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Measuring competition between the great powers across Africa and Asia using a measure of relative dispersion in media coverage bias

Elizabeth Gooch^{1✉}, Stone Goethe^{2✉}, Nicholas Sobrepena^{3✉} & Eric Eckstrand^{4✉}

Senior leaders in the US Department of Defense, as well as global affairs strategists and academics, have argued that China's economic growth is associated with a dramatic increase in competition for resources and Chinese influence abroad. We aim to ascertain whether and where competition between great powers exists and to characterize China's growing influence. Our main contribution is that we create a measure of competition among the United States, China, Russia, India, and France within African and Asian countries. We draw our data from a large media database that records news articles published since March 2015. We sum the quantity of articles published by local press agencies that discuss an international or regional powers' engagement in an event located within the Asian or African countries' borders, and we construct a measure of country-level competition among powers. To validate our country-level competition measure, we synthesize qualitative information from current government, think tanks, and academic documents on the presence and interests of foreign powers across subregions in Asia and Africa. From those narratives, we construct an additional subregional measure of competition. We compare our statistical country-level measure of competition to this narrative-based subregional measure of competition and find that they are correlated.

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Introduction

In the United States, news outlets and think tanks frame the Great Power Competition (GPC) as a steady decline of the American international influence relative to that of Russian and Chinese (Barry, 2022; Blanchette, 2021; Connaughton, 2022; Doshi, 2021). In fact, this public opinion reflects United States governmental fears and actions. Starting in 2015, the Obama administration's National Military Strategy refocused military and economic strategies to address the GPC. The Trump administration followed suit by revamping the National Security Strategy and National Defense Strategy to address GPC. In the current Biden administration, China and Russia have become central targets for intelligence and counterintelligence of the Central Intelligence Agency (O'Rourke, 2021). Given the immediacy of the GPC, now is a crucial time to provide more evidence about the situation.

To begin, let us understand that competition is when two or more state actors in the same region pursue the same or connected national interests. In our research, we create a country-level measure of competitiveness based on the coefficient of variance (CoV). Since CoV measures the joint variability of two or more random variables, we propose that our metric captures competitiveness in mathematical terms. We focus our analysis on countries in Asia and Africa because they are important theaters of GPC and the location of most of the on-the-ground Belt and Road Initiative projects since 2013.

In our research, we observe data drawn from an article-level news database called Global Database of Events, Languages, and Times (GDELT), which has been available since March 2015 (GDELT, 2015). We use GDELT data to quantify the frequency of local press reports discussing "great power" events located within their borders in each Asian and African country. Our metric, the Great Power Competition measured through the Coefficient of Variance (GPC-CoV), offers a country-level measure of GPC for the five years between March 2015 and March 2021.

Simultaneously, we created another metric based on an extensive literature review of great powers' recent pursuits in African and Asian countries. This metric, referred to as GPC-Narrative, synthesizes great power pursuits at the subregion level, in contrast to GPC-CoV, which we quantify at the country level. Most importantly, we created these two metrics in isolation from one another. Then, we used the correlation between the two metrics to help validate GPC-CoV. We find that the two metrics confirm one another.

We constructed GPC-CoV such that the metric ranks African and Asian countries according to competitiveness among the great powers. Our find Egypt, Seychelles, Oman, Uzbekistan, Mauritius, and Angola to be the most competitive countries. The least competitive countries: Israel, Kenya, Swaziland, Liberia, Somalia, and the Central African Republic, are dominated by the United States except for the Central African Republic. The general United States dominance illuminated by GPC-CoV supports Tella (2016)'s conclusion that the United States continues to hold noteworthy influence in Africa. Russia and China only dominate in a few locations: e.g., Syria, Tajikistan, and Turkmenistan and Lao, Namibia, and the Maldives, respectively.

Conceptually, our GPC-CoV varies directly with heterogeneity of great power presence in an African or Asian country. As constructed, the most competitive countries are not necessarily the most economically and militarily valuable nations. Competition in this research captures the opportunity for a great power to pursue its interests within a targeted country. In the following example, we illustrate the nature of competition as defined in our metric through differences between Nigeria and Angola.

Using GPC-CoV, we find Nigeria to be less competitive than Angola, even though Nigeria has one of the largest economies and

is one of the largest fossil fuel exporters in Africa, with recent increases in both its domestic population and Chinese foreign direct investment (African Affairs, 2021). Angola, in contrast, is a less economically sought-after market, though it is the third-largest exporter of fossil fuels in Africa.

United States dominance in many Nigerian sectors explains Nigeria's ranking in our metric. Nigeria has taken steps to facilitate a close relationship with the United States. In 1960, Nigeria established diplomatic relations with the United States. In 1960, while Angola did so in 1993. Nigeria is a member of the African Growth and Opportunity Act, which provides preferential trade to friendly US partners, and Angola is not. Nigeria has also signed bilateral security cooperation agreements with the US, which Angola never has (BAA, 2019; African Affairs, 2021). Much as competitive markets in economics have easy entry and exit for firms, Angola is more open to the establishment of great power influence and achievement than is Nigeria.

Our paper joins the literature describing the multi-polarity of our contemporary global political environment by adding an empirical measure at the country level. To our knowledge, only the Lowy Institute has created a related metric. Lowy's Asia Power Index captures influence across Asia based on economic, military, and other resources the great powers are focusing on the targeted countries (Lowy, 2021). In contrast, our metric, GPC-CoV, measures the local perspective on great powers, drawing on the local presses and covering wider geography than the Asia Power Index. In the final empirical section of our paper, we demonstrate a use case of GPC-CoV examining the relationship between a country's competitiveness and press perspectives toward Chinese in-country activities.

The paper is structured as follows: in the next section, we present our conceptual framework for our analysis. In section "Quantify competition using local media reporting on great powers", we detail the data and the construction of the media-based GPC-CoV index. In section "Narrative on great powers competition in African and Asian countries", we present our subregion-by-subregion narrative to highlight great power interests and actions. In section "Validating the metric", we present our other metric, GPC-Narrative, which synthesizes our qualitative assessment of great power interest by subregion. In this section, we also establish that there is a correlation between GPC-CoV and GPC-Narrative. In section "Using the competition index", we use GPC-CoV to explore the role of competition on local press attitudes towards the US, China, and Russia using marginal effects. We conclude in the last section.

Conceptual framework

Our analysis quantifies the current state of the GPC (Great Power Competition) (2015–2020 on average). Measuring competitiveness is not straightforward. We detail our methodology in section "Coefficient of variance ranking metric" and here we describe the conceptual framework behind the methods. We developed our metric through a creative and interdisciplinary endeavor uniting international relations literature with a quantitative approach to measure competitiveness from the ecology literature. We also draw more ideas about the meaning of competition from the economics literature.

Competition and its association with the great powers can be explained as a "race" for economic privilege (Lake, 2018). Since firms and investors are seeking economic opportunities, a great power can facilitate these economic opportunities within its subordinate states. In turn, to ensure the integration of the subordinate state into the great power's economy, the great powers divide the world into economic zones (Copeland, 2015). In the

end, a fear of exclusion from each great power's international economic zone drives the great power competition (Lake, 2018).

We define a great power as a nation that can extend its influence into multiple regions (Toynbee, 1925).¹ Since our study focuses on competition within Africa and Asia, we identify the pertinent competitors as China, Russia, US, and include India for its influence in South Asia and France for its influence in many African nations (Mazarr, 2018).

To gain an approach to measure competition, we pivot to the ecology literature. Implicit in Darwinism, but not formalized until G. F. Gause's 1934 book, *The Struggle for Existence*, Gause's competitive exclusion principle (CEP) states that two species with identical niches cannot coexist indefinitely (Begon et al., 2006; Darwin and Kibler, 1859; Gause, 1934). We propose that CEP and the "race" for economic privilege, as described by Lake (2018) are comparable in certain respects. In CEP, stasis is when one species dominates. Therefore, the most competitive period is when there is equality between species' populations. Likewise, in the great power competition, a great power's fear of exclusion is quelled when economic zones are the most defined and heightened when they are not clear.

Besides CEP, we find a parallel between Mearscheimer (2001)'s description of state behavior in the global power arena and animal behavior in the ecosystems. We know animals seek to protect and feed themselves and their position in the natural order. Likewise, Mearscheimer says that states prioritize the maintenance of their territorial integrity and the autonomy of their domestic political order and, therefore, seek viable and helpful interests abroad.

Now that we have laid out the theories underlying our metric, we want to address a major difference between CEP and the great power competition. South Africa provides a good illustrative example. Until recently, South Africa was a US subordinate, which meant that US firms and investors had exclusive economic opportunities there.² Over the past decade or so, Chinese firms and investors have gained significant economic ties in South Africa (MFA, 2022). Now, the US and China share economic privilege in South Africa—spurring the US' fear of exclusion. However, our metric reveals that South Africa is not very competitive—why?

