

# Analyzing the Expansion of China's Infrastructure for Resources Model Across the Developing World

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## ABSTRACT

As an alternative to loans from traditional lenders, China has begun to experiment with a financial model known as the Infrastructure for Resources (IFR) model. The IFR model is a model of infrastructure financing in which China sends their workers, equipment, and expertise to the recipient country in exchange for a portion of the future revenue of the resource development project. Despite the promising design of the model, China has only engaged in IFR deals with a few countries, all of which are in Sub-Saharan Africa. This research determines the characteristics most in need of the IFR model based on previous literature, and then conducts case studies of one country in every developing region of the world to examine which regions are most in need of the model. For the methodology, quantitative case study analysis was conducted utilizing the economic indicators related to each problematic characteristic the IFR model targets. As for the findings, the best performing regions were Central Asia and Eastern Asia, which were represented by Kyrgyzstan and Mongolia, indicating that the IFR model would be of little benefit to these regions. The worst performing regions were determined to be Southern and Western Asia, which encompass the Middle East, as well as Latin America and the Caribbean. Considering this, China should consider engaging in IFR deals with countries in these regions, as infrastructure improvements would help give the regions the economic jumpstart they need to fuel domestic improvements.

## Introduction

Infrastructure serves as the foundation of every society, with major influences across a plethora of service sectors (Thacker et al., 2019). Due to this, the United Nations Sustainable Development Goals, which are a blueprint for the peace and prosperity of the world, included the building of resilient infrastructure as one of the goals. This goal provides particular emphasis on developing quality, reliable, and sustainable infrastructure to support economic development (United Nations, 2015). However, infrastructure's impact extends well beyond just one of the goals, as infrastructure either directly or indirectly impacts all the sustainable development goals and 72% of the targets (Thacker et al., 2019). Despite this inclusion, lack of infrastructure spending remains a great problem throughout the world, particularly in lower-income countries and middle-income countries due both to a failure to prioritize infrastructure spending and a lack of capital available (Foster et al., 2022). To combat this global infrastructure gap, global superpowers have stepped up to promote their ideologies through economic development. In particular, China has invested heavily in other countries across initiatives including its Belt and Road Initiative and One China in Africa. China spends more annually on infrastructure than North America and Western Europe combined (Woetzel et al., 2016). The strategies used to make these decisions by infrastructure policymakers have a massive impact on the future development of the world, as infrastructure is extraordinarily long-lasting. One particular strategy, China's Infrastructure for Resources model, which is abbreviated as IFR, will be the major focal point of this research.

The term "resource curse" refers to a situation in which a country has a multitude of valuable resources, yet underperforms economically (Mailey, 2015). Resource curses are most prominent in developing countries, and are

oftentimes associated with poor institutional integrity. Luke Durovic, a foundational researcher in IFR studies, classified resource curses as having three characteristics: Dutch disease, vulnerability due to commodity dependence, and adverse effects on the governance of the country (Durovic, 2016). In his research, Durovic found that the IFR model is effective at combating Dutch disease and at combating adverse governmental effects, but not vulnerability due to commodity dependence. Therefore, the methodology section will only focus on whether the IFR model would successfully combat Dutch disease and adverse effects on the governance of the country in the case studies selected.

Designed to combat the resource curse, China's IFR model is a strategy for the allocation of foreign direct investment whereby China finances the construction of infrastructure in a developing country in exchange for a portion of the resources generated by the infrastructure. The funds for the infrastructure are facilitated by China's Export-Import Bank throughout the process, with the bank transferring the funds directly to the construction company rather than the recipient country's government. This is very significant, as it reduces the chance of funding misuse because the recipient country never controls the capital, addressing the third aspect of the resource curse. The model also combats the first aspect of the resource curse, Dutch disease, because the model helps establish a manufacturing sector. This does not spark inflation due to the fact that the funds are never transferred to the country's government (Durovic, 2016). For China, the model stimulates economic growth because the construction of infrastructure uses Chinese workers and materials, creates political allies through economic means, and allows China to gain access to the resources necessary to support the massive industrial growth the country is undertaking. The model is a win-win-win situation for China, but it is also beneficial for the recipient country. Due to the high-risk nature of developing countries, developed countries often offer highly unfavorable deals or outright ignore developing countries. This oftentimes causes developing countries to become desperate for foreign direct investment, allowing China to leverage its position of power to offer favorable yet aggressive terms. However, while the terms are aggressive, the alternative for recipient countries is worse, as the IFR model allows the countries to jumpstart their economic growth by tapping into the global supply chain. An example of the IFR model in action is the financing of the construction of a hydroelectric complex in Mambilla, Nigeria (Konijn, 2014).

While China has not explicitly used the model in any countries outside of Africa, China has used similar approaches to mitigate investment risk when funding international development. For example, China financed a multi-billion dollar oil-backed debt deal with Ecuador, similar to that of an IFR deal (Gelpert et al., 2021). This research will focus solely on the IFR model itself, seeking to analyze which areas of the world are most in need of the IFR model.

