings challenge the view that Chinese engagement with African countries merely aims at securing natural resources and increasing geopolitical influence, suggesting a more complex and pragmatic approach.

KEYWORDS

China; Africa; Chinese international aid; natural resources; political stability; social network analysis

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Introduction

International cooperation has traditionally been considered an instrument of foreign policy soft power, through its capacity to channel resources to developing countries. In this vein, it is no surprise that emerging countries have strengthened their cooperation activities to gain influence in a loosened international system, using South–South cooperation as an encompassing powerful framing for their actions abroad (Gray and Gills 2016).

Among these countries, China has emerged as a key player in the last two decades: foreseeing a major role in the world economy, China opted for ‘going global’ in 2000 (Wang and Miao 2016) and in 2013 it further strengthened its international strategy by launching the Belt and Road Initiative (BRI). Two new multilateral financing mechanisms, the Asian Infrastructure Investment Bank (AIIB) and the New Development Bank (NDB), were created in 2014 and 2015, respectively, to shape, together with the China Development Bank (CDB) and the Export–Import Bank of China (CHEXIM), China’s overseas finance architecture (Humphrey and Michaelowa 2019). In 2018, the China International Development Cooperation Agency (CIDCA) was established, with the aim of coordinating the vast and fragmented cooperation efforts undertaken by the country.

The ascent of China and its progressive engagement in international development has been widely studied, especially focusing on the repercussions on global governance (Mawdsley et al. 2017; World Bank Group 2021) and within the context of the crisis of Western multilateral institutions (Hout and Onderco 2022). Chinese foreign aid has been considered a potential challenge to the Development Assistance Committee (DAC) regime within the Organisation for Economic Co-operation and Development (OECD) (Brautigam 2011; Hoeffler and Sterck 2022), and a way of securing resources that support China’s economic growth (Shaoshi et al. 2020). Within this perspective, efforts have been made to identify the drivers of Chinese development finance (Brant 2013; Guillon and Mathonnat 2020) and its effects in terms of recipients’ growth (Dreher et al. 2021; Demir and Duan 2023), employment (Guo, An and Jiang 2022) and the broader political environment (Isaksson and Kotsadam 2018; Bai, Li and Wang 2022; Appiah-Kubi and Jarrett 2023). Empirical studies have also focused on regional geographic perspectives such as the South Pacific (Brant 2013) and Latin America (Gallagher and Irwin 2015; Kaplan 2016; Malacalza 2019). Chinese engagement with Africa has been a major topic of research (Broich 2017; Guillon and Mathonnat 2020; Landry 2021) and scholars have explored both Chinese and partner countries’ expectations from this tightening economic relationship (Dollar 2016; Mourao 2018; Carrozza 2021).

Less attention has been paid to understanding the evolution of Chinese strategy over time and whether it has been tailored according to partner countries’ characteristics, beyond the narrative of a homogeneous strategy based on the need to secure access to critical raw materials and other commodities (Klinger and Muldavin 2019). This article explores the existence of a differentiated strategy that can be observed in Chinese development finance in Africa, between the pre- and post-BRI periods and according to partner countries’ characteristics such as the availability of natural resources and political stability. We aimed to identify patterns of similarities

in the relationships that China has maintained with African partner countries that have received financial support between 2000 and 2021. We carried out a social network analysis based on data contained in AidData, a large dataset that has been used in previous studies on Chinese international cooperation (Dreher et al. 2021). This dataset makes possible a comparison of the networking strategy – that is, the establishment of cooperative ties between China and other countries – adopted by the Chinese government between the period before the BRI (2000–13) and after its official launch in 2013 (2014–21). The results confirm that the BRI marks a cornerstone in China’s development finance to Africa as part of its wider global projection. For the relationship with partners, evidence on country-specific factors is not conclusive: political stability seems to be a relevant attribute that shapes Chinese relations, suggesting a pragmatic attitude in providing financial support, while natural resource endowments do not emerge as relevant.

The rest of this article is organised as follows: the second section offers an overview of Chinese aid and engagement in international development, particularly in Africa; the third illustrates the data and analytical method, while the fourth presents the main findings. The last section discusses the results and concludes by offering some final remarks on the article’s contribution and future research streams.

China’s aid along the African belt and road

China has a long tradition of engagement in foreign aid that goes back to the 1950s, when it was also a recipient of economic assistance from the Soviet Union. Following the economic reforms that started in the 1970s, China began to receive official development assistance (ODA) from Western institutions (Kitano 2018), laying the ground for the unique condition of being both a large donor and significant recipient at the global level, something that still remains, although on a very small scale (Humphrey and Chen 2021; Morris, Rockafellow and Rose 2021). As its role in the world economy has increased, China has been strengthening its cooperation with developing partners, through intensified participation in bilateral initiatives, multilateral banks and political dialogue. Some authors see this as an attempt by China to build its own ‘international South–South cooperation regime’ (Domínguez 2018; Vadell 2018).

The term South–South cooperation has been used in China since the beginning of its own aid system in 1951 (Rudyak 2022) and still embodies the conceptual framework to which China appeals in its relationships with partner countries (Owen 2021). In line with the traditional framing of South–South cooperation, China’s development finance includes grants, but also export facilities and preferential and non-preferential credit and project loans. Against the restrictive interpretation of ODA under the OECD-DAC aid regime, developing countries have been asserting the importance of a wide range of instruments (in particular, trade, regional integration, private and public investment, export credit lines and remittances) to promote development and prosperity (Besharati and MacFeely 2019). Consistent with this approach, a wide range of tools are established in China’s partnership agreements, both financial – grants, investments, loans and credit lines – and technical, such as technology transfer or capacity building (Domínguez 2018). Among these latter

two, professionalisation training programmes have seemingly become increasingly important in recent years (Benabdallah 2018).