Here, we draw on the critique made by a mid-century economist about the definition of competition. McNulty (1968) in "Economic Theory and the Meaning of Competition" states that while competition is a fundamental concept for economic theory, economists define competition poorly and understand it as the opposite of the well-defined concept, of monopoly. Like McNulty's criticism, we aim to measure competition in this paper and not just when there exists a deviation from a monopoly of power or lack of exclusivity in an economic zone, as discussed above. In other words, being a valuable country, like South Africa, which can be seen as the gateway to Africa, a member of the BRICS alliance (denoting the emerging national economies of Brazil, Russia, India, China, and South Africa) with a diversified and sophisticated economy, does not mean it is the ripest for competition. Our metric shows the United States dominates in South Africa. Therefore, competitive countries are places where a great power can have the chance to pursue their interests even when other great powers are present.

Finally, we draw one more characteristic of competition from economics. Both in CEP and in the international relations' theory of competition as a "race" for economic privilege, competition exists between two species or great powers. In economics, competition increases with the number of competitors. Therefore, a target country with three great powers of equal presence, like Uzbekistan, which is split between Russia, China, and the US according to our metric, is experiencing greater competition than

a country with two great powers with equal presence, like Georgia, which is split between Russia and the United States.

Quantify competition using local media reporting on great powers

Data. Our data comes from the Global Database of Events, Language and Tone (GDELT) dataset. GDELT offers coded event data reported on by the global media and linked articles for each event (GDELT, 2015). The GDELT dataset was created in its 2.0 version in March 2015, and it is maintained by the GDELT Project (GDELT, 2015). Our sample begins at the start of GDELT's 2.0 version creation and ends in March 2021.

The GDELT dataset differs from other publicly available datasets because it offers sentiment analysis at the article level. Article-level granularity is lacking among competing datasets covering media events. Additionally, the GDELT dataset is updated every 15 min and spans media outlets around the globe. The GDELT dataset has been employed by many researchers in the fields of social and communications studies (Galla and Burke, 2018; Kwak and An, 2014; Qiao et al., 2017).

For this research, we focus on great power actors in events that took place in African and Asian countries. As such, we remove any events in the GDELT dataset where the actor is not from China, Russia, India, France, or the US. Additionally, we remove any event that did not occur in an African or Asian country.

Identifying whether a press agency is local to an African or Asian country was a key component of this research. To do this, we first sorted the GDELT article dataset by the most common reporters of events in the countries of interest. Then, we manually searched the websites for the contact address of the news agency. If the agency had a local address to the country of interest, then we deemed it a local press. If the news agency headquarters were located in, for example, Europe, or the US, then we remove those articles.

The GDELT project continuously scrapes the global media landscape and maintains a convenient repository of event and article mention data that can be readily queried using Google BigQuery. An important feature of the GDELT dataset is that the articles are coded with information, such as the actors' country of origin, the location of the event, and the source of the reporter. This allows us to curate country-level collections of articles upon which we develop competition metrics. On the other hand, the algorithms that the GDELT organization employs to generate the publicly available dataset is proprietary. It is unknown, for example, how they identify global events and their respective reporters, as well as how they determine an event's actors and country of origin. If their collection and characterization algorithms are biased, it is possible that this could affect our downstream competition analysis.

In Table 1, we summarize our final dataset. Since our coefficient of variance ranking metric is based on the relative quantity of coverage of the great powers by the local presses, in this table we present the count of the news article for each Power for each subregion with the totals in the far-right column and bottom rows. The mean and standard deviation quantifies the average number of articles per country within the subregion-power combination and the spread, respectively.

Coefficient of variance ranking metric. In this research, we assert that the process of a great power pursuing its interests harms the interests of another great power. This idea follows from Lake (2018), which we discuss in section "Conceptual framework". We believe we can capture this idea of competition using media coverage bias as a proxy measure for the relative "power"

Table 1 Summary statistics on number of articles written about an actor from China, Russia, USA, India, or France between March 2015 and March 2021 by local presses in African and Asian Countries, sourced from (GDELT, 2015) and calculations made by the authors.

Great Power	Metric	Asia				Africa					Total
		Central	Southeast	South	West	North	Middle	West	Southern	East	
ALL	Count	183,744	625,696	1,422,549	756,761	180,585	24,918	349,518	116,018	116,838	3,776,627
	Mean	6336	12,513	32,330	10,090	6019	711	5377	2320	1669	8429
	Std	17,333	26,582	88,330	22,361	10,262	1548	16,542	5347	5638	32,860
CHN	Count	35,415	246,133	375,836	50,256	27,978	3921	56,666	29,525	19,414	845,144
	Mean	5902	24,613	41,759	3350	4663	560	4358	2952	1386	9390
	Std	8074	35,020	75,507	2643	7932	1054	7536	3785	1771	29,827
FRA	Count	21,293	38,872	90,323	78,781	57,882	13,192	76,844	13,073	11,889	402,149
	Mean	3548	3887	10,035	5252	9647	1884	5911	1307	849	4468
	Std	6762	4193	18,427	5210	8722	2521	8620	2508	713	8343
IND	Count	1483	13,051	54,618	11,868	574	53	1598	1011	2139	86,395
	Mean	247	1305	6827	791	95	7	122	101	152	970
	Std	424	1536	8776	1247	166	15	270	165	306	3324
RUS	Count	24,486	38,040	104,043	225,736	36,625	847	11,019	7082	3535	451,413
	Mean	4897	3804	11,560	15,049	6104	121	847	708	252	5072
	Std	3906	4268	16,619	21,003	10,641	169	1513	1017	287	12,037
USA	Count	101,067	289,600	797,729	390,120	57,526	6905	203,391	65,327	79,861	1,991,526
	Mean	16,844	28,960	88,636	26,008	9587	986	15,645	6532	5704	22,128
	Std	34,222	39,695	164,295	39,875	14,543	1471	32,860	9727	11,567	63,176

of each great power in a country. We aggregate the country-level measure to the subregion in section “Validating the metric”.

In the previous section, we used a qualitative assessment to create a ranking of competition between great powers in each region. As a second method of creating a competition ranking, we create a quantitative comparison between each country or region, based on the dominance of each great power in the local media. We define “competition” between the United States, China, Russia, India, and France in a country as the media prevalence between these great powers in a country’s local news outlets.

Using the GDELT data, we found the “media ratio” for each country. We define the media ratio as the number of articles about actors of a great power’s nationality to the sum of the articles of all actors we are interested in. For example, the United States’ media ratio in Egypt is 0.34, meaning that 34% of the articles about actors from all five countries (United States, China, Russia, India, and France) involve American actors.

The media ratio r for the great powers j in the i th country is:

$$r_i = \frac{x_{ij}}{\sum_{j=1}^5 x_{ij}} \tag{1}$$

where x_{ij} is the number of articles involving actors of the great power j in the country i .

Before we created our competition ranking, we created a measure of competition. For this measure, we define minimum competition as one country’s actors having complete dominance in the media at 100% and maximum competition as an equal to 20% ratio of media dominance between each of the five interested countries’ actors. For the media ratios for Russia and India, we do not include local actors, as we are more interested in foreign actors than domestic actors. With four competing great powers in these two countries, the maximum competition between the four great powers would be a 25% ratio for each.

In other words, the more spread out the ratios are, the less competitive the country is, and the less spread out the ratios are, the more competitive the country is. Therefore, if we create a ranking of spread, we can create a ranking of competition. To create a ranking of spread, we must find a measure of spread that is well ordered and quantitative. One measure of spread is

called the coefficient of variance, which is what we use as a ranking metric.

The coefficient of variance is a common dispersion measure for sets of data on a ratio scale. In our case, the media ratio. We use the coefficient of variance instead of the variance or standard deviation because the former allows us to compare when the mean is different, while the latter does not. For the press ratios in Russia and India, the mean media ratio will be higher since we calculate the media ratio for four great powers instead of five (we omit Russian and Indian coverage of themselves.)

The coefficient of variance allows us to compare dispersion between samples of varied sizes. Therefore, we can rank the coefficient of variance for each country even when there are a different number of articles for that country. Next, we create a ranking based on the coefficient of variance. For example, if the coefficient of variance for country A is lower than country B, then country A is considered more competitive. However, the numerical value of the coefficient of variance is not meaningful in and of itself but only in relation to one another.

We can calculate the coefficient of variance for each country by taking the standard deviation of the media ratios divided by their mean. For each country, the coefficient of variance is calculated by the formula:

$$\frac{\sqrt{\frac{1}{n-1} \sum_{i=1}^n (r_i - \frac{1}{5} \sum_{j=1}^5 r_{ij})^2}}{\frac{1}{5} \sum_{j=1}^5 r_{ij}} \tag{2}$$

To better visualize competition, we created two heatmaps for the media ratios, coefficient of variance and their competition rank for each country. In Fig. 1, we present the more competitive countries with ranking 1 to 43 (out of 88), and in Fig. 2, we present the less competitive countries with ranking 44 88 (out of 88). In these figures, the color gradient on the media ratios signifies the dominance of a great power. When the color is purple, that the great power is most often reported on by the local press, taking up 50% to 100% of the media’s attention (ratio $\in [0.5, 1.0]$). When the color is white to red, the great power gets at 0% to 49% of the media’s attention (ratio $\in [0.0, 0.5]$).