## Literature Review

### The Importance of Infrastructural Investment

In David Aschauer's 1989 research "Is Public Expenditure Productive," spending on public infrastructure in the United States from 1949 to 1985 was estimated to yield extraordinarily high returns (Aschauer 1989; Gómez-Ibáñez & Liu 2022). To conduct this research, Aschauer estimated the productivity output of infrastructural facilities, with great consideration toward the variety of implications for infrastructural investment. Aschauer's research serves as a foundational source in the context of the financing of global development through infrastructure, as his research firmly established that infrastructure is the backbone of a healthy economy.

Considering how important infrastructure is for a country's economic development, developing countries are highly incentivized to attract foreign direct investment to link their domestic industry with foreign markets by participating in the global supply chain (Lehmann & Cordon, 2020). However, this is difficult to achieve for many developing countries, as poor infrastructure serves as a major obstacle to economic growth (Development Bank of South Africa, 2023). Not only do developing countries lack quality infrastructure, but it is also extremely difficult for them to attract foreign direct investment because of the high risk-investment environments within the countries.

## Perceptions of the IFR Model

China's IFR model, while designed to specifically address this problem, has faced backlash, with many researchers believing the model to be highly unfavorable for developing countries and even a form of neo-imperialism. For example, a World Bank Study by Håvard Halland and fellow contributors raised a variety of concerns after analyzing the IFR model's impact on sub-Saharan Africa. Primarily, the project risk taken by China when offering IFR deals creates a high premium on the deal, which is evident both in the cost of the infrastructure and the structure of the deal. Regarding the cost, the deal requires Chinese materials and workers to be used, which raises the price because it would be cheaper in most places to hire and source materials locally. The cost is also particularly high for these deals because of the lack of competition for the construction of the infrastructure, which raises the cost of the project while simultaneously lowering the transparency of the price. Regarding structure, the credit agreement that recipient countries have to sign often hinders the ability of the recipient government to specify the desired quality of infrastructure and ensure the most cost-effective process is being used (Halland et al. 2014). To gain access to China's capital, recipient countries must abide completely by China's restrictive terms.

While the terms are restrictive, that does not necessarily mean the recipient countries do not benefit from the deals. In a case study of the model in Angola, the IFR model was determined to be more beneficial and attractive than traditional lenders (Ogwang & Vanclay, 2021). The approach of comparing the model to alternatives that African countries are offered provides a more accurate understanding of the potential for the model, as the harsh reality is that for African countries, gaining a perfectly favorable deal is nearly impossible due to the high risk investment environment. For this reason, many African countries have eagerly accepted IFR deals, and the projects have helped address the various needs of these developing countries. In Angola and Uganda, the model successfully addressed the lack of established infrastructure, and the two countries have economically benefited as a result (Legodi & Rapanyane, 2022). More relevant for the analysis of the model is not a criticism of the design, as the recipient countries are agreeing to the terms, but rather an investigation of the past and theoretical future impacts of the model on developing countries.

## Foundational Source

Case study analysis of IFR model's implementations is a very niche segment of the research field, however, there is an important foundational source. Luka Durovic used case study analysis with both qualitative and quantitative data to analyze the IFR model's successes and pitfalls in Angola (Durovic, 2016). Quantitatively, indicators to determine the model's effect on each aspect of the resource curse were listed and charted over eight years. Qualitatively, the political and economic environment of each case study is considered to contextualize the quantitative data holistically. Durovic concluded that the model has helped subdue Angola's resource curse. More relevant for this research is Durovic's discussion of the theoretical effect of the model on each aspect of the resource curse, as he highlighted the model's ability to help countries combat Dutch disease and adverse effects on the governance of the country, but not vulnerability due to commodity dependence.

For this research, the two aspects of the resource curse that Durovic demonstrated to be compatible using the IFR model will be analyzed using their respective indicators in each case study. However, as the goal of this research is to identify the model's potential for expansion around the world, the methodology will be misaligned slightly with Durovic's research by being relegated solely to quantitative data, which is more time efficient considering the number of case studies being conducted. Durovic solely conducted one case study, Angola, while this research will be selecting a case study from every world subregion that meets the analysis criteria, as described in the following section.

## Methodology

### Case Study Selection

Considering the infeasibility of conducting a case study of the IFR model’s potential in every country in the world, a selection process was utilized to choose countries that would be representative of the model in their respective region as a whole. To begin, as the IFR is designed to help developing countries that are facing a resource curse, the list of all the countries in the world was filtered to remove countries that are not considered to be low-income or lower-middle income. These designations were taken from a World Bank report on the 2020 fiscal year, and 79 countries were classified as lower-income or lower-middle-income (World Bank, 2020). However, implementing the IFR model would not be possible if the loan facilitator, China, is not interested in investing in the country. Therefore, countries that have not received any Chinese foreign direct investment in the last decade were removed, alongside a few exceptions where China has previously invested in the country but would be unlikely to do so now. For example, although Ukraine has received over \$5.5 billion from China in the last decade, considering the current geopolitical situation between China’s ally, Russia, and Ukraine, it is unlikely they would be interested in further investing in the country (American Enterprise Institute, n.d.). In addition, since the design of the study is to examine where the IFR model could be expanded with success, the countries that have already experimented with the model have been removed from the list. With these conditions in mind, 50 countries remained eligible for analysis. However, conducting 50 case studies remains infeasible for the scope of the study, so a subregional approach was used to further narrow the selection. The 50 countries were sorted into their respective subregions of the 17 subregions in the world as designated by the United Nations geoscheme. Subregions with no remaining countries, such as Western Europe, were ignored entirely. This criterion removed the subregions of Eastern Europe, Northern Europe, Southern Europe, Western Europe, Australia and New Zealand, Micronesia, Polynesia, and North America. For each of the nine remaining subregions, the countries were sorted in order of most Chinese foreign direct investment received, with the median country being selected for as the subregion’s representative. In the end, the case studies shown in Table 1 were selected as representatives of the model’s feasibility in their sub-region.