Development finance has traditionally been an area where the institutional status quo has been perceived by developing countries as particularly hostile. China and the rest of the developing world, often backed by critical voices from the global North itself (Stewart 1987; Cabello, Sekulova and Schmidt 2008), have long claimed that the conditionalities adopted by the World Bank and the other Bretton Woods institutions were unfair and imposed on recipients coercively, treating them as subordinated agents. Particularly controversial have been the loans and grants conditioned on adjustment policies (Wu 2017), along with World Bank's environmental and social safeguards (ESS), applied since the 1980s regardless of the specific conditions of recipients (Wang and Sampson 2022). Hence, the absence of conditionality within China's lending is highly emphasised by the official narrative: China respects the 'non-interference principle' in respect of domestic economic and political systems (one of the pillars of South–South cooperation), revealing a quite pragmatic approach to partner countries' political orientation (Broich 2017). The one large exception to non-interference is the request to adhere to the official 'One China' policy pursued by Beijing with respect to Taiwan, and to abstain from open criticism of China's human rights standards and authoritative regime (Ye 2022).

The Chinese international cooperation institutional setting is complex and involves ministries, subnational administrative units with large degrees of autonomy and, foremost, several finance institutions. Among the latter, the most important are the China Development Bank (CDB) and the Export–Import Bank of China (CHEXIM), as bilateral banks; and the Asian Infrastructure Investment Bank, the New Development Bank and the Silk Road Fund, as multilateral initiatives. These actors represent the largest source of global development finance (Horn, Reinhart and Trebesch 2021; Ray et al. 2021; World Bank Group 2021): the CDB and CHEXIM have provided 'more financing to emerging market and developing countries (EMDs) than all of the Western-backed development finance institutions combined' (Chin and Gallagher 2019, 246). The predominant role of state finance and its ties with commercial banks has been a trait of the Chinese financial system: external loans reproduce the coordinated interventions of state policy banks and commercial banks, securing the government a firm grasp over international lending (Chen 2013; Horn, Reinhart and Trebesch 2021). Beneficiaries are mostly governments, government agencies or state-owned companies (Malik et al. 2021), and even when private stakeholders are part of an agreement, their investments are usually underwritten by state guarantees.

CIDCA is responsible for coordinating China's foreign aid efforts, which have long been fragmented into a variety of instruments and institutional arrangements (Zhang and Smith 2017). It responds directly to the State Council and its mandate is explicitly intended to promote and strengthen the BRI, which means supporting both geopolitical and development agendas related to the project (Zhao and Jing 2019).

The BRI was launched in 2013 as an initiative aimed at establishing and enhancing mutually beneficial development relationships between China and several partner countries along the 'Silk Road Economic Belt' and the 'Maritime Silk Road'. It is a foreign political and economic strategy focused on large-scale regional integration and connectivity, bridging Asia, Europe and Africa. The BRI has been analysed through

different lens (Clarke 2017): one perspective depicts it as a geopolitical project aimed at breaking the perceived US ‘encirclement’ in the Asia-Pacific region and limiting India’s rise (Tomé 2023). A second stream emphasises the economic motivations behind the initiative, arguing that the BRI is a response to China’s economic challenges following the global financial crisis; this includes addressing economic imbalances between China’s coastal and inland regions and finding markets for surplus production (Summers 2016; Rimmer 2018). According to this view, any geopolitical benefits from the BRI are secondary. It has also been outlined how the BRI serves as a strategy for regional integration that continues China’s traditional periphery integration and security policy (Swaine 2015; Bhattacharya 2016) and how, far from being a monolithic programme, it embodies internal power conflicts (Jones and Zeng 2019).

Beyond these different perceptions, which often reflect ideological perspectives, it is a huge programme: its partners have increased from seven in 2013 to 150 in 2021, spread across all regions of the globe, including Europe. Cumulative BRI engagement (overall finance and investment) in 2023 amounted to US\$1.053 trillion: about US\$634 billion in construction contracts and US\$419 billion in non-financial investments (Nedopil 2024). Priority is given to infrastructure, particularly renewable energy, mining and related technologies, with Chinese companies investing strongly in metals and mining, which are particularly relevant to the green transition and to batteries for electric vehicles (Nedopil 2024). By 2023, Africa was the largest recipient of Chinese finance and direct investment, with 44 sub-Saharan countries involved in the BRI. In 2000, China and Africa established the Forum on China–Africa Cooperation (FOCAC) as the main arena for political dialogue (dos Santos, Li and Alves 2023).

China has experienced growing engagement in Africa since 2000 and has become the continent’s largest trading partner. Additionally, many Chinese workers, with estimates of up to one million, have relocated to Africa, initially involved in Chinese-financed infrastructure building. This tightening relationship has nurtured a vivid and controversial debate on the effects on partner countries (Dollar 2016). Increased Chinese engagement has undoubtedly contributed to faster economic growth and poverty reduction on the continent. Sub-Saharan Africa, in particular, saw remarkable growth, especially in the mid 2000s, when gross domestic product (GDP) growth averaged nearly 7% annually. China’s demand for Africa’s raw materials, such as oil, iron, copper and zinc, among others, has positively affected the continent’s terms of trade and export volumes (Dollar 2016).

However, concerns have been raised with respect to China’s policy to push partner countries’ indebtedness beyond any realistic possibility of repayment, with the aim of creating a debt trap or a dependency relationship (Carmody 2020; Al-Fadhat and Prasetio 2022). Moreover, it has been suggested that the opaque and scarce available information on the actual amount of Chinese loans hides a significant part of the global indebtedness to China (Horn, Reinhart and Trebesch 2021). On the other hand, it has also been argued that objections regarding the lack of transparency and the risk of over-indebtedness are part of a Western attempt to discredit Chinese penetration in areas traditionally influenced by the West (Singh 2021), while other studies draw a more complex and differentiated landscape of opportunities and risks, according to country-specific conditions (Hurley, Morris and Portelance 2018).