Competition among great powers is the norm according to Brands (2017) and GPC-CoV shows that every country has more

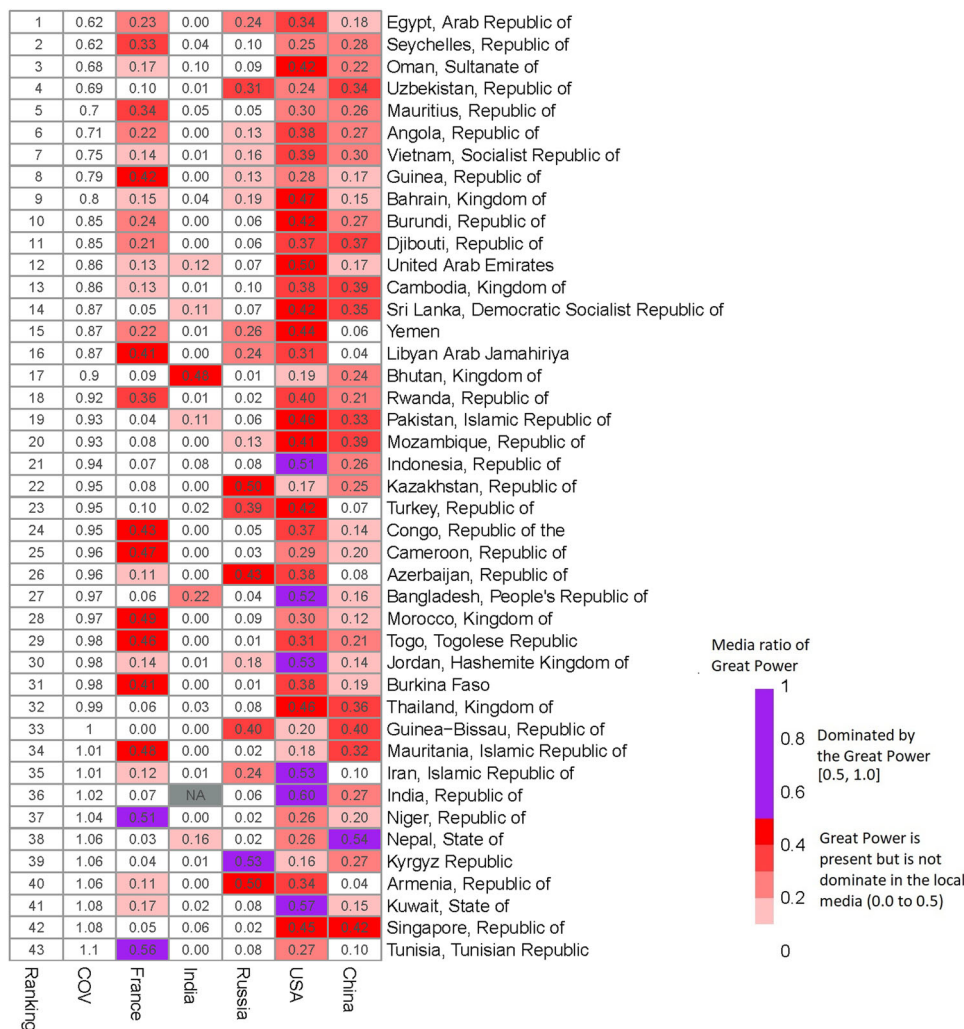


Fig. 1 Coefficient of variance and media ratio for great powers for the most competitive countries in Asia and Africa (ranking 1 to 43 out of 88 countries).

than one great power present. Additionally, our metric reveals the still current condition of US dominance in over half of Asia and African nations.

Narrative on great powers competition in African and Asian countries

Competition occurs when great powers pursue the same national interests within the same geographic space. To understand the GPC in Africa and Asia, this section will highlight the national interests of great powers in five subregions of Africa and four subregions of Asia. We do not intend these summaries to support the GPC-CoV metric. We aim for these included examples to provide context for a reader with regards to section “Validating the metric” in which we draw on a more extensive literature review to create a new metric, GPC-Narrative.

East Africa. The region of East Africa is critical for international trade due to its bottlenecking of cargo ships through the Bab al-Mandab into the Suez Canal. The United States, China, France, and Russia have all established a naval presence in the region. Insufficient transportation infrastructure and rapid urbanization will affect economic prosperity in the region (Human, 2017). France and Russia compete in military sales to regional groups to combat security risks caused by the rise of Islamist and separatist insurgencies with groups such as Al-Shabab.

The United States has maintained a presence in the region stretching back to the Cold War. Currently, its interests are limited to humanitarian aid, anti-piracy, and counter-terrorism operations with the overall goal of regional stability. The US has a large naval installation in Djibouti, which protects maritime lanes from piracy and disrupts jihadist activity in the region. According to Debsa (2021), the priorities of the US in Ethiopia and the Horn of Africa are “peace and security, humanitarian and developmental activities, and counter-terrorism.” The US achieves this by providing by extending finance, logistic organization, and intelligence assistance to the nations to promote regional stability.

In past administrations, the US did not regard China as a serious threat in the region. In December 2018, then-U.S. National Security Adviser John Bolton unveiled a new Africa strategy called the Prosper Africa initiative, which intended to expand US business interest on the continent (Vertin, 2020). The policy has had a limited impact, with the increase in aid only amounting to USD 500 million for the whole of Africa. These US foreign policy decisions demonstrate that the economic domination of East Africa is not a vital national interest for US policymakers.

The Russian Federation is a returning power in East Africa, having receded from the region after the fall of the Soviet Union. Russia’s national interests prioritize expanding the commercial interests of Russian firms, which Moscow has done by signing several military and commerce agreements in the region.

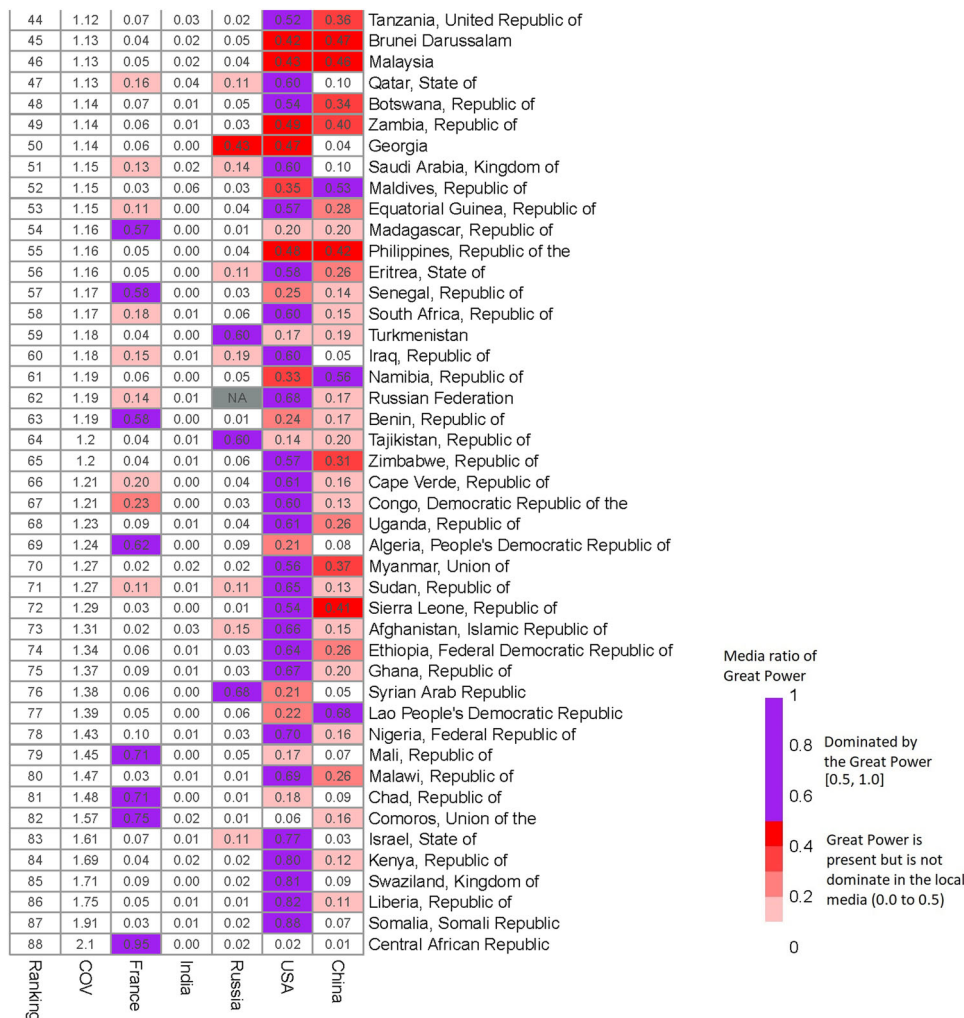


Fig. 2 Coefficient of variance and media ratio for great powers for the least competitive countries in Asia and Africa (ranking 44 to 88 out of 88 countries).