**Table 1.** Case Studies Selected for Analysis.

Region	Country
Northern Africa	Egypt
Sub-Saharan Africa	Mali
Latin America and the Caribbean	Bolivia
Central Asia	Kyrgyzstan
Eastern Asia	Mongolia
South-eastern Asia	Cambodia
Southern Asia	Iran
Western Asia	Yemen
Melanesia	Papua New Guinea

## Quantitative Case Study Analysis

As is typical for international relations research, case studies were conducted for the selected countries to discover the extent to which the selected countries and therefore their respective regions would benefit from China's Infrastructure for Resources model of foreign direct investment. For each case study, quantitative data were collected using the indicators used in Durovic's 2016 research for the Dutch disease and adverse effects on the governance of the country aspects of the resource curse. Data for the indicators were collected from the U.S. Energy Information Administration, Trading Economics, The World Bank, Transparency International, BTI, and TheGlobalEconomy. In accordance with Durovic's 8-year range of data in his original research, data was charted over an 8-year time span ending in 2021, which is when the most recent reports were published. Currency conversions were as of June 2023, and data for each year's GDP per Manufacturing was represented by taking the data from the first month of each year. Tables with the data are included in the results section. To determine whether the IFR model would be feasible in each country, a scoring system was utilized based on the criteria in the chart below. Each indicator has criteria based on both the quantitative data itself and the recent trends in the data, and the indicators with their respective criteria are included in Table 2. To assign a score, a binary system was utilized in which each country gains either zero or one point per indicator, and the indicator scores were averaged for each aspect of the resource curse. To account for differences in the number of indicators between the two aspects, the total score was scaled from 0.0 to 4.0. These averages were then added together to yield the country's overall score, which will be referred to as the IFR Feasibility Index, on a scale from zero (most needing of the IFR model) to eight (least needing of the IFR model). If data was not available for more than half the years for the indicator, the indicator was ignored when calculating the average, which ensures countries were not punished for a lack of available data. The design of this scoring system is to quantitatively measure the extent to which each country is suffering from the aspects of the resource curse that the IFR model solves.

**Table 2.** Scoring Criteria for Each Indicator.

Indicator	Criteria
Electricity Generation	The point is earned if electricity generation grows at least 50% from 2014 to 2021 or at least 10 billion kilowatts are generated for at least seven years within the time range.
GDP from Manufacturing	The point is earned if GDP from Manufacturing grows at least 50% from 2014 to 2021 or GDP from Manufacturing is at least \$1 billion for at least seven years within the time range.
Percent Inflation of Consumer Prices	The point is earned if Percent Inflation of Consumer Prices decreases at least 50% from 2014 to 2021 or it is below 15% for at least seven years within the time range.
Country Policy and Institutional Assessments	The point is earned if the Country Policy and Institutional Assessments score rises at least 50% from 2014 to 2021 or the score is at least 3.0 for at least seven years within the time range.
Corruption Perceptions Index	This point is earned if the Corruption Perceptions Index score rises in four of the seven year-over-year instances or the score is at least 35 for at least seven years within the time range.
Governance Index	The point is earned if the Governance Index score rises in two of the three two-year instances (and remains above 2.0) or the score is at least 5.0 for at least

	seven years within the time range.
Control of Corruption	The point is earned if Control of Corruption rises in four of the seven year-over-year instances (and remains above -1.25) or it is above -.5 for at least seven years within the time range.
Government Effectiveness	The point is earned if Government Effectiveness rises in four of the seven year-over-year instances (and remains above -1.25) or it is above -.5 for at least seven years within the time range.

## Method Alignment and Rationale

The case study selection process was designed to choose the countries that are best representative of the IFR model’s potential in each given sub-region. Within each sub-region, similar natural resource deposits and governmental styles make it so conducting multiple case studies within a particular sub-region would likely yield similar results. Therefore, to fulfill the goal of the research, Durovic’s methodology was followed but modifications were made. Importantly, solely quantitative data is used in the case study analysis, which differs from Durovic’s original usage of qualitative data. In addition, the second aspect of the resource curse, vulnerability due to commodity dependence, was ignored entirely because the nature of the commodity price calculations prohibits the IFR model from combatting the vulnerability due to commodity dependence aspect of the resource curse. Finally, for the third aspect of the resource curse, Durovic’s usage of the African Governance Index indicator was replaced with the more broad Governance Index indicator, as unlike in Durovic’s research, not all case studies conducted were of African countries.