Scholars have been concerned about exploring the drivers of Chinese development finance. While there is a consensus on the relevance of adherence to the ‘One China’ policy (Nowak 2015; Zhang and Smith 2017; Yuan, Su and Ouyang 2022), evidence is not conclusive when other dimensions are explored, such as the role of large natural resource endowments or the political stability of partner countries. Scholars are divided on natural resources, particularly the need for China to secure strategic commodities for its development. Based on a 1996–2005 dataset on Chinese aid, Dreher and Fuchs (2016) find no evidence of Chinese aid being distorted towards commodity-exporting countries and therefore reject the label of ‘rogue aid’. Dollar (2016) shows similar results and adds that China’s recent pattern of growth is increasingly less resource-intensive; therefore, China’s needs for energy and minerals are expected to decrease in the future. Similarly, Brautigam (2009) highlights how grants and zero-interest loans are rather equally distributed between resource-rich and non-resource-rich countries. Conversely, Guillon and Mathonnat (2020) analyse Chinese aid according to sector and find that countries rich in natural resources tend to benefit from higher Chinese ODA, while both Broich (2017) and Fuchs and Rudyak (2017) provide evidence that supports the positive association between Chinese aid and the endowment of natural resources. With respect to the quality of governance, evidence is mixed. Guillon and Mathonnat (2020) explore the relevance of weak institutions and find no significant relation overall, though countries with weak governance (mainly assessed through property rights protection and rule of law indicators) seem to benefit slightly more from aid in the economic and production sectors. These results are in line with previous studies (Broich 2017). Mourao (2018) reaches opposite results, finding evidence that government effectiveness and political stability seem to be requirements for Chinese aid. Dollar (2016) affirms that Chinese direct investment is not correlated with good governance indicators, even after adjusting for market size and natural resource wealth. This indicates that Chinese investment is largely unaffected by the governance conditions in a country. For example, China has investments in nations with weaker governance, such as the Democratic Republic of the Congo, Angola and Sudan, but also in countries with relatively stronger governance, such as South Africa, which is the leading recipient of Chinese investment in Africa.

Data and methodology

In this work, we use the AidData database, a major source of information on Chinese official development finance that has been widely used to explore Chinese aid, especially as regards its potential for partner countries’ development (Strange et al. 2017; Bluhm et al. 2020; Dreher et al. 2021, 2022; Custer et al. 2023; Demir and Duan 2023). As of November 2023, AidData reported 20,985 projects financed by loans and grants in 165 low- and middle-income countries from 2000 to 2021, totalling US\$1.34 trillion (in 2021 constant US\$) (Custer et al. 2023). In order to make Chinese efforts comparable with DAC donors, AidData differentiates Chinese ODA-like aid, which refers to grants, interest-free loans, debt relief, technical assistance and in-kind contributions, from other official flows (OOF), which include loans (semi

and non-concessional) and export credits. Although this is not in line with the tradition of South–South cooperation and the official Chinese definition of foreign aid (Brautigam 2011), it is still useful to grasp China’s overall approach to development finance, given the lack of alternative official and exhaustive metrics (Ye 2022).

Prior to our analysis, we filtered the AidData database to consider only the African countries which benefited from Chinese funding and had joined the BRI. Moreover, we considered all projects where the recipient expressed a formal commitment to the BRI. Data were analysed using social network analysis, which provides a range of methods for studying global (Bolívar, Casanueva and Castro 2019; Kurt and Kurt 2020) and international aid networks (Han, Koenig-Archibugi and Opsahl 2018; Horowitz, Kali and Song 2021). Given the peculiar structure of the AidData database, we can model the relationship between a Chinese funding institution and target country – the country that is receiving ODA-like or OOF-like aid – as a two-mode or bipartite network. Two-mode networks are made by two sets of nodes and the connections between these nodes (Prell 2012); in this context, one set is made by Chinese institutions while the other set is made by countries, and the connection between an institution and a country indicates that the former funded a specific project in the latter. These networks can be converted into a one-mode network, where only one set of actors is included. Since we are interested in investigating countries’ similarity in terms of funding received, our analysis should concentrate on one-mode networks made by countries only. **Figure 1** provides an example of the transformation from a two-mode to one-mode network: if Togo and Somalia receive funding from the same Chinese institution (for instance, the Agricultural Bank of China), this two-mode network can be transformed into a one-mode by removing the node representing the Agricultural Bank of China and adding a tie between the two countries.¹

Two countries are therefore similar if they share a connection because of a common funding source. However, they may share two or even more funding sources; in this case, we can say that there is a certain level of similarity that can be estimated for each pair of countries (i.e. dyad) in the network. The similarity level is a score from zero to one: the higher the score, the greater the similarity between two countries.

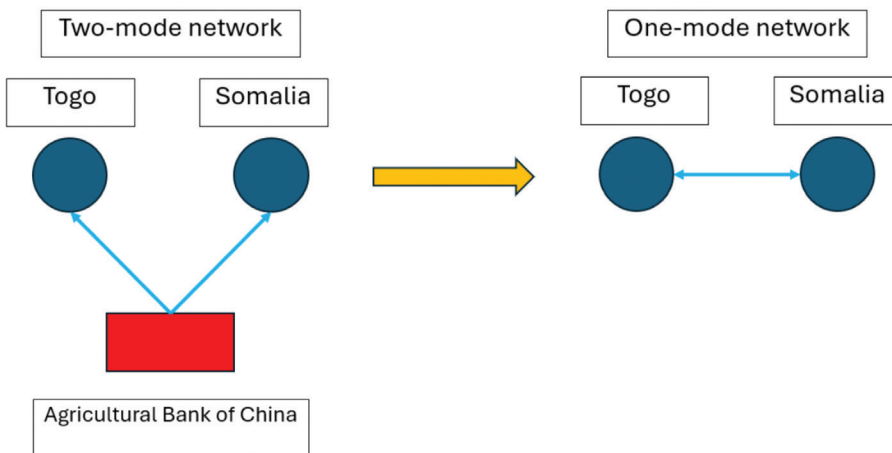


Figure 1. Example of the transformation from a two-mode to one-mode network.