These agreements range from arms sales to private military contracts and nuclear energy infrastructure. Russia has sold arms ranging from small arms to aircraft and heavy munitions to nations like Kenya and Uganda.

Russia is expanding its influence in the Horn of Africa. For example, Russia attempted to establish a military outpost in Eritrea and a naval base in Djibouti, but met failure (Ramani, 2020). Russia uses its military cooperation and other policies to build relationships with East African leaders and thus gain more regional influence. Russian companies have been gaining mining and energy contracts for African nations. Russia is the largest exporter of nuclear energy and has already negotiated cooperation agreements with nations like Ethiopia, Kenya, Tanzania, Sudan, and Rwanda (Neethling, 2020).

France is a nation that has been a long-term actor in East Africa. It has been in the region since the formation of French Somaliland in 1884, modern-day Djibouti. East Africa is critical to French commercial and military interests. In recent years, President Macron has been expanding arms sales and military aid to nations like Ethiopia and Kenya. Macron also co-signed a defense cooperation agreement, “which included a deal to help Ethiopia construct a navy (reportedly to be based in Eritrea) and to provide aid for air cooperation, joint operations, and opportunities for training and equipment (Fowler, 2019).” France has a naval base in Djibouti to provide security for its shipping.

France also wishes to expand commercial interests in the region, with French companies providing renewable energy and other services. In 2017, Ethiopia became France’s third-largest market, with the value of French exports soaring to a record high of 832.1 million euros (Fowler, 2019).

Finally, the People’s Republic of China is a newcomer to the region. Through the One Belt and One Road initiative, Chinese-East African commercial ties have expanded. Unlike the other actors, China is leveraging economic resources to influence East African leadership. Both government and privately owned firms are building and repairing regional infrastructure to facilitate commerce.

While the Chinese state pledges billions of dollars in infrastructure spending, Chinese firms are expanding their investments to telecommunications and other services. Chinese loans to East African states ensure ties between the regional governments and Beijing. Powerful African states such as Ethiopia, Kenya, and Sudan account for 52.2% of all Chinese loans consumed in East Africa (Krukowska, 2018). However, Beijing also leverages its military forces to encourage regional stability with peacekeeping missions and limited arms sales. In 2015, China constructed a naval base in Djibouti to protect its commercial interests in the Horn of Africa. This multi-facade strategy by China makes it the most competitive power in Africa.

West and Central Africa. The regions of West and Central Africa are emerging as an economic power in the next following decades. It has vast natural resources and is undergoing rapid urbanization and with 12% of its population being under the age of 15, Western and Central Africa has one of the youngest populations in the world and has such incredible growth potential (WB, 2020). Access to these raw resources has put Chinese and French firms in competition with each other in the regions. To exploit these untapped resources, nations need new infrastructure systems, which both France and China are willing to provide. West and Central Africa also require security and energy for its growing population, which has put France and Russia in competition.

Russia is militarily and commercially involved in West and Central Africa as it has sold small arms and other military equipment to nations like Nigeria and the Democratic Republic of Congo. The Wagner group also operates in these regions, with the most notable example being the Central African Republic to help the government combat local rebels. The Central African Republic sold its mining rights at a discount in exchange for military advisers and arms sales from Moscow (Neethling, 2020). The Central African Republic is a clear example of Russia being able to use its military cooperation agreements to rage economic gains.

Russia also leverages its energy sector to increase its access to African markets. Adetokunbo (2017) states, "Nigeria needs Russian technology to boost industrialization just as Russia needs Nigeria as a market for its industrial products and military equipment." Russian petrol companies like Lukoil and Russian nuclear energy companies have been developing Nigerian energy infrastructure to address the nation's energy issues (Neethling, 2020).

France has been a great power within West and Central Africa since the nineteenth century, and even after decolonization, France continues to influence the region. France exercises soft and hard power to maintain economic, strategic, and commercial interests. France does this through a political and economic relationship known as *Francafrique*, in which French commercial enterprises, such as oil and mining companies, have unique access to a nation's natural resources in return for financial and military support by the French government to West and Central African regimes.

One of the most powerful vehicles of influence France has over its former African nations is the CFA zone (Gyimah-Boadi et al., 2020). The CFA zone is a monetary system split between West and Central CFA francs and French institutions control the printing, exchange rate, and banking of the currency. These institutions include the Banque Nationale de Paris, Societe Generale, Credit Lyonnais and Trésor public, French national treasury (Korkmaz, 2019).

France maintains bargaining power with local leaders because West African and Central African nations' government revenue must pass through French financial institutions. Korkmaz (2019) explains that 50% of foreign exchange surpluses are deposited into French accounts for countries within the currency zone known the CFA Franc zone. France uses other tools of soft power. For example, French humanitarian aid and foreign direct investment have increased tenfold from 2000 to 2017 (Korkmaz, 2019). France also influences many of its former colonies, including government languages, and educational and legal systems.

France also has many military cooperation agreements to sell arms and provide military aid and engagements in several West and Central African states, primarily in the Sahel region. The French army regularly intervenes in African conflicts on the side of the federal government to maintain regional stability (Gyimah-

Boadi et al., 2020). France also has three permanent military bases in West and Central Africa in the countries of Senegal, Gabon, and the Ivory Coast. French economic and military involvement in West and Central Africa demonstrates these regions' geopolitical importance to French policymakers.

China has been making large investments and political inroads into West and Central Africa. In 2009, China replaced the US as the major trade partner, and by 2014 it had reached USD 222 billion in GDP between China and African countries. China is already the second-largest importer of crude oil from Africa, and it counts for some 50% of the construction contracts in Africa. Under the Belt and Road Initiative, Chinese business pursuits include ports, railways, manufacturing, mining, telecommunications, and the agricultural sector for foreign investment (Krukowska, 2018).

Chinese investment seeks out nations with little global investment to industrialize these nations for new markets. Chinese firms were able to start the process of large-scale land acquisition in Africa for cash crops because of this leverage (Krukowska, 2018). Nigeria is a prime example of Chinese soft power projection in Africa. China has several objectives in Nigeria to guarantee the supply of raw mineral and agricultural materials, create a market for Chinese and Nigerian products, and gain diplomatic support for Chinese interests. China provides Nigeria with foreign exchange earnings, technical aid, and loan facilities (Raji and Ogunrinu, 2018).

According to Raji and Ogunrinu (2018), China has been successful as, "Nigeria is the largest market for China's industrial products in Africa, as the country's imports from China account for over a third of its total trade with West Africa." Nigeria's economic diversification with China gives it alternative US and European Union markets. China is also deploying more military forces in UN peacekeeping missions in the Democratic Republic of Congo, Mali, and the Ivory Coast and has pledged USD 100 million in military aid to the African Union (Albert, 2017). This behavior shows that China intends to stay and build up the regions of West and Central Africa as a long-term investment.

North Africa. The region of North Africa is growing in geopolitical importance with the rise of sub-Saharan Africa as a whole. The region holds petroleum resources, and it also serves as a gateway for maritime trade from Europe into sub-Saharan Africa (Jacobs, 2020). North Africa is critical for any naval force that operates within the Mediterranean seas due to the Suez Canal and Straits of Gibraltar. However, France and Russia have taken the approach to cooperate in the region, providing military assistance to nations with petroleum resources.

Russia is entering the region of North Africa with similar interests to the rest of Africa. Russia sells arms in the region, primarily to Algeria and Egypt. The Russian government is currently supporting the Libyan National Army in Libya with arms sales and the Wagner Group (Jacobs, 2020). Moscow has formed a multinational alliance to achieve success in Libya, which includes Egypt, UAE, Saudi Arabia, and even France (Jacobs, 2020). This military involvement secures Russian petroleum companies' contracts in eastern Libya.

France also has an economic interest that necessitates the victory of the Benghazi government, which has led to the alliance. The activities of Russian commercial interests, like the rest of Africa, are primarily focused on petroleum and nuclear energy. Russia has already agreed with the Egyptian president al-Sisi to enter a contractual obligation to build Egypt's first nuclear power station. These activities serve the commercial interests of Russia to increase its economic power and international prestige.