The rationale behind this approach is to ensure the research is being properly conducted in alignment with past research, while also adapting to the specific needs of this niche approach. Further, the field of IFR model studies is extremely niche in itself, so a lack of past literature to align with is a major limitation of this research. Particularly, the scoring system used to evaluate the potential for the IFR model’s expansion is a major point of unalignment because there has never been a comprehensive multi-case study of the model’s potential expansion throughout the world. Despite this limitation, it is important to note that the data collection method, which is the most important part of the case study, is properly aligned with Durovic’s 2016 research.

## Results

### Influence of the IFR Model on Dutch Disease and Governance Indicators

According to Durovic’s examination of the theoretical effects of the IFR model on each aspect of the resource curse, the model is effective at combating Dutch disease and adverse effects on the country’s governance (Durovic 2016). Therefore, to determine how successful the implementation of the model has been in a country that has used it, Durovic tracked the changes in the indicators over time to see if the model has sparked the positive change that it promises. However, for this research, the case studies examined will be of countries that have not previously implemented the model, which changes the approach.

To conduct this theoretical application of the IFR model, the indicators will be examined over time in the same way as Durovic’s research, but they will be examined to determine the direction the country is headed in, rather than how the model has previously influenced the direction. The goal of each case study is to highlight whether or not the government’s current policies are doing an effective job at tackling the resource curse, or if the IFR model is needed to guide the countries toward economic growth. With this in mind, there are three possible outcomes of each case study, which are reflected in the scoring criteria. These outcomes are that the country is not facing a significant

resource curse, the country is facing a significant resource curse but current policies are helping the country grow out of it, or the country is facing a significant resource curse and current policies are not helping the country grow. In the first two scenarios, the IFR model would be unnecessary, so the country would score high according to the criteria. In the third scenario, the IFR model would be necessary, so the country would score low according to the criteria. The first scenario is reflected in the criteria describing points earned simply by output, not growth. The second scenario is reflected in the criteria describing points earned by growth percentage, not output.

### Egypt Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Northern Africa, a case study of Egypt was conducted. Tables 3 and 4 demonstrate Egypt's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. Overall, Egypt scored 5.0 out of 8.0 possible points and ranked third highest of the nine case studies, which indicates that Egypt and Northern Africa are not in drastic need of the IFR model. More specifically, Egypt scored a perfect 4.0 out of 4.0 on Dutch disease related indicators, but only 1.0 out of 4.0 on governance-related indicators, suggesting that Egypt is most hindered by the corruption aspect of the resource curse.

**Table 3.** Egypt Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	175	186	190	197	200	195	189	202
GDP from Manufacturing†	2.0	2.2	2.5	4.9	5.2	5.3	5.6	5.1
Percent Inflation of Consumer Prices	10.1%	10.4%	13.8%	29.5%	14.4%	9.2%	5.0%	5.2%

\*in billions of kilowatts

†in billions of USD

**Table 4.** Egypt Governance-Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	-	-	-	-	-	-	-	-
Corruption Perceptions Index†	37	36	34	32	35	35	33	33



Governance Index‡	4.52	-	4.44	-	3.96	-	3.85	-
Control of Corruption§	-0.58	-0.58	-0.57	-0.47	-0.49	-0.63	-0.79	-0.68
Government Effectiveness§	-0.72	-0.66	-0.5	-0.5	-0.42	-0.22	-0.42	-0.43

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

## Mali Case Study

To determine the feasibility and level of benefit of expanding the IFR model to sub-Saharan Africa, a case study of Mali was conducted. Tables 5 and 6 demonstrate Mali's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. The case study of Mali serves as an interesting test because the majority of countries that have implemented the IFR model are in Mali's region of sub-Saharan Africa. Based on this information alone, it can be concluded that the region needs the IFR model, and the findings from the case study back this claim. Mali scored extremely poorly, earning only 2.8 out of 8.0 possible points, and scored the third worst of the nine case studies. This indicates that as predicted, Mali and sub-Saharan Africa need the IFR model in order to attain economic prosperity. Broken down by category, Mali scored 2.0 out of 4.0 on Dutch disease related indicators, but only 0.8 out of 4.0 on governance related indicators, suggesting that Mali is hindered by both aspects of the resource curse, but is most hindered by the corruption aspect.