As an example, in the pre-BRI period (2000–13) Djibouti managed to secure 22 ODA-like aid flows from four different Chinese institutions, while Libya secured three ODA-like aid flows from two institutions. These same two institutions funded 17 out of 22 projects in Djibouti, for a similarity level equal to 0.97. In this vein, the similarity level can be seen as a weight associated to each tie in the network (Barrat et al. 2004), and therefore the strength of the similarity between two countries. Once we estimated the similarity level score, we impose a threshold equal to 0.97² to identify those pairs of countries that are almost identical in terms of funding received.

The ODA-like and OOF-like one-mode networks created with the above procedure were then analysed considering the key features discussed in the previous section: the presence of natural resources and institutional stability. These features can be seen as attributes of the network nodes (Prell 2012), and were operationalised by adopting the following procedure. For the presence of natural resources, we used the International Monetary Fund (IMF) classification (IMF 2012; Mlachila and Ouedraogo 2017), where countries are classified as resource-rich or non-resource-rich countries. As a measure of political stability, we used the Global Peace Index (GPI),³ a composite index measuring countries' peacefulness. Previous studies (Broich 2017; Coppedge et al. 2020; Guillon and Mathonnat 2020) based their assessment of the governance and/or institutional quality on indicators such as Worldwide Governance Indicators (GGI), the Corruption Perceptions Index or Varieties of Democracy (VoD) project, which reflect experts' opinions rather than objective circumstances and tend to be tailored to Western standards and subject to ideological bias. We prefer to adopt the GPI to assess the exposure of the country to conflicts, terrorism and other hazards that can have a disruptive effect on political stability as we believe this indicator is more in line with China's pragmatic orientation towards partner countries' regimes and the principle of non-interference with domestic affairs. The GPI score has been estimated for 163 countries since 2008; in this study, we considered the 2008–13 and 2014–21 periods, created an average score for each country in each period,⁴ and then divided our observations into four groups based on the quartiles. Observations range from 1 (most stable) to 4 (least stable), while 0 indicates that the country has never received a GPI score.

The resulting networks can thereby be interpreted as communities of countries sharing similar funding sources, resulting from a deliberate strategy implemented by China's government and potentially linked to: the presence of natural resources; the presence of a stable political environment; or a combination of both.

Results

Table 1 describes the dataset used for investigating the pre- and post-BRI ODA-like and OOF-like aid flows, while **Table 2** shows the network statistics. Most of the aid flows are ODA-like, both before and after 2013, but OOF-like aid flows always have a higher average value – even if we observe an increased number of high-value ODA-like flows in the post-BRI period. The two types of aid flows led to different network structures: overall, OOF-like aid flows involved a reduced number of countries, and there are also fewer connections between countries compared to the ODA-like aid

Table 1. Descriptive statistics: AidData's Global Chinese Development Finance Dataset (constant 2021 US\$ million).

Type of flow	Number of projects	Average value	Min	Max	Standard deviation
ODA-like aid network 2000–13	1,489	44.7	0.0000935	3,251	196
ODA-like aid network 2014–21	1,769	79.1	0.0000014	23,046	851
OOF-like aid network 2000–13	541	373	0.01567	32,032	1652
OOF-like aid network 2014–21	765	373	0.00308	13,355	1043

Table 2. Network statistics.

Type of flow	Nodes ¹	Number of ties ²	Average degree centrality	Density	Centralisation
ODA-like aid network 2000–13	49	50	1.020	0.021	0.152
ODA-like aid network 2014–21	50	90	1.800	0.037	0.238
OOF-like aid network 2000–13	46	4	0.087	0.002	0.021
OOF-like aid network 2014–21	48	76	1.583	0.034	0.165

Notes: Number of ties refers to the number of existing relationships in the network; average degree centrality refers to the average number of relationships owned by each node/country; density refers to the ratio between the number of existing relationships and all the possible relationships in the network; centralisation refers to a measure of how tightly the network is structured around specific central nodes. ¹This value includes isolated nodes as well; that is, nodes without connections in the network (where the similarity rate with other nodes is below 0.97). ²Since we created one-mode networks from two-mode networks, ties are considered reciprocal and their value is doubled. This column shows the number of relationships with a similarity level score above 0.97.

flows – countries are less similar in terms of funding received. We can also see that ODA-like networks are denser and more centralised compared to OOF-like networks. In this case, this means that: (1) in ODA-like networks, countries are more densely connected (i.e. similar); (2) in ODA-like networks, some countries are particularly central (i.e. they are similar to many other countries).

As described above, our analysis concentrates on the pre- and post-BRI periods (considering 2013, when the BRI was launched, as the threshold). Results are presented for a total of four networks: the pre- and post-BRI ODA-like aid network and the pre- and post-BRI OOF-like aid network. **Figures 2 to 5** show these networks, considering GPI and the IMF's classification for resource-rich countries as network attributes.⁵ The former is represented according to a scale of colours from red (lowest score) to blue (highest score) – where black indicates that a country is not classifiable because it has not been included in the list by the Institute for Economics and Peace. The latter is a visual variable that takes a circle shape for resource-rich countries and a square shape for non-resource-rich countries.

The networks above show different structures, regardless of whether comparing different aid flows (ODA-like and OOF-like) or looking at the same flow over time. Countries are connected if they received funding from (almost) the same Chinese institutions: however, most of them are represented as isolated nodes because they lack connections with other countries due to a similarity score below 0.97. When looking at the ODA-like aid network (**Figures 2 and 3**), network structures seem to be linked to countries' attributes. In **Figure 2**, we can see a triad made up of Egypt,

Lesotho and Togo, which are all countries with a medium-high GPI, and another group made by Guinea, Guinea-Bissau, Somalia and South Africa, which have a low or medium-low GPI. If we consider resource-richness as an attribute, Lesotho is similar to Cabo Verde and the Comoros – three non-resource-rich countries; however, other non-resource-rich countries are not connected with this group. The situation changes if we look at the 2014–21 period (Figure 3). Here, non-resource-rich countries become connected with – and therefore similar to – resource-rich countries; Libya is still similar to many other African countries, despite the worsening of its GPI; and a large block of countries with a low GPI (Burundi, Eritrea, Libya, Somalia and Sudan) are now all connected. At the same time, there are cases where two countries turn out to be less similar: for instance, Guinea and Guinea-Bissau.