Southern Africa. Southern Africa is a region that is home to some of the most powerful economies in Africa and has access to vast amounts of natural resources that contribute about 81.9 percent of the region's GDP (AFDB, 2019). However, Southern Africa is facing significant issues, which include security threats from non-state actors and slowing economic growth. To address these issues, China is undertaking a strategy of increased trade and investment. Russia is attempting to fulfill the security and energy needs of the region. Each great power is exploiting different opportunities in Southern Africa, which results in a lack of competition.

Southern Africa is another region in which Russia seeks to expand economically and militarily. In the region, Russia has increased arms sales to governments to add revenue and political influence on nations such as Zambia and Mozambique. The Russian private military contractor, Wagner Group, has been operating in Mozambique to aid the central government against rebels (Neethling, 2020).

Russia is also looking to expand its commercial involvement in the region with Russian firms. For example, in 2019 the Zambian government an agreement with Moscow to receive support as it explores nuclear technology Neethling (2020). Uralchem, a Russian chemical company, also has plans to increase the production of phosphate fertilizers to 1 million tons per year to supply neighboring Zambia, Malawi, the Democratic Republic of Congo, and Botswana (Kachur, 2020).

According to (Mpungose, 2019), Russia has a strategy known as *Povorot na Vostok* or *Pivot to the East*, which intends to strengthen Russia's economic and energy ties with the BRICS nations and Africa. *Pivot to the East* serves to diversify Russia's energy ties, proceeding with the deterioration of relations with the European Union. African nations like South Africa with aging energy infrastructure and insufficient generation are interested in engaging with Russian energy. Russia has also adopted *Pivot to the East* to develop and export energy to Africa because it lacks economic power as compared to other great powers.

Like in the rest of Africa, China is investing massive quantities of capital into infrastructure, manufacturing, and industry in Southern Africa. Chinese firms have the potential to export and import cheap manufactured goods from Southern Africa (AFDB, 2019). According to Tella (2017), "South Africa maintains a cordial relationship with China and would rather strain its relations with the US than with China," which means that South Africa is more willing to grow its relations with China relative to the US. Currently, China is South Africa's largest trade partner and South Africa is the largest recipient of Chinese foreign direct investment in Africa.

In addition, Southern Africa has access to platinum, copper, iron ore, and chromium, which are key to Chinese manufacturing. A Chinese construction firm has funded massive construction projects in Southern African nations. Angola has had China's participation in the public investment program, representing 70 percent of the total, over USD 398 million in 2015 (Ferreira, 2019). China has also been expanding into petroleum, as it needs fossil fuels to sustain its economic growth. An example of this is that Angolan crude exports to China in the first quarter of 2019 are 68 percent of the nation's total exports (Ferreira, 2019). China is interested in long-term economic cooperation with Southern Africa, which will meet its nation's commercial needs.

Central Asia. Central Asia is a region growing in global significance due to its increasing role as a causeway for goods and commodities from East Asia to Europe (Thornton, 2020). Central Asia has recently become an additional source of natural gas and other hydrocarbons, which now supply much of China and

Europe. Security threats in Central Asia primarily arise in Afghanistan and from groups like the Islamic Jihad Union (Rumer et al., 2016). The strategic position and energy resources of Central Asia have put China, Russia, and the US in competition with each, although Russia and China are strategic partners in other areas.

In the past, the Russian Federation and its predecessors have been the hegemony of Central Asia. The Russian companies have deep roots within the region with energy and telecommunication being the focus. The Russian petroleum company, Lukoil, has seven onshore and three offshore projects in Kazakhstan involving 40% of Kazakh reserves (Kothari, 2018). Many politicians in Kazakhstan, Tajikistan, and Uzbekistan have a connection to the Russian oligarchs and government officials in Moscow. This deep political connection between Russia and Central Asia also extends to military aid to all Central Asian countries, except for Tajikistan. The Collective Security Treaty Organization and the Commonwealth of Independent States is a good example of security and political cooperation agreements with Russia.

Russia also has a cultural influence on the region, with many Central Asian nations still using the Cyrillic alphabet and with Central Asian students continuing to learn the Russian language and studying in Russian universities. Therefore, Central Asia is clearly within Russia's sphere of influence and Russia will be very protective of its unique relationship.

The US has a limited role in Central Asia, with most of its effort focused on regional stability, economic prosperity, and energy security, (BSCAA, 2020). The US gave USD 9 billion in aid to five nations of Central Asia in 2019 and commercial ventures have interested USD 31 billion into the region. US firms have shown interest in the region due to its large supply of natural gas. The US has also been using soft power as student exchange programs and the American University of Central Asia in Bishkek increases connectivity and it also encourages democratic practices and human rights (BSCAA, 2020). The US is pushing forward with the C5+1 platform to better integrate Central Asia and the US economy, as the region grows in its geopolitical importance.

The US is also militarily involved with Central Asia in the form of USD 79 million in open government-to-government sales in foreign military sales. In addition, the US has signed the Acquisition and Cross-Servicing Agreement and General Security of Information Agreement with Uzbekistan and Kazakhstan and conducted a multilateral military exercise in Tajikistan in 2019 (BPMA, 2020). The US has an interest in maintaining security cooperation in Central Asia. However, its importance is connected to US involvement in Afghanistan. With the US withdrawal from Afghanistan, the US activity could wane in the region (Rumer et al., 2016).

China has been making significant investments in Central Asia, which first began in 2001 with the Shanghai Cooperation Organization. Now, China is one of the largest trading partners with Central Asia, with a total of USD 19.8 billion in 2018 (Yau, 2020). The primary objective of these investments is to improve the civil and energy infrastructure of Central Asian nations. With better infrastructure systems, they can transport more Central Asian natural gas to China for electricity and heating. China has already built gas pipelines in Kazakhstan, Uzbekistan, and Tajikistan (Kothari, 2018).

The Silk Road Economic Belt, a component of the Belt and Road, is updating roads and railways going through Central Asia to facilitate the transport of Chinese goods to Europe. Chinese firms are increasing their presence in telecommunications and information technology, which were previously provided for by Russian firms. China also has a military presence in the region, with military outposts and training centers on the Tajik Afghan

border as part of a 2016 agreement with Tajikistan (Asiryany and He, 2020). These efforts will open Central Asia more to global markets and diminish Russian influence in the region.

South Asia. South Asia is a region prized for its natural resources and its strategic positioning along the Indian ocean. South Asia has been dominated and associated with Indian states, so much so that we often refer to it as the Indian subcontinent (Yasmin, 2019). China is expanding its economic and political presence in South Asia, leading to competition with India.

The Indian government is making a push to improve its relationships with all its neighbors, except for Pakistan. It has worked to expand markets in countries such as Bangladesh, Nepal, and Bhutan. This interest of India is to diversify economic activity diverse and maintain interconnections with its neighbors. Historically, Nepal and Bhutan have been close to India to gain access to the ocean. In 2015, President Modi of India visited Bangladesh to resolve the long-standing disputes between the countries (Yasmin, 2019). It has also increased its military cooperation and aid with Afghanistan to contain Pakistan.

Through the Belt and Road Initiatives, China has expanded its economic ties and geopolitical positioning within several key South Asian countries. Sri Lanka has received several loans from the Chinese government, which they defaulted on. This resulted in Sri Lanka transferring ownership of a port to the Chinese government. This port gives the Chinese navy access to the Indian Ocean, allowing China to project power further abroad. Chinese military presence in the Indian Ocean is a rational geopolitical calculation by Beijing as a large percent of its oil supply and almost 80 percent of its total trade is shipped through the Indian Ocean region (Rajendram, 2014).

China has also become the largest trading partner of Bangladesh and has significantly improved its relations with Bhutan and Nepal. China is doing this to provide Chinese firms with areas of cheap manufacturing and industry. The Chinese government has also made more provocative steps, such as improving infrastructure and relations with Pakistan. The China-Pakistan Economic Corridor, endorsed by President Xi back in April 2015, facilitates the movement of Chinese commodities to Europe and the Middle East.

"String of Pearls" is a larger scale strategy for South Asia, wherein China will develop a string of naval-base ports and naval-base-use-related ports in Gwadar (Pakistan), Chittagong (Bangladesh), Hambantota (Sri Lanka), and Kyaukphyu (Myanmar)." These massive investments in industry and maritime infrastructure signal a long-lasting Chinese presence in South Asia (Yasmin, 2019).

New Delhi's sudden renewed interest in rebuilding its relations with its neighbors demonstrates the severity of Chinese encroachment into South Asia. The presence of Chinese-owned ports in Sri Lanka, Bangladesh, and Pakistan threatens to encircle India and limit its maritime capabilities. The Indian Ocean is the only means by which India can freely trade with the rest of the world without an intermediary nation. India protects its access to the sea by taking up a policy of enforcing maritime laws (Yasmin, 2019).