**Table 5.** Mali Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	2.4	2.3	2.8	3.3	3.5	3.3	3.2	3.4
GDP from Manufacturing	-	-	-	-	-	-	-	-
Percent Inflation of Consumer Prices	0.90%	1.50%	-1.80%	1.80%	0.30%	-1.70%	0.40%	3.90%

\*in billions of kilowatts



**Table 6.** Mali Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	3.0	3.0	3.0	3.0	3.0	3.1	2.7	2.6
Corruption Perceptions Index†	32	35	32	31	32	29	30	29
Governance Index‡	4.19	-	5.4	-	5.17	-	5.19	-
Control of Corruption§	-0.75	-0.68	-0.66	-0.64	-0.69	-0.69	-0.78	-0.87
Government Effectiveness§	-1.09	-0.93	-1	-0.94	-1	-1.07	-1.17	-1.22

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

## Bolivia Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Latin America and the Caribbean, a case study of Bolivia was conducted. Tables 7 and 8 demonstrate Bolivia's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. From a resource-availability standpoint, the IFR model would be a great fit for Bolivia due to Bolivia's lithium deposits, which China could be interested in to fuel the massive electrical transformation that is taking place. Bolivia scored just below average among the case studies, earning 3.3 out of 8.0 possible points, which is sixth of the nine case studies. This indicates that Bolivia and Latin America and the Caribbean could benefit from the IFR model, but it is not a desperate, glaring need for the region's future economic development outlook. Broken down by category, Bolivia scored a 1.3 out of 4.0 on Dutch disease related indicators, and 2.0 out of 4.0 on governance related indicators. According to the scores, Bolivia's struggles are evenly distributed between poor governance and Dutch disease related economic stagnation.

**Table 7.** Bolivia Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	8.2	8.6	8.8	9.2	9.4	10	9.8	11

GDP from Manufacturing†	238	250	262	275	287	307	309	332
Percent Inflation of Consumer Prices	5.80%	4.10%	3.60%	2.80%	2.30%	1.80%	0.90%	0.70%

\*in billions of kilowatts

†in millions of USD

**Table 8.** Bolivia Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	3.2	3.1	-	-	-	-	-	-
Corruption Perceptions Index†	35	34	33	33	29	31	31	30
Governance Index‡	5.34	-	5.63	-	5.66	-	5.45	-
Control of Corruption§	-0.63	-0.69	-0.75	-0.68	-0.67	-0.76	-0.82	-0.86
Government Effectiveness§	-0.59	-0.65	-0.58	-0.37	-0.3	-0.77	-0.7	-0.73

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

## Kyrgyzstan Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Central Asia, a case study of Kyrgyzstan was conducted. Tables 9 and 10 demonstrate Kyrgyzstan's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. Throughout the case study analysis, Kyrgyzstan benefited from the first criteria point, as many of Kyrgyzstan's scores are high but lack significant growth. Overall, Kyrgyzstan scored above average among the case studies, earning 6.4 out of 8.0 possible points, which is the second-best of the nine case studies. This indicates that Kyrgyzstan and Central Asia would not stand to benefit much from the IFR model, as current policies are doing an effective job of removing any resource curse standing in the way of economic growth. More specifically, Kyrgyzstan scored a perfect 4.0 out of 4.0 on Dutch disease related indicators, and 2.4 out of 4.0 on governance related indicators. According to the scores, Kyrgyzstan excels significantly more in combating Dutch disease than combating poor governance.

**Table 9.** Kyrgyzstan Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	14	13	13	15	15	15	16	14
GDP from Manufacturing	-	-	-	-	-	-	-	-
Percent Inflation of Consumer Prices	7.50%	6.50%	0.40%	3.20%	1.50%	1.10%	6.30%	11.90%

\*in billions of kilowatts

**Table 10.** Kyrgyzstan Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
Corruption Perceptions Index†	27	28	28	29	29	30	31	27
Governance Index‡	4.67	-	4.78	-	4.73	-	4.56	-
Control of Corruption§	-1.13	-1.14	-1.07	-1.05	-0.93	-0.94	-1.1	-1.12
Government Effectiveness§	-0.87	-0.92	-0.91	-0.71	-0.61	-0.69	-0.53	-0.73

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

## Mongolia Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Eastern Asia, a case study of Mongolia was conducted. Tables 11 and 12 demonstrate Mongolia's resilience to Dutch disease and adverse governance effects,

with the overall scores being available in Tables 21 and 22. Throughout the case study analysis, Mongolia demonstrated proficiency in combating Dutch disease and adverse governance effects. Mongolia scored the highest of all nine case studies, earning an astounding 6.7 out of 8.0 possible points. This indicates that Mongolia and Eastern Asia would not stand to benefit much from the IFR model, as current policies are doing an excellent job of removing any resource curse standing in the way of economic growth. Broken down by category, Mongolia scored a 2.7 out of 4.0 on Dutch disease related indicators, and a perfect 4.0 out of 4.0 on governance related indicators. According to the scores, Mongolia excels significantly more in combating adverse governance effects than combating Dutch disease, however, Dutch disease is not a noteworthy problem in Mongolia.