In the OOF-like aid network (Figures 4 and 5), we observe a slightly different situation compared to the evolution of the ODA-like aid network. In the pre-BRI period (Figure 4), few countries show a similarity level equal or above 0.97: only Liberia and Madagascar on one side, and Djibouti and Guinea on the other. The importance of the GPI attribute is particularly evident here, where countries are connected if they have a similar score. This is even more evident if we consider a 0.95 similarity level (see Appendix B): we can see network substructures made by countries with only medium-high – or low and medium-low – levels of the GPI. The post-BRI period (Figure 5) shows a network characterised by a core/periphery structure (Borgatti and Everett 2000), where non-resource-rich countries can be mainly found in the network's core, creating a cohesive clique⁶ made up of Burundi, Lesotho, Namibia, Rwanda and Somalia. The dense core⁷ is populated by a mix of countries with a low, medium-low and medium-high GPI; differently from the pre-BRI period, political stability does not seem to be a major driver of similarity.

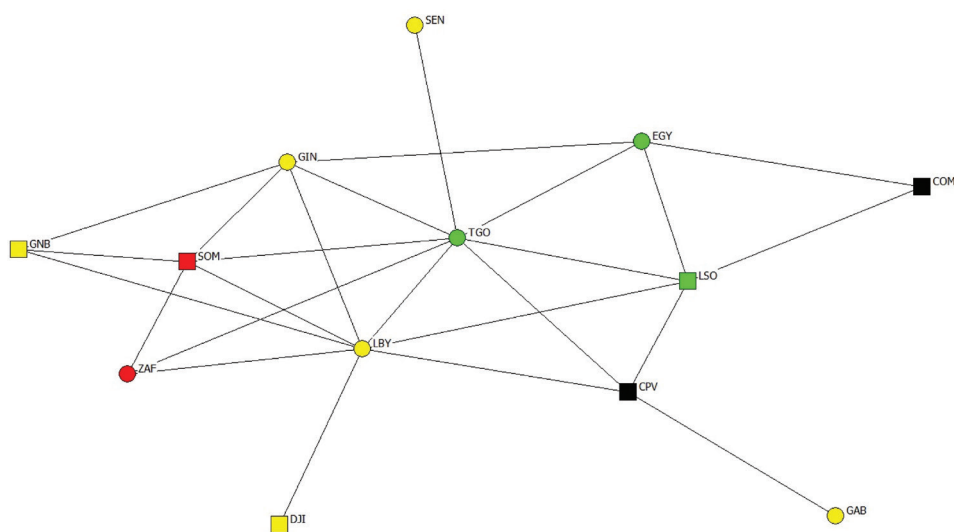


Figure 2. ODA-like aid network 2000–13.

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

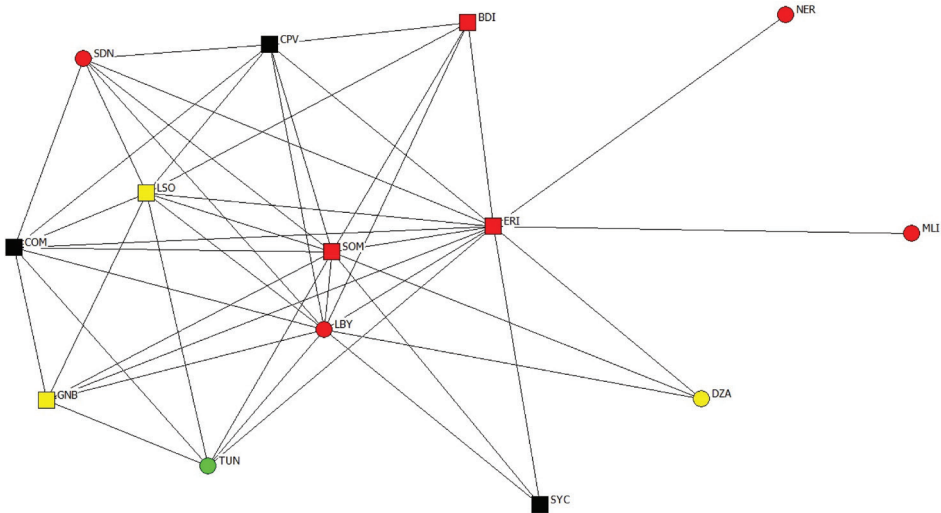


Figure 3. ODA-like aid network 2014–21.

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

Discussion and conclusions

By looking at the African countries who joined the BRI, this study investigated their similarity level in terms of aid flows received by Chinese institutions in the 2000–21 period. We used social network analysis to map the two-mode network made by Chinese institutions and countries receiving aid flows, and then transformed this into a one-mode network made by countries only – where a relationship between two countries indicates a high level of similarity in terms of funding received from the same Chinese institutions. We examined two types of networks (based on ODA-like or OOF-like flows) in two different time periods: 2000–13 (pre-BRI) and 2014–21 (post-BRI).

The results show that China's strategy varies according to the type of aid flow (ODA-like or OOF-like), with the political stability of partner countries playing a more important role than the endowment of natural resources in shaping Chinese foreign aid. The launching of the BRI in 2013 is confirmed as a cornerstone in China's strategy of international projection, as reflected in the substantially different structure of the networks for the two time periods; changes between the two different phases are observable for both ODA-like and OOF-like flows.