India has also made maritime deals with Myanmar and other nations to keep the Indian Ocean within its sphere of influence. China and India still have active border disputes in the Himalayan region, which have led to violent clashes in 2017 and 2020. The tension has manifested in other areas, such as the suspicious disappearance of the Bangladesh-China-India-Myanmar (BCIM) Corridor from the Belt and Road project list (Yasmin, 2019). The rise of China in South Asia has forced India

to change its posture and compete with China for influence in its neighboring nations.

Southeast Asia. The region of Southeast Asia is critical for global trade and is undergoing significant economic growth (USTR, 2021). China and the US are expanding their military activities and alliances in the region to protect their access to these maritime lanes. China's economic expansion into Southeast Asian countries has led India and the US to become more involved than before, leading to competition.

US foreign policy for Southeast Asia is to prioritize the freedom of navigation for the US navy and commercial vessels. Therefore, the US provides military and financial support to ASEAN (Association of Southeast Asian Nations) nations to protect their maritime rights in the South China Sea. The US often invokes articles from the Law of the Sea Convention, such as Innocence Passage, to support US challenges to Chinese maritime claims (CRS, 2021). The US uses its own naval forces to exercise its maritime rights by conducting Freedom of Navigation (FON) Operations through the South China Sea and Taiwan Straits.

In addition, the US has significant commercial and economic ties with ASEAN nations, with US goods imports from ASEAN totaled at USD 206.3 billion and US foreign direct investment (FDI) into ASEAN (stock) being USD 338.3 billion in 2019 (USTR, 2021). Having a well-established economic tie with Southeast Asia aids in maintaining US influence in the region. These actions all serve to prevent China from reaching regional hegemony and having a regional balance favorable for the US.

China has been making key investments in Southeast Asia to gain influence in the region. According to Oxford Economics, ASEAN member countries such as Indonesia, Vietnam, Cambodia, Malaysia, and Singapore have received USD 171 billion, USD 152 billion, USD 104 billion, USD 98 billion, and USD 70 billion USD respectively in Belt and Road investment as of 2018 (Cox, 2018). Like in other regions, China is gaining influence in Southeast Asia with large infrastructure projects and foreign direct investment. Owing to China's rapidly growing middle class, it is now outsourcing low-cost manufacturing to Southeast Asian nations. For example, Myanmar and Cambodia are now hubs of textile manufacturing for Chinese investment (Cox, 2018). Likewise, Singapore, Vietnam, Thailand, Malaysia, Cambodia, and Myanmar are all ranked among the top ten most connected to China via trade, which demonstrates how China is becoming an integral regional actor in Southeast Asia (Cox, 2018).

Southeast Asia is a key component of China's economic future. In addition, China has used its military force to unilaterally impose its maritime claims within the South China Sea. Such activities include China Coast Guard operations, the construction of artificial islands, and Maritime militia swarms to enforce its claims of ownership (CRS, 2021). The Chinese Coast Guard has sunk Vietnamese fishing vessels that enter the vicinity of the Paracel Islands (CRS, 2021). China's goal for the region is to integrate its political and military sphere of influence to protect its national integrity.

India is increasing its relations with the Southeast and the US to achieve its objectives of stability and security for the straits of Malacca. This is a vital national interest as "almost 55 percent of India's trade transiting through the Malacca Straits, India does not want to see these crucial waterways dominated by a strategic competitor" (Rajendram, 2014). India is involved in several projects to increase its economic influence within the ASEAN states. One of these being the India-Myanmar-Thailand Trilateral Highway and the Kaladan Multimodal Transit Transport projects will boost economic activity in their respective nations (Atwal, 2016).

India is also increasing its economic role in Southeast Asia to further its own economic growth. It has formed economic partnerships with ASEAN nations to expand trade and manufacturing such as Comprehensive Economic Cooperation Agreement (CECA) with Singapore, Mekong-Ganga Cooperation (MGC) and the BIMST-EC (Bangladesh, India, Myanmar, Sri Lanka, Thailand Economic Cooperation) (Sen et al., 2004). India also aids the US in protecting maritime law as a way of containing Chinese expansion into Southeast Asia. By pursuing these policies, India hopes to realize its economic potential.

Western Asia. Western Asia, also known as the Middle East or Southwest Asia, is a region that is critical to the global economy due to hydrocarbon resources. Stability, therefore, is a top priority for many great powers, especially the US. Great powers, like China and Russia, desire more economic and/or military involvement in the region but are not willing to supplant the role of the US.

Western Asia has been a top priority for the US since the OPEC crisis of 1979. The most vital national interest in the US is ensuring the free flow of petroleum and commerce from the Middle East to the global economy (Michael, 2020). The Strait of Hormuz funnels a huge portion of the world's petroleum supply and any disruption in that flow will lead to a negative impact on the global economy. The US has a diverse set of interests in the region that support local allies like Saudi Arabia, UAE, and Israel and opposes actors that might cause regional instability, such as Iran and the Islamic State (Michael, 2020). To ensure stability, the US maintains a significant military presence in the region with military bases, troops, and defensive Patriot missile systems. However, the US has few economic aspirations in the region besides petroleum.

The Russian Federation is returning to Western Asia after losing most of its influence after the fall of the Soviet Union. Like North and Sub-Saharan Africa, Russia's interests are primarily focused on expanding its commercial activity and geopolitical prestige in the region. Like in other parts of the world, Russia has made significant arms sales in the region with S400 missile systems being sold in Qatar, Turkey, and Saudi Arabia (Karmon, 2018). Russia has also been selling weapons to Iran and Syria, which are factions in opposition to the Gulf Arab States. Russia supports the Assad regime to secure its naval presence in the Mediterranean Sea (Karmanau, 2019).

Russia has increased its economic presence in the region, specifically in the energy sector. Russia invested in the upcoming Aramco IPO, the state-owned petrol company of Saudi Arabia. In addition, Russia supported the efforts of Saudi Crown Prince Mohammed bin Salman to diversify the economy of the kingdom away from solely fossil fuels (Karmon, 2018). These actions show Russia is content with its position in Western Asia as a mediator and a beneficiary of the status quo.

China is a new arrival to Western Asia and with the One Belt and One Road Initiative, it seeks to grow its economic presence. China has already made a significant impact in Western Asia by being Saudi Arabia's leading trading partner and Israel's second-largest trading partner. China has prioritized the region heavily with approximately 16% of all China's foreign investment going to the region in 2019 and totaling USD 143 billion from 2013 to 2019 (Mashino, 2020). The fact that China is quickly becoming the number one importer of oil and natural gas can help explain China's growing interactions in the region. However, China is not completely apolitical as it has also signed a 25-year bilateral trade and military cooperation agreement with Iran (Motamedi, 2021). China intends to exploit any economic opportunity that may arise in Western Asia/Middle

East, but it is uninterested in expanding competition in other fields.

Validating the metric

In this section, we take three steps towards providing evidence that GPC-CoV captures great power competition in Africa and Asia: (1) drawing on an extensive literature review, we create tables that summarize competition areas by subregion, (2) using equation (3), we create our second metric called GPC measured through Narrative (GPC-Narrative) at the subregion level, and (3) we calculate the correlation between GPC-Narrative and GPC-CoV (aggregated to the subregion.)

As briefly stated in the previous section, we conducted an extensive literature review of government, academic, and think tank analyses to identify the contemporary interests of great powers across Africa and Asia. Here, we synthesize that literature on GPC into two tables, Table 2 for Africa and Table 3 for Asia, and include the citations for each power-subregion combination in these tables in the appendix.³

Each table is structured such that the subregions of the continent make up the columns, and the rows in panel A are the great powers, the rows in panel B are the interests, and the row in panel C is the overall competition. In Panel B of each table, we calculate the competition score for each interest area using the following model:

$$\text{Competition Score}_i = \begin{cases} 2^n, & \text{if } n > 0 \\ 0, & \text{otherwise} \end{cases} \quad (3)$$

where n is the number of great powers that hold a given national interest i , where i is an aspect of military and national security geopolitical interests: the (1) expansion sale of military arms, equipment, and technologies, (2) establishment of security agreements, joint operations of armed forces, military training and military bases, and (3) use of force to ensure the status quo, maintaining the existing power, peacekeeping operations, and economic interests (4) expansion energy facilities or technology or training, (5) expansion extraction of fossil fuels, (6) control of the flow of maritime shipping, maritime navigation, and naval presence, (7) expand infrastructure projects, transportation development, and telecommunication, and (8) increase in bilateral trade, FDI (Foreign Direct Investment) and other commercial interests.

Finally, in Panel C of each table, we sum up the competition scores for each subregion. The totals are our GPC-Narrative metric. We find that equation (3) gives the following scores for the subregions: East Africa (68), Southeast Asia (62), Central Asia (56), North Africa (54), South Asia (52), Western Africa (46), Central Africa (46), Western Asia/Middle East (42), and Southern Africa (24). In Table 4, we compare GPC-Narrative with GPC-CoV (see section "Coefficient of variance ranking metric") aggregated to the subregion. We find that the two metrics are indirectly and weakly correlated ($\rho = -0.31$) providing evidence that GPC-CoV reflects the great power pursuits from the literature. The indirect correlation reflects the construction of each metric, such that low values of GPC-CoV are more competitive and high values of GPC-Narrative are more competitive. In Fig. 3, we plot the correlation and trendline for the two metrics.

