



RESEARCH ARTICLE

A Stochastic Frontier Analysis of Cultural Influence and Comprehensive Power of Countries

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ARTICLE INFO	ABSTRACT
<p>Received: Apr 30, 2024</p> <p>Accepted: June 15, 2024</p>	<p>Cultural influence has been claimed to have a positive impact on the comprehensive power of countries and is an important element that needs to be considered when countries develop policies. In this study, the relationship between cultural influence and comprehensive power will be studied the fixed-effect regression model. Furthermore, the level of efficiency of cultural influence factors and the effect on comprehensive power will also be examined using the stochastic frontier model. The relationship between cultural influence and the comprehensive power of countries is tested based on a sample of sixteen (16) countries listed on the Lowy Institute Asia Power index which were selected based on available and obtainable data. The impact of cultural influence on comprehensive power is evaluated by examining the impact of three cultural influence sub-measures, namely, cultural projection, information flows, and people exchanges. Furthermore, the economic capability indicator which was adopted from the Lowy Institute Asia Power index will be used as a control variable in the study. The theoretical implications of the study suggest that cultural influence has a positive influence on comprehensive power. Nonetheless, economic capability is more influential in terms of its impact on comprehensive power as compared to cultural influence. Furthermore, the evidence implies that information flow is the most important cultural influence sub-measure. Results from the stochastic frontier analysis however indicate that superpowers are more culturally efficient as compared to middle and minor powers. The practical implications of the study provide reason and justification for countries to focus on policies relating to improving cultural influence, in particular, information flows to improve comprehensive power. Furthermore, the results from the study also provide reasons and motivations for the government and the corporate sector to work together to improve cultural influence.</p>
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INTRODUCTION

Comprehensive power is often perceived to be an important issue for governments. Bajwa (2008) defines comprehensive power in terms of the sum of various factors that influence the power or strength of a country. These factors have been further delineated to include the economy, military affairs, science and technology, education and resources, and a country's ability to influence other nations. The notion of the influence of culture as an integral yet elusive aspect of the power and dominance of a country was also discussed in Bajwa's (2008) framework for comprehensive power and was also reiterated in earlier works by German (1960), Cline (2019) and Castellani (2019). Nonetheless, efforts have been made to understand the relationship between culture and its

influence on the comprehensive power of countries. For instance, various researchers including Singer (1972), Ferris (1973), Muir (1975), Hofstede (1980), Tellis (2001), and Zarghani (2017) have attempted to develop cultural influence measures and indices at a national level. Furthermore, these cultural influence measures and indices were used in various studies to ascertain the effect and relationship of cultural influence on a country from various perspectives. As an example, Beckley (2018) was mainly concerned with studying the impact of cultural influences on a country's military effectiveness without accounting for the overall effects of culture on a country's comprehensive power or dominance. Moreover, Maridal (2013) as well as Minkov and Blagoev (2009) asserted that the effects of culture on the power and dominance of a country have been disregarded by analysts and researchers for far too long.

A review of previous studies in the area indicates that there is a notable chasm in terms of previous works focusing on the efficiency and effectiveness of cultural measures, which can be managed and influenced by governments, and how these cultural measures have an influence on comprehensive power. As such, this paper will attempt to address the gaps in the current extant literature by examining the efficiency of cultural influence measures in terms of how they affect the comprehensive power of countries using broad-based measures of cultural influence and comprehensive power developed by the Lowy Institute. There are several reasons for studying the relationship between cultural influence measures on comprehensive power of countries. Firstly, previous researchers such as German (1960) and Zarghani (2017) have alluded to the difficulties in measuring and contextualizing the nature and effect of cultural influence and its relationship with comprehensive power. Intellectual incongruities between theorists have led to disputes and differences of opinion in terms of the measures and indicators used to proxy for cultural influences. Nonetheless, the advent of country-specific factors developed by the Lowy Institute is apt as it offers an opportunity to empirically test and evaluate the relationship between cultural influence and comprehensive power.

Secondly, previous studies have not managed to expansively study the impact of cultural influence on comprehensive power as a result of their narrow focus on cultural influence and comprehensive power. As an example, studies by Beckley (2018) as well as Tsegaye, Su and Malik (2019) were deliberately narrow and limited in their focus on cultural influence and power. Once again, the Lowy Institute measures provide an opportunity to apply cultural influence and cultural influence sub-measures in its relationship with the comprehensive power of countries. It is hoped that results from such analysis will provide useful insights and empirical evidence to expand on findings from existing literature. Thirdly, the potential benefits which would come from studying the efficiency of cultural influence measures on comprehensive power would be a matter of interest for governments. Previously, the efficient utilization of cultural resources was studied by Patience (2014) and Cesa (2011) with a narrow view of cultural influence and comprehensive power. By applying the stochastic frontier model, this study will attempt to comprehensively evaluate the effects of culture on comprehensive national power by studying the efficiency of cultural influence and cultural influence sub-measures.