However, the BRI seems to have produced different effects on each type of flow. When ODA-like flows are considered in the 2000–13 period, most similarities are found among countries which share similar characteristics in terms of political stability, especially countries with medium-high or medium-low GPI scores. After 2014, the ODA-like aid network shows a group of densely connected countries with low GPI scores, that can be associated with a specific behaviour towards such countries. Overall, political stability seems to be important for China's allocation of ODA-like aid throughout the period analysed, in line with the literature that considers it a

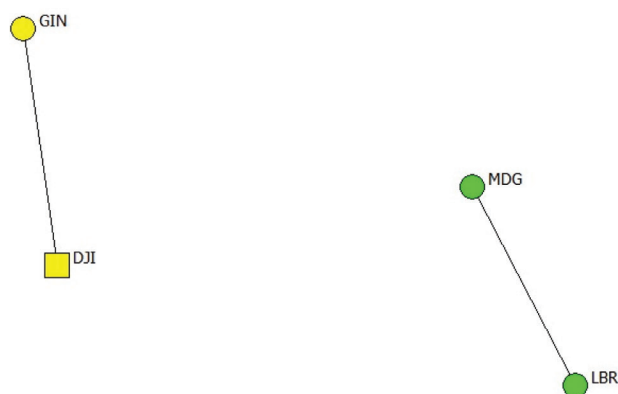


Figure 4. OOF-like aid network 2000–13.

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

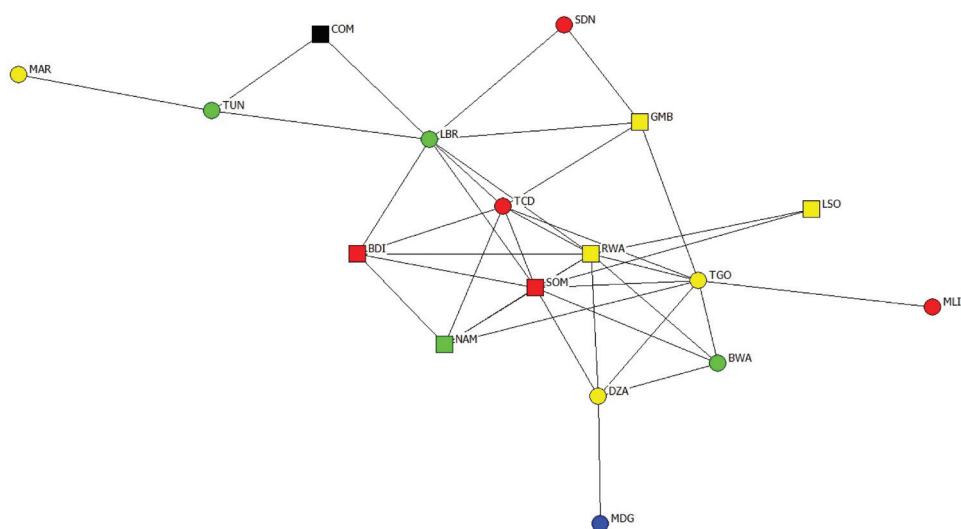


Figure 5. OOF-like aid network 2014–21.

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

requirement for the establishment of economic and political relations with China. The OOF-like network for the pre-BRI period confirms this trend: countries are tied together, with a very high degree of similarity, if they share similar characteristics in terms of GPI scores. This pattern is consistent with the pragmatic character that is often associated with Chinese development finance, which relegates factors such as ideological alignment to a secondary role.

The 2014–21 OOF network is the most difficult to interpret: neither of the two attributes selected seems to contribute to shape Chinese strategy and no clear

pattern emerges. At the core of the network, we find non-resource-rich countries. In this case alternative explanations need to be found. It is possible that with the BRI, the geopolitical need to strengthen ties with all countries in the region prevailed over a more selective strategy tailored to specific countries' characteristics. Having already gained a favourable political position, the reasons to be selective with regard to the political stability of partners countries became less important.

The period after the BRI was launched also corresponds to a slowing in China's spectacular growth rates, which fuelled a commodity boom between 2003 and 2014. Under these circumstances, the need to secure natural resource supplies may have decreased, thus reducing the need for a specific strategy towards resource-rich countries. However, the endowment of natural resources does not emerge as a relevant attribute in shaping China's behaviour in allocating aid: we find no evidence of Chinese aid being aimed at securing commodity supply, not even in OOF-like flows, often associated with loans to be repaid in kind (with natural resources). We also find no geographic pattern that may reflect a differentiated strategy for sub-Saharan countries, with respect to the northern part of the continent.

Overall, China's strategy of providing development finance to African countries appears to be flexible and adaptative to different patterns. It is pragmatic in nature and political stability plays a significant role, enabling long-term and stable relations. Geopolitical motivations remain in the background, as demonstrated by the importance of the BRI as a landmark in shaping Chinese engagement; however, the long-term vision of building strong partnerships with high capillarity⁸ across the continent seems to prevail over short-term considerations, such as the need to secure access to natural resources. The focus on infrastructure is consistent with China's endeavour to strengthen its trade connections with the region and offers great opportunities for Chinese firms to do business with loan-financed projects. On the other hand, it also meets the region's need to upgrade connectivity, energy and transport facilities, which are vital for integration into global value chains as a strategy for economic growth and development. Our results point to a flexible, differentiated and complex strategy, which can allow scope for more assertive negotiation by African countries at both bilateral and multilateral levels, the latter being a field to which China devotes relevant efforts.

Policy implications can be derived from our results. If ODA-like and OOF-like aid flows are inherently different, and they are intended as different strategies, then it is important that African policymakers can envisage and recognise such a strategy and adopt differentiated negotiating approaches accordingly. They can use successful or unsuccessful experiences to design new aid agreements that are aligned with national development plans or better respond to people's expectations. Our findings suggest that some African countries become less similar to others – when looking at the same aid flow type – across time, which suggests that China is differentiating its aid towards them. However, a negative experience when employing a specific financial instrument can be used to learn, thus avoiding the same errors when using other financial instruments. We are aware that Chinese institutions' strategies are influenced by several factors, and the decision to finance a project in a country is often subject to a unbalanced distribution of bargaining power among partners; however, a more in-depth understanding of Chinese aid drivers can help to design

more focused strategies to attract and manage aid and forge alliances among countries that are similar, reflecting the same Chinese behaviour.