Correlation at the subregion is weakly negative, which we consider sufficient evidence of a logical relationship between GPC-CoV and GPC-Narrative. However, we want to acknowledge that GPC-CoV, by construction, cannot disaggregate media bias coverage within the niches prescribed in GPC-Narrative. Instead, our GPC-CoV metric is all-encompassing, thereby simplifying our complex reality.

Table 2 Competition information and score by powers, interests, and subregions in Africa.

	East Africa	West Africa	Central Africa	North Africa	Southern Africa
Panel A: Competition areas by Power and Subregion					
Russia (RU)	Arms, Energy, M.L., S.C.	Arms, Energy, Petrol, S.C.	Arms, Energy, Petrol, S.C.	Arms, Energy, Petrol, S.C., Region	Arms, Energy, Comm
US	M.L, Region	Region	Region	Arms, M.L., S.C., Region	Comm, Region
China (CN)	Arms, Comm, M.L., Infrast.	Energy, Petrol, Comm, S.C., Region, Infrast.	Energy, Petrol, Comm, S.C., Region, Infrast.	Arms, Energy, Comm, Infrast.	Energy, Comm, Infrast.
France (FR)	Arms, Energy, Comm, M.L., S.C., Region, Infrast.	Arms, Energy, Petrol, Comm, M.L., S.C., Region, Infrast.	Arms, Energy, Petrol, Comm, M.L., S.C, Region, Infrast.	Arms, Energy, Petrol, S.C., Region, Infrast.	Energy, S.C.
India (IN)	Comm, M.L., S.C.				
Panel B: Competition Score using equation (3) by Interest and Subregion					
Arms	RU, CN & FR ($2^3 = 8$)	RU & FR ($2^2 = 4$)	RU & FR ($2^2 = 4$)	RU, US, CN & FR ($2^4 = 16$)	RU ($2^1 = 2$)
Energy	RU & FR ($2^2 = 4$)	RU, CN & FR ($2^3 = 8$)	RU, CN & FR ($2^3 = 8$)	RU, CN & FR ($2^3 = 8$)	RU, CN & FR ($2^3 = 8$)
Petrol	0	RU, CN & FR ($2^3 = 8$)	RU, CN & FR ($2^3 = 8$)	RU & FR ($2^2 = 4$)	0
Comm	FR, CN, & IN ($2^3 = 8$)	CN & FR ($2^2 = 4$)	CN & FR ($2^2 = 4$)	CN ($2^1 = 2$)	RU, US & CN ($2^3 = 8$)
ML	RU, US, CN, FR & IN ($2^5 = 32$)	FR ($2^1 = 2$)	FR ($2^1 = 2$)	US ($2^1 = 2$)	0
SC	RU, FR & IN ($2^3 = 8$)	RU, CN & FR ($2^3 = 8$)	RU, CN & FR ($2^3 = 8$)	RU, US & FR ($2^3 = 8$)	FR ($2^1 = 2$)
Region	US & FR ($2^2 = 4$)	US, CN & FR ($2^3 = 8$)	US, CN & FR ($2^3 = 8$)	RU, US & FR ($2^3 = 8$)	US ($2^1 = 2$)
Infrast	FR & CN ($2^2 = 4$)	CN & FR ($2^2 = 4$)	CN & FR ($2^2 = 4$)	CN & FR ($2^2 = 4$)	CN ($2^1 = 2$)
Panel C: Total Competition Score by Subregion					
Total	68	46	46	54	24

Table 3 Competition information and score by powers, interests, and subregions in Asia.

	Central Asia	South Asia	Southeast Asia	Western Asia
Panel A: Competition areas by Power by Subregion				
Russia (RU)	Arms, Petrol, Energy, Comm, S.C., Region, Infrast.,	Arms, Energy, S.C.	Arms, S.C.	Arms, Petrol, S.C.
US	Arms, Comm, S.C., Region,	Arms, Comm, M.L., S.C.	Arms, Comm, M.L., S.C., Region	Arms, Petrol, M.L., S.C., Region
China (CN)	Energy, Petrol, Comm, S.C., Region, Infrast.	Energy, Comm, M.L., S.C., Region, Infrast.	Arms, Energy, Comm, M.L., S.C., Infrast., Region	Energy, Petrol, Comm, S.C., Infrast.
France (FR)		Comm, S.C.	Arms	Energy, Comm, S.C.
India (IN)	Energy, Comm, S.C.	Energy, Comm, M.L., Region	Comm, M.L., S.C., Region, Infrast.	M.L.
Panel B: Competition Score using equation (3) by Interest and Subregion				
Arms	RU & US ($2^2 = 4$)	RU & US ($2^2 = 4$)	RU, US, CN & FR ($2^4 = 16$)	RU & US ($2^2 = 4$)
Energy	RU, CN & IN ($2^3 = 8$)	RU, CN, & IN ($2^3 = 8$)	CN ($2^1 = 2$)	CN & FR ($2^2 = 4$)
Petrol	RU & CN ($2^2 = 4$)	0	0	RU, US, & CN ($2^3 = 8$)
Comm	RU, CN, US, & IN ($2^4 = 16$)	US, CN, FR & IN ($2^4 = 16$)	US, CN, & IN ($2^3 = 8$)	FR & CN ($2^2 = 4$)
ML	0	US, CN, & IN ($2^3 = 8$)	US, CN, & IN ($2^3 = 8$)	US ($2^1 = 2$)
S.C.	RU, US, CN, & IN ($2^4 = 16$)	RU, US, CN, & IN ($2^4 = 16$)	RU, US, CN, & IN ($2^4 = 16$)	RU, US, CN & FR ($2^4 = 16$)
Region	RU, US, & CN ($2^3 = 8$)	CN & IN ($2^2 = 4$)	US, CN, & IN ($2^3 = 8$)	US ($2^1 = 2$)
Infrast	RU & CN ($2^2 = 4$)	CN ($2^1 = 2$)	CN & IN ($2^2 = 4$)	CN ($2^1 = 2$)
Panel C: Total Competition Score by Subregion				
Total	56	52	62	42

Table 4 Subregion level comparison of GPC-CoV and GCP-Narrative scores.

	GCP-CoV	GCP-Narrative
East Africa	1.17	68
Southeast Asia	1.07	62
Central Asia	1.04	56
North Africa	0.97	54
South Asia	1.03	52
Western Africa	1.2	46
Central Africa	1.31	46
Western Asia	1.06	42
Southern Africa	1.19	24
	$\rho = -0.31$	

Using the competition index

In this section, we illustrate the informativeness of our country-level competitive measure using three examples focused on the press tone taken towards Chinese actors located in African and Asian countries. For ease of interpretation, we reverse the direction of GPC-CoV such that greater values correspond to greater competition.

First, we find that the distance a country is from China and the level of competition for that country matter in terms of the emotional tone taken by local press’ in reporting on in-country Chinese activities. In the Fig. 4, we plot the predict mean tone used in reporting on Chinese actors. The x-axis is the geographic distance from China; the y-axis is the scale of GPC. The plots on the plot represent the mean tone toward Chinese actors (scale is defined in the legend on the right side of the plot.) An exact

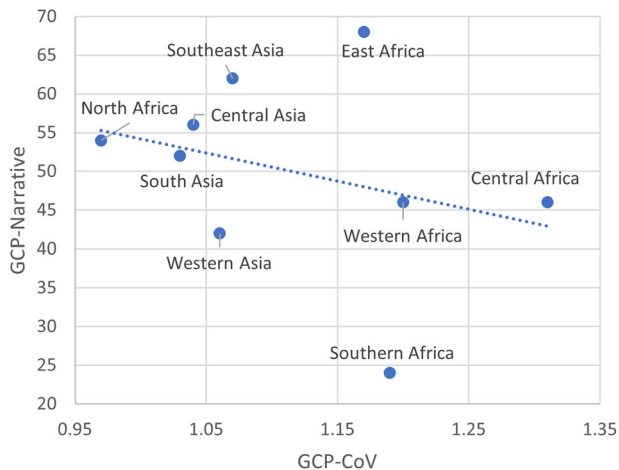


Fig. 3 Visualization of correlation between CoV-GCP and Narrative-GCP at the subregion level, including trendline.