The theoretical, contextual, and practical foundations of this study are based on the national concept of power proffered by various philosophers and researchers. Nonetheless, conceptualizing and measuring national power on a country level has been a subject matter that has intrigued numerous researchers (e.g., Bremer, 1992; Stuckey and Pistorius, 1985; Organski, 1972; Cline, 2019; Zarghani, 2017). Various reasons have been cited for the issues and complexities faced by researchers in developing a measure or index for country-level power including the qualitative nature of variables used for measurement, difficulties in defining and establishing a power model, and issues relating to determining the effect of the power of nations based on a country's ability to influence domestic or international affairs. The multi-factor model has been favored as an approach to measure and calculate national power by various researchers (Ferris, 1973; Cline, 2019; Muir, 1975; Zarghani,

2017). The variables that were often utilized to measure national power included economic, political, social, cultural, and military factors. These variables were also perceived to contribute positively to the national power of a country and enable a cross-country and comparative study of these antecedent factors and their relations with country power. The importance of understanding the influence of countries over other nations was also reiterated by Targ (1976). The concept of national power has also been conceptualized by emerging countries in Asia. In particular, China has developed the concept of national power based on what is termed comprehensive national power (Azari et al., 2022). In this context, national power takes three separate dimensions including hard, soft, and smart power. China's perception of comprehensive national power mirrors that of Nye (1990), which not only focuses on the need to include objective measures such as GDP and military power, but also subjective measures such as cultural influence in explaining national power. Furthermore, the concept of smart power is also conspicuously banal in terms of its similarities with Wilson's (2008) idea of combining both soft and hard power when it comes to countries making reasoned and calculated judgments on national policies. In so far as cultural influence is concerned, culture is perceived as a means to influence others either through the promotion of local culture, education, martial arts, public diplomacy, ideology, and foreign policy. The relationship between culture and comprehensive national power has been tested in several studies including Gil (2015), Zhang (2010), and Bajwa (2008). Nevertheless, the concept of national power and comprehensive national power serves as a theoretical foundation that supports the theorized assumption that culture has a positive impact on comprehensive power.

This paper contributes to the existing strand of literature on national cultural influence and its relationship with comprehensive power will be evaluated from a theoretical, contextual, and practical standpoint. From a theoretical point of view, this study has managed to address some of the concerns of German (1960) and Zarghani (2017) in so far as the study has provided empirical evidence to support theoretical assumptions made relating to the positive impact of cultural influence on comprehensive power. By implication, the results from the study would also attest to the qualitative and subjective nature of the cultural influence components that were used in this study and how those subjective components relate to comprehensive power. The study also introduces a country-level multi-variable framework consisting of cultural influence sub-measures and has managed to improve on extant work performed by Bajwa (2008), Beckley (2010, 2018), and Bloor (2022) in effectively testing country-level cultural influence measures against comprehensive power. Furthermore, another theoretical contribution of the study comes as a result of the stochastic frontier analysis and its contribution to current literature in providing a framework to understand the efficiency of cultural influence on comprehensive power amongst countries categorized as superpowers, middle powers, and minor powers.

The contextual contribution of the study can be derived from the specific findings from the study in terms of the relative importance of information flows as compared to other cultural influence sub-measures, as well as the importance of economic capability relative to cultural influence in terms of its effect on comprehensive power. Furthermore, the contextual contribution can be seen from the point of view of the relatively improved cultural efficiency of superpowers over middle power and minor power. In addition, the practical contribution of the study can be perceived from the point of view of policymakers and the corporate sector. Government agencies should be aware of the importance of designing policy measures to improve cultural influence at a country level. Furthermore, the corporate sector would also benefit as a result of focussing on improving information flow and investing in cultural sector activities as such investments would lead towards an improvement in returns.

The rest of the study will be presented as follows. Section 2 will focus on a review of literature relating to the effects of cultural influences on comprehensive power. Section 3 will present the theoretical framework. Section 4 will discuss the data and methodology applied in the study. Section 5 will

examine the results of the analysis. Finally, Section 6 will provide a summary of the conclusions and future directions of the study.

LITERATURE REVIEW

Cultural influence

Several studies in the past have been directed at understanding and conceptualizing the role and function of cultural influence and its effect on the comprehensive power of countries. The function of culture and its influence on national power have been discussed by Singer (1972), Ferris (1973), Muir (1975), Tellis (2001), Bajwa (2008), and Zarghani (2017) who approached the issue of comprehensive national power from a political science perspective. Furthermore, Nye (1990) contextualized the importance of culture as a subjective measure such as the news media and pop culture which has a positive impact on national power. Cultural influence is also regarded as soft power and is an important element of the international relations theory as a means for countries to assert influence over other nations (Nye, 1990; Targ, 1976; Froehlich, 2021).