**Table 11.** Mongolia Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	5.1	5.2	5.3	5.5	6.1	6.5	6.7	7.1
GDP from Manufacturing†	-	-	134	140	167	220	230	275
Percent Inflation of Consumer Prices	12.30%	5.70%	0.70%	4.30%	6.80%	7.30%	3.80%	7.40%

\*in billions of kilowatts

†in millions of USD

**Table 12.** Mongolia Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	3.3	3.4	3.3	3.3	3.2	3.3	-	-
Corruption Perceptions Index†	39	39	38	36	37	35	35	35
Governance Index‡	6.24	-	5.83	-	5.96	-	5.87	-
Control of Corruption§	-0.47	-0.48	-0.48	-0.45	-0.42	-0.43	-0.47	-0.53
Government Effectiveness§	-0.43	-0.41	-0.08	-0.25	-0.22	-0.19	-0.37	-0.47

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

## Cambodia Case Study

To determine the feasibility and level of benefit of expanding the IFR model to South-eastern Asia, a case study of Cambodia was conducted. Tables 13 and 14 demonstrate Cambodia's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. Throughout the case study analysis, Cambodia demonstrated proficiency in combating Dutch disease but struggled majorly with adverse governance effects. Overall, Cambodia scored the third-highest of all nine case studies, earning 4.8 out of 8.0 possible points. This indicates that Cambodia and South-eastern Asia could benefit from the IFR model, but it is not a desperate, glaring need for the region's future economic development outlook. Broken down by category, Cambodia scored a perfect 4.0 out of 4.0 on Dutch disease related indicators, but only 0.8 out of 4.0 on governance related indicators. According to the scores, Cambodia excels significantly more in combating Dutch disease than combating adverse governance effects, with corruption being a major problem throughout Cambodia.

**Table 13.** Cambodia Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	3	4.3	5.4	6.8	8	8.5	8.4	8.7
GDP from Manufacturing†	2.2	2.4	2.55	2.7	3	3.2	3	3.4
Percent Inflation of Consumer Prices	3.90%	1.20%	3%	2.90%	2.50%	1.90%	2.90%	2.90%

\*in billions of kilowatts

†in billions of USD

**Table 14.** Cambodia Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	2.8	2.7	2.7	2.7	2.6	2.6	2.7	2.8
Corruption Perceptions Index†	21	21	21	21	20	20	21	23

Governance Index‡	3.5	-	3.42	-	3.23	-	3.14	-
Control of Corruption§	-1.15	-1.13	-1.28	-1.3	-1.34	-1.3	-1.25	-1.18
Government Effectiveness§	-0.69	-0.7	-0.69	-0.65	-0.56	-0.57	-0.39	-0.42

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

### Iran Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Southern Asia, a case study of Iran was conducted. Tables 15 and 16 demonstrate Iran's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. Throughout the case study analysis, Iran performed extremely poorly, which can be attributed to a highly inflationary environment and widespread corruption. Overall, Iran scored the second-worst of all nine case studies, earning 2.0 out of 8.0 possible points. This indicates that Iran and Southern Asia desperately need the IFR model to mitigate the massive challenges that are hindering the establishment of quality infrastructure. Broken down by category, Iran scored a 2.0 out of 4.0 on Dutch disease related indicators but failed to score any points on governance related indicators. Therefore, as Iran struggles significantly in both categories, Iran fits the characteristics for the IFR model to have a significant impact.

**Table 15.** Iran Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	274	281	288	307	308	322	325	341
GDP from Manufacturing	-	-	-	-	-	-	-	-
Percent Inflation of Consumer Prices	16.6%	12.5%	7.2%	8.0%	18.0%	39.9%	30.6%	43.4%

\*in billions of kilowatts

**Table 16.** Iran Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	-	-	-	-	-	-	-	-
Corruption Perceptions Index†	27	27	29	30	28	26	25	25
Governance Index‡	1.92	-	2.73	-	2.85	-	1.79	-
Control of Corruption§	-0.63	-0.61	-0.72	-0.82	-0.96	-1.05	-1.09	-1.1
Government Effectiveness§	-0.43	-0.21	-0.19	-0.2	-0.43	-0.56	-0.99	-0.86

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

### Yemen Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Western Asia, a case study of Yemen was conducted. Tables 17 and 18 demonstrate Iran's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. Throughout the case study analysis, Yemen performed remarkably poorly, which can be attributed to the massive lack of infrastructure and rampant corruption. Overall, Yemen scored the worst of all nine case studies, earning 0.0 out of 8.0 possible points. This indicates that Yemen and Western Asia desperately need the IFR model in order to mitigate the massive challenges that are hindering the establishment of quality infrastructure. According to the case study, Yemen majorly struggles in both categories, so the IFR model would have a remarkable impact on the country's economy.

**Table 17.** Yemen Dutch Disease Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	7.2	5.9	4.5	3.8	3.3	3.4	3.2	3.5



GDP from Manufacturing	-	-	-	-	-	-	-	-
Percent Inflation of Consumer Prices	8.10%	-	-	-	-	-	-	-

\*in billions of kilowatts

**Table 18.** Yemen Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	2.7	2.4	2.2	1.8	1.7	1.7	1.7	1.7
Corruption Perceptions Index†	19	18	14	16	14	15	15	16
Governance Index‡	4.5	-	3.82	-	1.7	-	1.63	-
Control of Corruption§	-1.57	-1.49	-1.68	-1.6	-1.64	-1.7	-1.69	-1.65
Government Effectiveness§	-1.44	-1.67	-1.87	-1.94	-2.26	-2.32	-2.35	-2.3