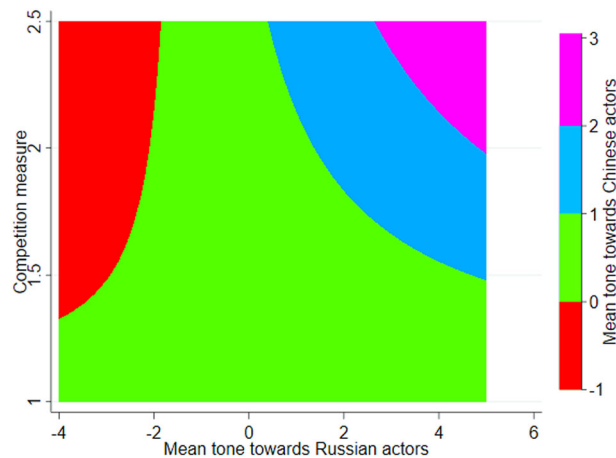


Fig. 5 Contour plot of predicted mean emotional tone taken by the local presses towards Chinese actors at the intersection of the Great Power Competition and tone taken towards American actors.

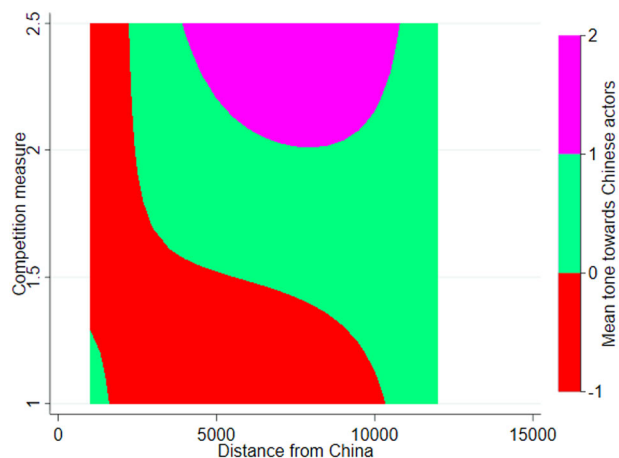


Fig. 4 Contour plot of predicted mean emotional tone taken by the local presses towards Chinese actors at the intersection of the Great Power Competition and distance from China.

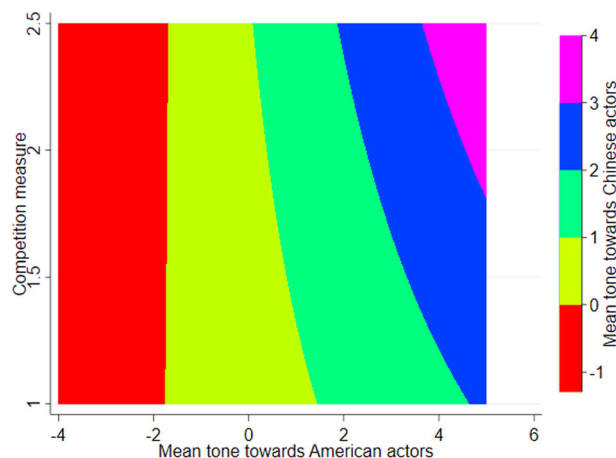


Fig. 6 Contour plot of predicted mean emotional tone taken by the local presses towards Chinese actors at the intersection of the Great Power Competition and tone taken towards Russian actors.

predicted mean for any given combination of geographic distance from China and competition can be found by finding the color at the intersection of those two independent variables on the plot.

We find that the only countries reporting very positively about Chinese actors are those who are experiencing extremely prominent levels of competition from the great powers and are moderately far from China. The interaction effect is also clear from the plot. Looking across the very top of the plot (extremely competitive countries): the probabilities change relative to the country's distance from China. This is not the case for countries experiencing little competition; their press' take a constant, negative tone towards Chinese actors. Also, countries close to China, no matter their competition level, are reporting negatively about in-country Chinese activities.

Next, we use our competition measure to further explore the correlation between the tone with which local presses reported on Chinese in-country activities in contrast with American and Russian activities. In Figs. 5 and 6, the x-axis is the mean tone towards American or Russian actors, respectively, and the y-axis is the rescaled GPC-CoV. We predict the average emotional tone taken towards Chinese actors with respect to the tone taken towards American or Russian in-country activities modified by the country's competitiveness. The color at the intersection of

those two independent variables on the plot measures the emotional tone toward Chinese in-country actors (see the legend).

The pattern between the tone taken by the local press reporting on Chinese and American in-country shown in Fig. 5 and Chinese and Russian in-country shown in Fig. 6 differ substantially. The contour plot in Fig. 5 shows that the correlation between the tone taken towards American and Chinese in-country activities is strongly positive across all competition levels. An interaction effect is not clear from the plot; across each level of competition, the probabilities change at a constant rate relative to the tone taken towards American actors. This empirical evidence implies that the intensity of GPC has no bearing on the relative positivity (or negativity) of the local presses towards American and Chinese in-country actors.

On the contrary, in Fig. 6 the correlation between the tone taken towards Russian and Chinese in-country activities is significantly different for countries with low competition as compared with high competition. In the low-competition countries, no matter the tone taken by the local press regarding Russian in-country actors, the press reports neutrally (tone $\in (0, 1)$) about Chinese actors. While in competitive countries, the tone taken about Russian and Chinese actors is strongly and directly correlated.

Conclusion

This study examines the current state of competition among great powers US, China, Russia, India, and France across Africa and Asia for the five years between 2015 to 2020. We construct a country-level measure of competition based on media coverage bias of local African and Asian presses towards great powers. We rank 88 African and Asian countries from the most competitive: Egypt, Seychelles, Oman, Uzbekistan, Mauritius, and Angola to the least competitive: Israel, Kenya, Swaziland, Liberia, Somalia, and the Central African Republic.

Theories in international relations, ecology, and economics inform our conceptual framework. Most importantly, in our paper, the countries identified as the most competitive should be understood as the set of countries that are the most accessible to the pursuit of great powers when other great powers are present. For example, we assess Egypt as an extremely competitive country. When we calculated the coverage bias of each great power by the Egyptian press, we find that events located within Egypt that engage actors from France, Russia, China, and the US are reported on with a similar frequency. Drawing on the ecological concept of the competitive exclusion principle, which states that two species with identical niches cannot coexist, we classify Egypt as a location where a "race" for economic privilege is intense (Darwin and Keble, 1859; Gause, 1934). Simply put, no one great power dominates in Egypt.

In contrast, in the Central African Republic, 95 percent of media reports published by the local press focused on French actors and events located within the country's borders. According to our metric, the Central African Republic is the least competitive country in Asia and Africa. Drawing on the analyses of Copeland (2015), Lake (2018) to interpret our result, France has secured an economic zone in the Central African Republic to benefit its firms and investors.

We believe that an empirical measure of competition regarding the Great Power Competition (GPC) can aid in national strategies for international influence. For example, the US has clearly stated its intentions to engage in competition in Asia-Pacific. However, as Cox (2018) points out, the US strategy has avoided influence in countries like Cambodia, Malaysia, and Laos, and instead has focused on its involvement with major allies like South Korea and Japan. Mazarr (2018) says that great powers should be economical about how they use their resources. Therefore, since our metric finds Cambodia is a competitive country, it may be the case that the US will gain influence there. This implication of our study supports Brands (2017) who argues that the "essence of long-term competition" is "strategic choice. Countries must choose where to focus and where to economize; they must deftly apply limited means while forcing a competitor to squander its own." We hope that our metric may illuminate some strategic opportunities for influence.

Since we developed our country-level measure of competition from hypothesis-generating methodologies and ideas, we seek some evidence to give credence to our measure. To do this, we synthesize a literature review into a simple quantitative measure at the sub-region level that captures great power interests across seven sectors of interest such as arms, energy, petrol, communication, etc. for the seven subregions in our sample.⁴ We compare this new literature-based measure with our original and find that they agree.

Finally, we demonstrate the usefulness of our empirical country-level measure of competition to explore the receptiveness of public opinion/media opinion across Asian and African nations to Chinese actors and events within their borders. Striking findings from this analysis are, first, a target country's distance from China is related to the local media's positivity when reporting on Chinese actors only when that country is a target of the great power competition. And second, we find that the intensity of the great power competition in a country has no

differential relationship with how the local press report on American and Chinese in-country actors. Across all countries, if the local press is reporting positively on Chinese actors, then they are also reporting positively on American actors.

Disclaimer

The views expressed in this document are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

Data availability

For data, please see repository at <https://www.dropbox.com/sh/pgglbjr8r726n18/AAD58zDTVzUYvhr-FMclbnCWA?dl=0>.

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Notes

- 1 Toynbee (1925) says, a "Great power may be defined as a political force exerting an effect coextensive with the widest range of the society in which it operates."
- 2 Lake (2018) points out that the US took over the former British subordinates with little controversy from Britain.
- 3 We made minor changes to the borders of subregion of Southern Africa to balance its size with other sub-regions.
- 4 Please note we created these two metrics in isolation from another. So, in practice, the researchers working on the quantitative metric and qualitative metric did not correspond with one another until the metrics were completed.

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Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

Informed consent

Informed consent was deemed not necessary for this study because no humans participated in the study.

Additional information

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