The work performed by Hofstede (1980), though not developed based on theoretical foundations in political science, has proven to be a useful framework for understanding culture and soft power and its influence over national power. Hofstede (1980) instead focussed on the effect of cultural attributes on businesses and the economy. Even though Hofstede's (1980) approach has been adopted in previous studies such as Hjalmarsson (2013) and Mittal and Elias (2016), we have instead chosen to focus on Lowy Institute cultural influence measures as these soft power measures have parallels with soft power measures adopted by Zarghani (2017) and others.

Nonetheless, the significance of cultural influence and its influence on national power is becoming an area of interest to various countries including developing countries such as China. The Chinese government has placed a high level of importance on cultural factors and cultural sectors in improving what they regard as comprehensive national power (Azari et al., 2022; Jam et al., 2018). Comprehensive national power has been further classified as a combination of three factors including hard power, soft power, and smart power. Given the growing interest in cultural influence approaches as a method used by governments to assert their power and dominance over other countries as argued by various researchers in Zarghani (2017), Bajwa (2008), and Bloor (2022), this study will therefore attempt to complement existing studies by addressing certain theoretical and contextual gaps.

A striking observation that pervades current literature corresponds to the fact that there is an absence of studies which has attempted to examine the relationship between cultural influence and comprehensive power using broad-based and inclusive variables and indicators as a proxy for both cultural influence and comprehensive power. Instead, previous studies have focused on a single (or several) component or measure for cultural influence or comprehensive power, and overlooking the comprehensive composite measures for both indicators. For instance, Beckley (2010) studied the effect of cultural influence on comprehensive power by focusing on several components of comprehensive power including military effectiveness, human capital, state resources, and international relations. Furthermore, following from the earlier study, Beckley (2018) cautioned that cultural and soft power measures can often be misinterpreted which could lead to confusion and disillusionment when concluding. Similar instances of narrow approaches to studying the impact of cultural influence over comprehensive power using the structural equation modeling approach by Tsegaye, Su, and Malik (2019) focused on distinct components of culture and comprehensive power such as innovation and creativity as well as individualist traits and behavior.

Recent studies on cultural influence and its relationship with comprehensive power seem to affirm previous observations relating to the distinct and specialized focus of the studies on several components of cultural influence and comprehensive power. For instance, Fattoumi et al. (2023) and Mugurtay and Muftuler-Bac (2023) both conducted empirical studies on the impact of cultural factors

such as digital culture and religious factors, and how these factors influence geopolitical power. In addition, Zhong et al. (2023) and Tsvyk and Tsvyk (2022) deliberated on the effects of contemporary issues relating to technology and its influence on a country from the point of view of cultural influences such as society's cultural views and perceptions of internet celebrities and social and cultural issues relevant to the artificial intelligence and its application. Nevertheless, findings from recent studies seem to confirm previous suppositions made by Bajwa (2008), and Zarghani (2017) in postulating a positive influence between cultural influence and comprehensive power, which forms the basis for our research hypotheses as follows:

Hypothesis 1: *There is a positive relationship between cultural influence and comprehensive power.*

Cultural projection

The current studies suggest that there is a positive impact of cultural projection on comprehensive power. This relationship persists even though researchers have taken a distinct view on cultural projection and its influence on comprehensive power. Nonetheless, a previous study performed by Gil (2015) has been useful in underlining the importance of cultural influence on comprehensive power by studying the approach taken by China in projecting its culture and influence. Furthermore, Gil (2015) asserted that China has been able to use overt means of influencing other nations using cultural factors such as attraction, appeal, persuasion, and co-option through the Confucius Institute. This soft power method that China has used to influence other nations was further reiterated in a prior study by Zhang (2010).

In a separate study, Tam and Kim (2020) used perceived power balance and perceived power dominance as a substitute for cultural projection. Based on the results of their study, the structural equation modeling results indicate that government reputation is mediated by the chosen cultural projection factors. The effects of cultural projection based on soft power were also studied by Albro (2018) who attempted to examine the relationship between cultural projection and a country's influence in terms of diplomacy. Both studies by Tam and Kim (2020) as well as Albro (2018) not only highlight the importance of cultural projection and its impact on comprehensive power but also complement earlier studies by Gil (2015) and Zhang (2010) in concentrating on the importance of the political dimension to cultural projection.

The political dimension of cultural projection was further discussed by Matveeva (2018). In this study, the author discussed the role that cultural projection has played in terms of Russia's efforts to influence the rest of the world as a result of the war in Ukraine. The national and military objectives and strategies of Russia during the war were intricately tied to its ability to project power using cultural influence measures. As a counterargument, in the context of the Russia-Ukraine war, a previous study by Valieva (2016) studied the impact of cultural projection from the viewpoint of European countries and their attempt to influence developments in Russia and Ukraine. Nevertheless, both studies have provided some useful insights in terms of the positive impact that cultural projection has on comprehensive power, even though it is seen from the lenses of countries that are at war. Notwithstanding these findings, it has been argued by Huq (2019) that cultural projection is only beneficial when applied responsibly using soft legitimate power, pertaining