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

### Papua New Guinea Case Study

To determine the feasibility and level of benefit of expanding the IFR model to Melanesia, a case study of Papua New Guinea was conducted. Tables 19 and 20 demonstrate Papua New Guinea's resilience to Dutch disease and adverse governance effects, with the overall scores being available in Tables 21 and 22. Overall, Papua New Guinea placed fifth of all nine case studies, earning 3.6 out of 8.0 possible. This indicates that Papua New Guinea and Melanesia could benefit from the IFR model, but it is not a major economic need for the region. Broken down by category, Papua New Guinea earned 2.0 out of 4.0 points on Dutch disease related indicators, and a 1.6 out of 4.0 on governance related indicators. According to the scores, Papua New Guinea most glaring problem is the low growth of industry, which needs to be tackled to help brighten Papua New Guinea's future economic outlook.

**Table 19.** Papua New Guinea Dutch Disease Related Indicators

Indicators	Year
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	2014	2015	2016	2017	2018	2019	2020	2021
Electricity Generation*	4	4.2	4.3	4.3	4.4	4.4	4.6	4.9
GDP from Manufacturing	-	-	-	-	-	-	-	-
Percent Inflation of Consumer Prices	5.20%	6%	6.70%	5.40%	4.40%	3.90%	4.90%	4.50%

\*in billions of kilowatts

**Table 20.** Papua New Guinea Governance Related Indicators

Indicators	Year							
	2014	2015	2016	2017	2018	2019	2020	2021
Country Policy and Institutional Assessments*	2.9	2.9	2.9	2.9	2.9	2.7	2.7	2.7
Corruption Perceptions Index†	25	25	28	29	28	28	27	31
Governance Index‡	4.74	-	4.77	-	4.78	-	4.69	-
Control of Corruption§	-0.91	-0.93	-0.92	-0.89	-0.86	-0.99	-0.58	-0.76
Government Effectiveness§	-0.61	-0.6	-0.74	-0.66	-0.67	-0.81	-0.84	-0.89

\*measured from 0 (lowest) to 6 (highest)

†measured from 0 (most corruption) to 100 (least corruption)

‡measured from 0 (worst governance) to 10 (best governance)

§measured from -2.5 (worst) to 2.5 (best)

**Table 21.** Case Study Scores for Each Indicator Based on the Aforementioned Criteria.

Indicator	Egypt	Mali	Bolivia	Kyrgyzstan	Mongolia	Cambodia	Iran	Yemen	Papua New Guinea
Electricity Generation	1	0	0	1	0	1	1	0	0

GDP from Manufacturing	1	-	0	-	1	1	-	-	-
Percent Inflation of Consumer Prices	1	1	1	1	1	1	0	-	1
Country Policy and Institutional Assessments	-	0	-	1	1	0	-	0	0
Corruption Perceptions Index	0	0	0	1	1	0	0	0	0
Governance Index	0	1	1	0	1	0	0	0	1
Control of Corruption	0	0	0	0	1	0	0	0	1
Government Effectiveness	1	0	1	1	1	1	0	0	0

**Table 22.** Case Study Scores for Each Resource Curse Aspect and Cumulative Score

Country	Dutch Disease (0-4)	Governance (0-4)	Cumulative (0-8)
Egypt	4	1	<b>5</b>
Mali	2	0.8	<b>2.8</b>
Bolivia	1.3	2	<b>3.3</b>
Kyrgyzstan	4	2.4	<b>6.4</b>
Mongolia	2.7	4	<b>6.7</b>
Cambodia	4	0.8	<b>4.8</b>
Iran	2	0	<b>2</b>
Yemen	0	0	<b>0</b>
Papua New Guinea	2	1.6	<b>3.6</b>

## Discussion of Significant Results

As demonstrated in Table 22's "Cumulative" column, IFR Feasibility Index scores varied majorly across case studies. Interestingly, the case study scores indicate a latitudinal difference in the level of benefit for the IFR model, with scores rising for countries west of Mali and east of Iran. Traditionally, longitudinal differences in levels of economic development are discussed, with countries in the Southern Hemisphere tending to be less economically developed than those in the Northern Hemisphere. The latitudinal results of the research indicate that China's choice of IFR model countries is empirically sound, with the next-most-needing region being Southern Asia and Western Asia. However, these next-most-needing regions are in even more need of the model than the regions that are currently

participating. This conclusion was drawn because Iran and Yemen, which represent Southern Asia and Western Asia, scored lower than Egypt and Mali, which represent Northern Africa and sub-Saharan Africa. While this would indicate that China's decision-making to target sub-Saharan Africa was incorrect, there is more influencing the decision than quantitative fit for the model. This research solely examined the quantitative reasons why China should consider expanding the model, but qualitative factors help explain China's decision of countries and regions to target. Natural resources serve as a major motivator for China's investments abroad, particularly through the Overland Silk Road Economic Belt and through the One China policy in Africa. These extensive economic development programs help explain why China is so interested in Africa, as there are a plethora of resource-rich countries that need foreign direct investment. Regarding why China has overlooked regions such as Southern Asia and Western Asia as candidates for the IFR model, the decision is likely influenced by qualitative factors. When investing abroad, China must consider a variety of factors, only one of which is economic fit for the model as studied in this paper. For example, political or social instability may dissuade China from committing to long-term infrastructural deals, even if the economic fit for the deal is sound.