This article offers a novel perspective on the approach toward international cooperation adopted by Chinese institutions; while we believe that using social network analysis can be a promising strategy for understanding such complex phenomenon, we should also point out its limitations – and the main limitations of this work. First, our analysis is based on a data visualisation of the pre- and post-BRI networks according to two main node attributes: the presence of natural resources and the GPI. Other attributes may be used for the visualisation: for instance, a more disaggregated node attribute where the type of natural resource is specified, such as energy, minerals or food. Moreover, the GPI score we created does not include information from 2000 to 2007, because this index did not exist in that period. Second, we did not use statistical network models to assess the influence of specific socioeconomic drivers on tie formation. This was not the main objective of our research, but future studies may be interested in investigating what is driving the relationships between Chinese institutions and other countries. Furthermore, our analysis does not concentrate on intercountry relationships: our one-mode networks are created from the two-mode networks representing aid flows from Chinese institutions. Further studies can investigate whether Chinese financial support helped in establishing connections between countries: if two African countries received the same type of support, did they have a chance to learn from their respective experiences and develop a partnership beyond Chinese support?

Notes

1. Please note that the figures in this article appear in colour online, but in black and white in the print version.
2. As a robustness check, we have used other thresholds as well: 0.95 and 0.99. The related **Figures (A1 to A7)** can be found in **Appendix B**.
3. Developed by the Institute for Economics and Peace, the GPI is made up of 23 quantitative and qualitative indicators, each weighted on a scale of 1–5, relying on three dimensions: the level of societal safety and security; the extent of ongoing domestic and international conflict; and the degree of militarisation. See <https://www.visionofhumanity.org/maps/#>.
4. This is why some countries, such as Algeria, belong to one category in 2000–13 and to a different one in 2014–21.
5. These figures do not show the isolated nodes, which, however, are considered in the estimate of the network statistics.
6. This refers to the concept of clique used in social network analysis; that is, a subset of nodes that are closely connected with each other rather than with other nodes in the network (Prell 2012).
7. This refers to the concept of density used in social network analysis; that is, the number of ties observed among a group of nodes over the total number of potential ties (Prell 2012).

8. This refers to a tight network of financial, investment and trade flows and counterflows both with China and among countries receiving Chinese development assistance.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix A

Table A1. List of Alpha-3 country codes.

Alpha-3 country code	Country
AGO	Angola
BDI	Burundi
BEN	Benin
BWA	Botswana
CAF	Central African Republic
CIV	Côte d'Ivoire
CMR	Cameroon
COD	Democratic Republic of the Congo
COG	Republic of the Congo
COM	Comoros
CPV	Cabo Verde
DJI	Djibouti
DZA	Algeria
EGY	Egypt
ERI	Eritrea
GAB	Gabon
GHA	Ghana
GIN	Guinea
GMB	Gambia
GNB	Guinea-Bissau
LBR	Liberia
LBY	Libya
LSO	Lesotho
MAR	Morocco
MDG	Madagascar
MLI	Mali
MOZ	Mozambique
MRT	Mauritania
MWI	Malawi
NAM	Namibia
NER	Niger
RWA	Rwanda
SDN	Sudan
SEN	Senegal
SOM	Somalia
SSD	South Sudan
SYC	Seychelles
TCD	Chad
TGO	Togo
TUN	Tunisia
TZA	United Republic of Tanzania
UGA	Uganda
ZAF	South Africa

Appendix B

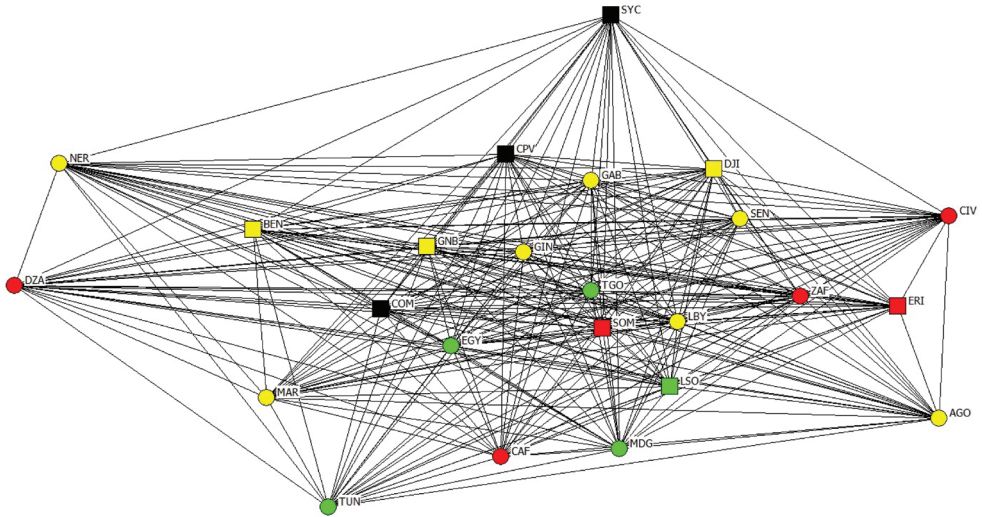


Figure A1. ODA-like aid network 2000–13 (0.95 similarity rate).

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list. GPI = Global Peace Index.

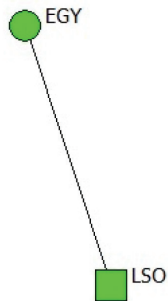


Figure A2. ODA-like aid network 2000–13 (0.99 similarity rate).