Nevertheless, the latest studies on the relationship between cultural projection and comprehensive power have certain profound findings that add depth to previous studies. For instance, Graafland and de Jong (2022) complemented Huq's (2019) suggestions by recommending that countries adopt a moderate and reasonable approach when projecting their cultural influence. Wang (2024) and Teughels (2023) justified the use of cultural projection in improving a country's economy and dominance by studying current and historical developments in a country and the function of cultural projection. Furthermore, the positive impact of cultural projection which is applied to support political movements was discussed in prior studies by Sanchez, Lamont, and Zilberstein (2022) as

well as Stamps et al. (2022) with results that reinforce prior suppositions made by researchers. Based on the abovementioned literature, we hypothesize the following:

Hypothesis 2: *There is a positive relationship between cultural projection and comprehensive power.*

Information flows

The cultural influence of information flows on comprehensive power has been argued to be the most important cultural influence measure that influences comprehensive power. Schiller (1975) went so far as to suggest that the United States has managed to achieve dominance and strength as a result of its mastery of the control of information flow. Similarly, Rothkopf (1998) Yadava (1984), and Keohane and Nye (1998) added to Schiller's (1975) reflections by suggesting that information flow in the modern era using the internet poses numerous issues and challenges for countries. These issues come in the form of threats from bad actors which could misuse information flows to destabilize countries by undermining political institutions. This form of threat was also termed cyberpolitik by Rothkopf (1998).

The effect of information flows on comprehensive power can also be envisaged from the perspective of disinformation which has a damaging impact on countries. A recent study by Vasist and Krishnan (2024) presented this idea from the point of view of the ill effects of disinformation on innovation. In the same study, the authors contend that domestic parties pose a greater threat to a country as compared to foreign parties as a result of their capacity to spread disinformation.

Nonetheless, the positive benefits of information flows have been described in various studies. As an example, Mishra and Mishra (2013) managed to provide evidence to suggest that information flows in the form of news bulletins and new frames when presented in a supportive and constructive way, had a positive impact on the 2010 Commonwealth Games in India. Similarly, Braman (2009) argued that information technology plays an important role in expediting information flows and has a positive impact on national comprehensive power.

As of late, the literature in the area of information flows indicates that researchers have not only taken into consideration technological developments but also social-political developments in understanding the relationship between information flows on comprehensive power. For instance, Andries et al. (2022), and Aydin et al. (2022) approached the issue of information flows from the point of view of how different social and cultural traits and characteristics influence information flows and its corresponding effect on comprehensive power. Feng et al. (2023) on the other hand asserted that the new media and the internet are forms of technologies that attenuate the relationship between the cultural influence of information flows and comprehensive power. Weinberg et al. (2023) on the other hand argued that the Russians have managed to devise a method to influence other nations by using Twitter in dealing with the Russia-Ukraine war. Such methods would suggest that information flows have now become a tool to be used during periods of war. Based on the results of our investigations of relevant literature, the following is hypothesized:

Hypothesis 3: *There is a positive relationship between information flows and comprehensive power.*

People exchanges

Governments throughout the world have made efforts to influence other countries devising policies relating to encouraging people exchanges. This cross-country movement of people has been argued to provide benefits as countries improve diplomatic ties with other countries through cross-cultural exchanges from activities involving areas such as commerce, education and tourism. Nonetheless, a country's ability to project its power and cultural influence using people exchanges has been argued to provide both advantages and disadvantages to the countries that are involved with the exchange.

A good example of a country that has acknowledged the importance of people exchanges and its contribution towards comprehensive power is the efforts made by Canada to improve its trade and diplomatic relationship with the Indo-Pacific region. Inter alia, the Canadian government has made it a priority to encourage people exchanges as they consider this an important factor in meeting their economic goals. Bing (2015) also reasoned that Malaysia and China have also been improving cultural ties through an exchange of military students as well as other collaborations involving people exchanges in the area of agriculture. Nonetheless, the Chinese government has been widely touted for its efforts in encouraging people exchanges through strategic plans for the Belt and Road project. As part of the Belt and Road project, mutual exchanges of workers and personnel between partner countries were seen as a means to improve economic ties by using social and cultural diplomatic methods. Consequently, the Chinese government's Belt and Road initiative has been viewed as a tremendous success and has enabled people exchanges not only as a result of high-speed railway projects in countries such as Laos and Indonesia but also through the education and tourism industry.

Various other researchers have supported the assertions made by previous writers in suggesting that people exchanges have a positive impact on comprehensive power. For example, Baldwin (1978) alluded to the tenuous nature of the impact of social exchange and its influence over national power. Furthermore, as an extension to the idea of the importance of social and people exchange in a country, Nunkoo and Ramkissoon (2012) referred to the importance of the dimension of trust in so much as to intimate that trust plays a crucial role in contributing towards the success of a policy to encourage people exchanges.