Importantly, the scores from Egypt, Kyrgyzstan, Mongolia, and Cambodia are representative of the post-globalization emergence of an increasingly interconnected world. By establishing strong infrastructure, these countries have been able to overcome their resource curses. This is especially impressive for Cambodia, considering the political instability and genocide in Cambodia dating back only half a century ago. In addition, Kyrgyzstan's score of 6.4 out of 8.0 underscores the country's ability to depart from USSR-era economic stagnation and towards economic prosperity, which occurred in a period shorter than Cambodia's transformation. Not only does this finding highlight the rapid pace of economic growth following globalization, but also the rapid pace of societal growth over the last few decades, as technology has transformed the international development landscape.

Another significant finding is the clear correlation demonstrated between geographical closeness to China and high scores on the IFR Feasibility Index. The IFR model is one of many strategies China has used to finance global infrastructure, and the impact of these other strategies can be seen in the IFR Feasibility Index scores of neighboring countries. The highest-scoring countries in the case studies conducted were those located closest geographically to China, which is likely due to the previous economic interactions between China and these countries. This finding contrasts the widespread criticisms China has faced for the structure of its deals, as recipient countries have undergone economic growth after engaging in foreign direct investment deals with China.

## Conclusion

The goal of this research was to determine which regions of the world are most in need of the IFR model. To do so, a quantitative case study analysis was conducted, using Durovic's 2016 research as the primary source of methodology alignment. Due to the infeasibility of conducting a case study of every country, one developing country for each region was selected using criteria designed to pick the country that best represents the problems the region is facing as a whole. In regions where no countries met the criteria, such as many regions in the Northern Hemisphere, no case study was conducted for the region. In the end, nine case studies were conducted, and evaluated quantitatively based on indicators related to Dutch disease and adverse governance effects. As for results, there were two significant findings from the research. The first significant finding was that countries in the longitudinal region of the Southern Hemisphere and the latitudinal region extending between Mali and Iran, which encompasses Africa and the Middle East, are most in need of the IFR model. This makes empirical sense, as the countries within this region have poor institutions and major infrastructural problems. The second significant finding was that the best-performing countries and regions were those geographically closest to China. This finding also makes empirical sense, as China has previously prioritized gaining regional dominance to gain access to more resources, such as in the South China Sea.

## Limitations

The research was designed to minimize limitations, but the research design, data analysis, and research scope were limited in some aspects. Primarily, the design of the research, which was to apply an infrastructural investment model to places that have never used it before, is problematic because of the drastic differences across countries. Every country and region has different natural resource deposits, economic priorities, and governmental structure, so expanding an infrastructure investment strategy requires major adaptations. Considering this limitation, this research serves to inform China of the surface-level potential for expanding the IFR model. However, China would have to conduct a proper cost-benefit analysis for each project in each country before considering expanding resource-financed infrastructure deals. Further, while China has been generous in the quantity of capital invested in infrastructure abroad, it has not been generous in sharing the details of deals. China is notorious for a lack of transparency and confidentiality in deals, which increased the difficulty of evaluating the motivations behind China's investments and collecting data on their history of foreign direct investment. If China had been more transparent about the types and caliber of deals being facilitated, like the United States is, the accuracy of this research's results would be higher. Finally, the scope of the research was limited due to the infeasibility of conducting a case study of every developing country, which led to countries being selected to represent their region as a whole. While the selection process was designed to determine the country that best represents the region's characteristics and struggles, no two countries are the same, so conclusions drawn about the IFR's potential in the entire region are general.

## Implications

This research has implications for the future of the IFR model, the future of unique strategies of foreign direct investment, and the general outlook on infrastructural investments. Regarding the IFR model, this research demonstrates the potential for China to expand the model across the developed world. In particular, this research suggests that the next step for the model would be either to gain access to lithium deposits in South America or fossil fuel deposits in the Middle East. This research also indicates that the future is bright for unique strategies of foreign direct investment, as many borrowing countries that have previously been disenfranchised by third-party financing institutions seek atypical opportunities to promote economic growth. While China's investment approaches have not gone without criticism, developing countries continue to agree to China's untraditional deals because of the lack of alternative offers they receive. As for the general outlook on infrastructural investment, this research both strengthens the importance of building resilient infrastructure and underlines the negative ramifications of constructing poor infrastructure. As evident by the low-performing case studies, a plethora of developing countries across the world continue to struggle to promote economic growth due to poor infrastructure maintenance and institutions. On the other hand, many countries, such as Kyrgyzstan and Mongolia, have undergone an economic transformation due to strong infrastructure sparking economic growth. Looking forward, both China and recipient countries must undertake extensive cost-benefit analysis to ensure the infrastructure construction agreements they are considering undertake promote economic growth in their economy.

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