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

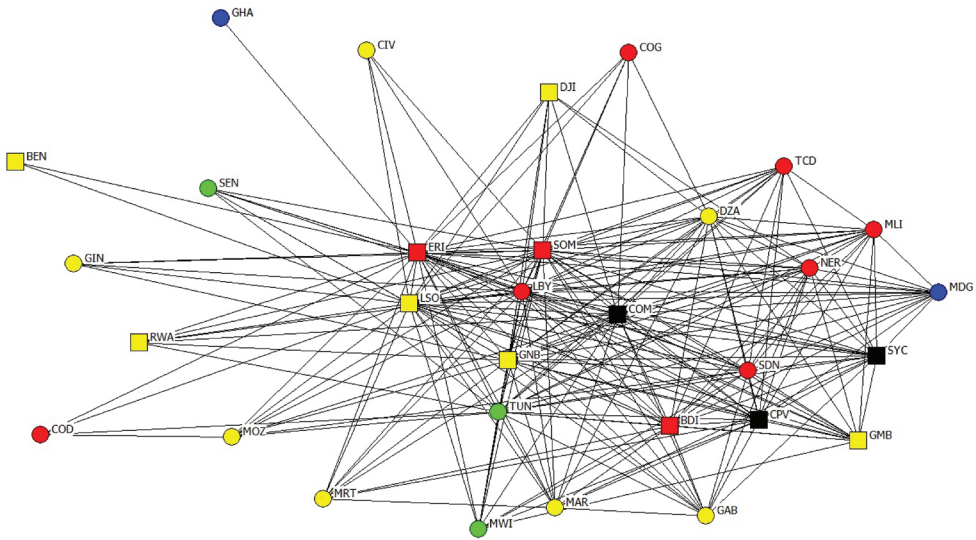


Figure A3. ODA-like aid network 2014–21 (0.95 similarity rate).

Notes: For the node’s shape: circle = resource-rich country; square = non-resource-rich country. For the node’s colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

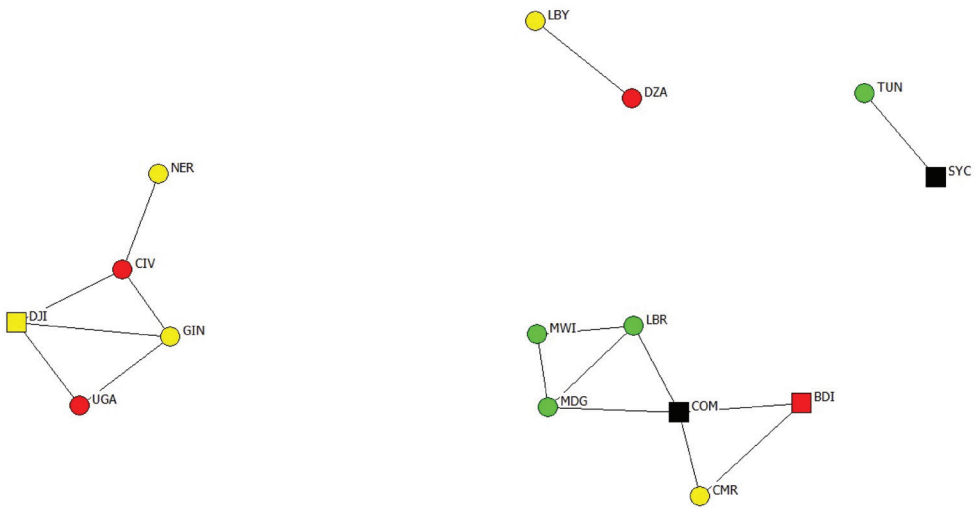


Figure A4. OOF-like aid network 2000–13 (0.95 similarity rate).

Notes: For the node’s shape: circle = resource-rich country; square = non-resource-rich country. For the node’s colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

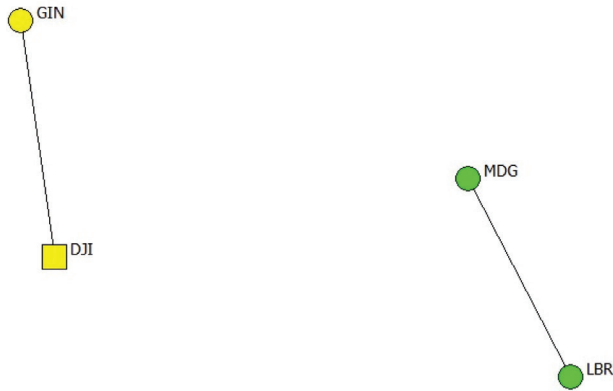


Figure A5. OOF-like aid network 2000–13 (0.99 similarity rate).

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

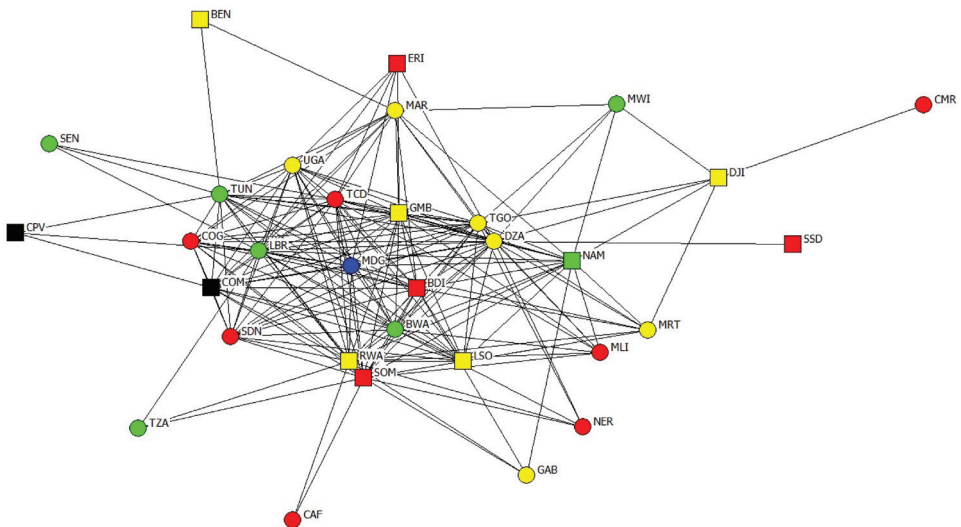


Figure A6. OOF-like aid network 2014–21 (0.95 similarity rate).

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.

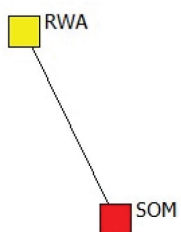


Figure A7. OOF-like aid network 2014–21 (0.99 similarity rate).

Notes: For the node's shape: circle = resource-rich country; square = non-resource-rich country. For the node's colour: blue = high GPI; green = medium-high GPI; yellow = medium-low GPI; red = low GPI; black = no score available. See Appendix A for a country code list.