Nonetheless, the existing literature has highlighted the fact that people exchanges do have incendiary effects on countries that are involved with the exchange. For example, Johnstone et al. (2018) claimed that the Chinese government's policy of projecting soft power through encouraging student exchanges has blemished the reputation of the country. Some of the reasons that have led to this damage to reputation were discussed by Cheetham and Lever (2021). In their study, Cheetham and Lever (2021) described the fact that government policies to focus on people exchanges as a method to project power would not be successful if countries do not take into consideration the cultural sensitivities and complexities of other nations.

By concentrating on recent literature, the influence of people exchanges on the soft power of a country has been reevaluated by Mateleshko (2023) in the context of Germany's diplomatic policy and influence on migrant Ukrainians. Furthermore, a study by Wang and Gao (2022) was instructive as the study implied constructive policy recommendations as to the importance of understanding the cultural peculiarities of societies to improve international student exchange. Nonetheless, Hajdari (2023) reaffirmed previous concerns of Cheetham and Lever (2021) as well as Johnstone et al. (2018) in suggesting that people exchange through media, education, and cultural programs can have harmful effects on a country and may be counterproductive as a method to expand comprehensive power. Nevertheless, the existing literature has led us to hypothesize the following:

Hypothesis 4: *There is a positive relationship between people exchanges and comprehensive power.*

Economic capability

Previous studies have tried to explain the role that cultural influences play in affecting the relationship between the economic capability of a country and comprehensive power. These studies have suggested that national culture has a positive relationship with the economic capability of a country. Nonetheless, the literature seems to indicate that countries that do not have strong economic foundations are not able to improve their power and dominance. These inferences could be implied from previous studies by Curgai (2009) and Russo et al. (2005) who found that cultural influences, though an important element to be considered for purposes of improving geopolitical

power projection, can only be employed effectively when the economic and financial foundations of a country are robust.

To this end, the approach taken by the Lowy Institute in attempting to measure the economic capability of a country is a suitable approach to be applied in this study as the sub-measures that are used do not only reflect the economic and financial position of a country but also its link and relationship with culture and comprehensive power. The sub-measures that are used to develop a composite score for the economic capability indicator include Gross Domestic Product (GDP), international leverage, technology, and connectivity. Concerning the above-mentioned studies by Csurgai (2009), Kanval et al. (2024) and Russo et al. (2005), the economic and financial dynamics of a country are fundamentally important. However, researchers such as Bialowolski et al. (2023) have contended that national culture should be considered just as important as economic fundamentals when it comes to influencing the comprehensive power of countries. Nonetheless, Bialowolski et al. (2023) and Rashid et al. (2023) chose a narrow view of comprehensive power by focusing on the financial capabilities of a country.

Other researchers have taken a nuanced approach to explaining the relationship between economic capability, cultural influences, and comprehensive power. For instance, Travkina et al. (2023), asserted that the development of national institutions is affected not only by culture and economic conditions but also through historical events. Aggarwal and Goodell (2010) on the other hand contended that national culture and its influence on economic development innovation needs to be better understood by studying the relationship between legal, cultural, and national characteristics. Furthermore, Anna (2021) expanded on the work by Aggarwal and Goodell (2010) by addressing the spillover impact of cultural sectors on the economy and comprehensive power and its positive influence on innovation.

Other contemporary studies seem to confirm previous findings in explaining the importance of culture in explaining the relationship between economic capability and comprehensive power. For instance, Bialowolski et al. (2023) argued that Hofstede's (1980) national cultural dimensions are an important factor that influences the comprehensive power of a country. In addition, Zhang and James (2023) cited the importance of cultural factors when it comes to designing China's Belt and Road initiatives from the perspective of a complex cause-and-effect relationship between cultural influence and strategic economic objectives. Nicholson (2023) on the other hand emphasized the importance of a country's position on gender-neutral policies when it comes to economic and national development.

Hypothesis 5: There is a positive relationship between economic capability and comprehensive power.

Efficiency studies

A review of prior literature indicates that there is a scarcity of work performed relating to cultural influences and its efficiency and its relationship with comprehensive power. From the point of view of this study, cultural influence factors are regarded as factors that can be influenced by the government through its policies. Therefore, an efficiency study on cultural influence factors would provide some indicators relating to whether countries could improve their power and dominance by focusing on cultural influence factors.

Nevertheless, evidence from prior literature indicates that researchers have taken a specific and limited approach when it comes to understanding the level of efficiency when it comes to managing cultural influence factors. For instance, Wang and Chen (2020) focused their efforts on understanding the efficiency of managing cultural services activities in Chinese municipalities. Jalali (2024) on the other hand indicated that there is an opportunity to improve the economic development of countries such as Iran by improving the efficiency and productivity of the creative cultural industry. In an earlier study, Camerer and Vepsäläinen (1988) argued for a closer

understanding of the different types of cultures to more efficiently manage employees. Consequently, this should also contribute towards corporate growth and by implication result in growth in the economy. There have also been several empirical studies that have attempted to explain the efficiency of cultural influence factors. For instance, Fotova et al. (2023) applied the data envelopment analysis approach to understand the efficiency of the creative and cultural industry. Moreover, Li et al. (2023) focused on the technical efficiency of cultural and creative sectors of the economy in addition to the effects of the external environment.

However, this study will attempt to understand the idiosyncratic nature of countries by way of understanding the implied level of efficiency in managing cultural influence factors. Additionally, this research work will attempt to categorize countries according to their level of technical efficiency based on countries that are classified as superpowers, middle powers, and minor powers. Prior studies by Cesa (2011) and Patience (2014) have found that countries that have been categorized as superpowers show evidence of higher levels of technical efficiency when it comes to managing cultural influence factors.

Recent literature on the efficient management of cultural influence factors indicates that researchers are attempting to add depth and refinement to their understanding of cultural influence factors. For instance, Li et al. (2023) asserted that regional differences affect the efficiency of managing the cultural industry sector in China. Zhou, Xia, and Lao (2023) on the other hand also reiterated the importance of understanding the idiosyncratic nature of different sub-regions in China and how these differences have led to inefficiencies in managing the cultural industry. Taken together, both studies of these studies have highlighted the importance of understanding cultural efficiency from the point of view of states and sub-regions within a country and provide valuable inferences relating to how different countries and nations manage cultural influence factors. Therefore, based on the above theoretical analysis, we propose the following hypothesis:

Hypothesis 6: Countries that are categorized as superpowers have a higher level of technical efficiency as compared to countries categorized as middle powers and minor powers.

THEORETICAL FRAMEWORK

Based on the abovementioned hypothesis, the relationship between cultural influence and cultural influence sub-measures with comprehensive power can be depicted in Figure 1 below:

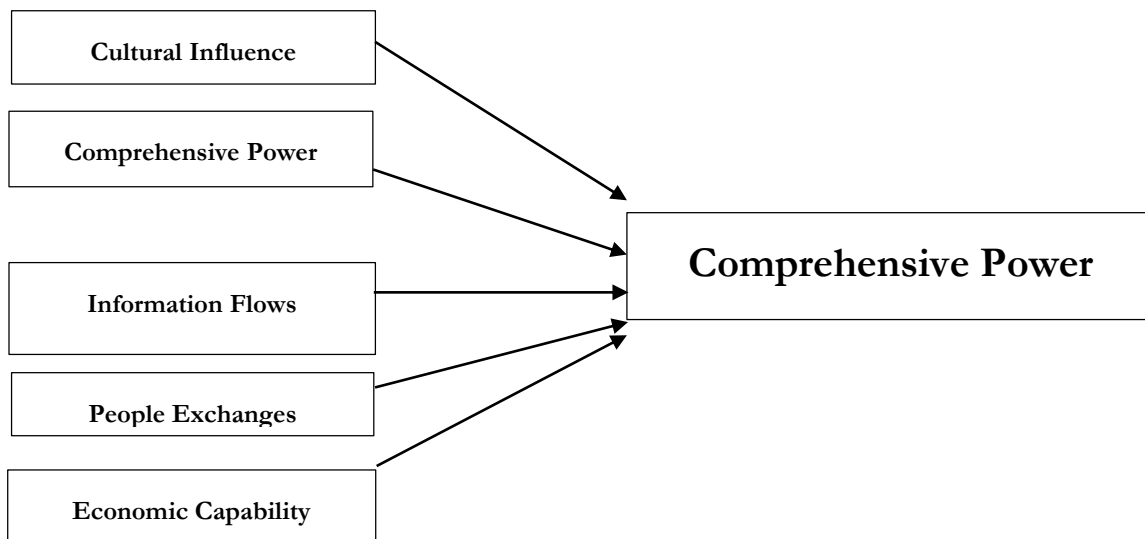


Figure 1: Theoretical framework
Source: Authors' illustration

The theoretical framework in Figure 1 will be used as a basis to address two research questions (RQs). **RQ1:** What is the relationship between cultural influence and sub-measures of cultural influence concerning the comprehensive power of countries? To address this research question, the fixed-effects regression model will be applied to the cultural influence measure as taken from the Lowy Institute Asia Power Index as well as three cultural influence sub-measures, notably, cultural projection, information flows and people exchange. The cultural influence factors will be tested against comprehensive power scores and the economic capability measure will be adopted as a control variable.

The second RQ will attempt to answer the following; **RQ2:** What are the variations of technical efficiencies of cultural influence and cultural influence sub-measures concerning the comprehensive power of countries? The stochastic frontier analysis model will be used to predict the relative technical efficiency scores of the countries. Following that, the cultural influence factors will be regressed against comprehensive power to predict the technical efficiency scores. Consequently, the results from the stochastic frontier analysis will be used to draw inferences relating to the policy and commercial implications of the model on policymakers and the corporate sector.

The findings from answering both **RQ1** and **RQ2** seem to indicate that cultural influences have a positive but insignificant influence on the comprehensive power of countries. Nonetheless, the information flows sub-measure has a positive and significant influence on comprehensive power and should be the focus for policymakers in influencing relative power and dominance of countries. The economic capability of countries however has a stronger effect and significance on the comprehensive power of countries.

DATA AND METHODOLOGY

The data used for the analysis was collected from the Lowy Institute Asia Power Index. Yearly data was collected from 2019 and 2023 from a total of 16 countries which are constituents of the Lowy Institute Asia Power Index. These countries include the United States, and China which are categorized as superpowers; Japan, Australia, Russia, India, Indonesia, Malaysia, New Zealand, Pakistan, Philippines, Singapore, South Korea, Thailand, and Vietnam which are categorized as middle powers; and Bangladesh which is categorized as a minor power. However, there are a total of ten (10) countries which was excluded from the study as a result of data insufficiency, and a five (5) year unbalanced panel was employed for the study.

The Lowy Institute Asia Power Index provides a measure of the Comprehensive Power of 26 countries based on a weighted average score across eight (8) measures. However, the measures that were selected for this study are Comprehensive Power (CompP), Cultural Influence (CI), Cultural Projection (CP), Information Flows (IF), People Exchanges (PE), and Economic Compatibility (EC). Comprehensive Power (CompP) is also defined as the capacity of a state or territory to direct or influence the behaviour of other states, non-state actors, and the course of international events.

Aggregate scores for each constituent of the index range from 0 to 100 based on various thematic measures and indicators. An aggregate score of 0 represents a low score, whilst a score of 100 represents the highest score for the measure or indicator. The index ranks 26 countries based on their ability to shape the external environment and the performance of countries in the Asia Pacific region is compared to one another and is also benchmarked against the United States and Russia.

Cultural Influence (CI) is defined as the ability to shape international public opinion through cultural appeal and interaction; measured in terms of cultural projection, information flows, and people exchanges and is calculated using a weighted average score of three (3) measures and 15 indicators. These three (3) measures are Cultural Projection (CP), Information Flows (IF), and People Exchanges (PE).

Cultural Projection (CP) is measured based on a composite of five (5) factors including online search interest, cultural exports, global brands, prestige, visa-free travel status, and cultural heritage. Information Flows (IF) on the other hand are measured based on regional influences such as news agencies, newspapers, TV broadcasters, and radio broadcasters as well as evaluations of Asia-Pacific international students. Furthermore, the People exchanges (PE) were derived from data relating to diaspora influence, migrant drawing power, regional travel destination, and regional travel connectivity.

Economic Capability (EC) was used as a control variable to account for the idiosyncratic nature of the economy of selected countries. The EC of a country is measured based on the size of gross domestic product (GDP), international leverage, technology, and connectivity.

The analysis of the relative technical efficiency of cultural influence and its constituent factors (i.e. cultural projection, information flows, and people exchanges) was performed in two stages. In the first stage, the relationship between comprehensive power and cultural influences is analyzed by choosing between a selection of fixed-effects, random effects, and pooled regression models using the Stata software. As a first step, The Hausman-Wu test will be used to statistically determine the best model to be chosen between fixed and random effects.

To avoid estimation bias due to unobserved time-invariant country-specific omitted variables, the use of the economic capability control variable was used in the fixed effects model. The time-invariant nature of cultural influence has been cited by Kumar et al. (2021) in what they described as cultural factors at the country level which do not change or vary over time. The importance of controlling for country-level differences was argued by Acemoglu et al. (2005), Noh (2009), and Davies et al. (2008). The suitability of the economic capability which was proxied by GDP and foreign direct investment was justified based on work by Davies et al. (2008), Gbetnkom D. (2006), and Tong (2005).

Once, the fixed or random effects model has been chosen based on the Hausman-Wu test, several diagnostic tests are performed for purposes of testing for model robustness and to improve model specifications. The Breusch-Pagan/Cook Weisberg test will be applied for testing heteroscedasticity and robust standard errors will be used to correct for heteroscedasticity issues. The serial correlation of the model will be tested using the Durbin-Watson test and the difference transformation method will be used to correct for serial correlation. In addition, the variance inflation factor (VIF) will be used to test for multicollinearity and the Mardia skewness, Mardia kurtosis, and Henze-Zirkler tests will be performed to test for data normality. The fixed effects regression can be represented by the following model:-

$$CompP_{it} = \alpha_0 + CI_{it} + CP_{it} + IF_{it} + PE_{it} + EC_{it} + \varepsilon_{it} \quad (1)$$

In Eq. 1, comprehensive power at the country level is the dependent variable (CompP), whilst cultural influence (CI) and its constituent factors including cultural projection (CP), information flow (IF) and people exchanges (PE) are independent variables. Economic capability (EC) on the other hand is the control variable for this model. Furthermore, i represents 16 countries, and t represents the variations in time. Furthermore, α is the constant which forms the intercept of the regression model and ε is the random error term.

The second stage of the analysis applies stochastic frontier analysis (SFA) to determine the technical efficiency of cultural influence and its constituent factors relative to the optimal boundary of the efficient frontier following Aigner, Lovell, & Schmidt (1977). Also, SFA considers the inefficiency of random shocks between observed and optimal values to ascertain technical efficiency (TE) scores. The fixed effects regression model controlling for the time-invariant country biases using the economic capability variable will also be applied instead of previous studies by Acemoglu et al.

(2005), Noh (2009), and Davies et al. (2008). The relative technical efficiency scores will then be analyzed by tabulating the average technical efficiency scores for each of the 16 countries selected in the study across the five years of study. Nevertheless, the approach applied in applying the SFA also followed by Kumar, Kumar, and Nicolau (2024) as below:-

$$CompP_{it} = \alpha_0 + \beta_1 CI_{it} + \beta_2 CP_{it} + \beta_3 IF_{it} + \beta_4 PE_{it} + \beta_5 EC_{it} + u_{it} + v_{it} \tag{2}$$

In Eq. 2, u_{it} represents the non-negative stochastic disturbance term which captures the technical inefficiency of the explanatory variables. On the other hand, v_{it} is a two-sided normal disturbance term with zero mean and σ^2 variance and represents the effects of statistical noise. EC_{it} on the other hand is the control variable used in the study. Similar to Eg. 1, i represents 16 countries, t represents the variations in time, α is the constant which forms the intercept of the regression model and ε is the random error term. Also, the SFA model would estimate the TE of CI_{it} and its constituents (i.e. CP_{it} , IF_{it} , and PE_{it}) as measured in terms of deviations from potential and actual values.

RESULTS

Descriptive statistics

Before conducting the fixed-effects regression and SFA model analysis, an analysis of the data used in the study is presented in Table 1 below:

Table 1: Descriptive statistics

Variable	Obs.	Values				Log Linearized			
		Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
CompP	80	30.61	20.24	8.80	84.50	3.25	0.58	2.17	4.44
CI	80	27.72	20.15	3.20	86.70	3.06	0.77	1.16	4.46
CP	80	30.28	26.36	0.40	100.00	2.90	1.24	-0.92	4.61
IF	80	14.78	22.89	0.10	100.00	1.94	1.35	-2.30	4.61
PE	80	43.04	47.15	5.30	416.00	3.50	0.72	1.67	6.03
EC	80	21.89	27.14	2.80	93.00	2.56	0.96	1.03	4.53

Results from the summary of statistics in Table 1 indicate that PE has the highest standard deviation (47.15) whilst IF has the lowest standard deviation (22.89) and mean (14.78).

Fixed-effects regression

In the first stage of the analysis, the fixed-effects model was selected over the random-effects model after having performed the Hausman-Wu test. Furthermore, the robustness of the fixed-effects regression was tested using various diagnostic tests. The Breusch-Pagan/Cook Weisberg test for heteroscedasticity found that there is heteroscedasticity in the specified model. As a result, the heteroscedasticity in the model was corrected by clustering standard errors in the specified model. The Durbin-Watson test indicates that there is an issue when it comes to serial correlation as the Durbin-Watson d-statistic is 1.14. However, this issue has been dealt with by applying the difference transformation method. Once the dependent variable $\ln CompP$ has been transformed, the Durbin-Watson d-statistic improved to 1.80 and this would indicate that the model no longer suffers from issues relating to serial correlation.

The normality tests were also performed and the results of various tests for normality are represented in Table 2 below:-

Table 2: Multivariate normality test

Mardia skewness	30.38***
Mardia kurtosis	76.50***
Henze-Zirkler	3.40***

Based on the multivariate normality test results in Table 2, the data set is found to be normally distributed.

Multicollinearity was tested based on the variance inflation factor (VIF) and the results are presented in Table 3 below:

Table 3: Variance inflation factor

CompP	VIF	1/VIF
CI	19.22	0.05
CP	7.21	0.14
PE	3.94	0.25
IF	3.22	0.31
EC	5.09	0.20
Mean VIF	7.74	

Note: All variables are log linearized; “Comprehensive Power” = CompP, “Cultural Influence” = CI, “Cultural Projection” = CP, “ People Exchanges” = PE, “Information Flow” = IF, “Economic Compatibility” = EC.

Based on the VIF test, the mean VIF seems to indicate that there is some presence of multicollinearity in the model but the multicollinearity is tolerable for purposes of analysis.

The results of the fixed effects regression to explain the relationship between cultural influence and its constituents against comprehensive power are shown in Table 4 below:

Table 4. Fixed-effects regression results

Variables	lnCompP
lnCI	0.032
	0.061
lnCP	0.008
	0.025
lnIF	0.044*
	0.021
lnPE	0.017
	0.024
lnEC	0.152*

	0.075
Constant	2.589
Number of Observations	80
Countries	16
R-squared	0.962
Overall r-squared	0.955
Note: Robust standard errors are in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.	

Results of the regression indicate that economic compatibility and information flow have a significant effect on the comprehensive power of countries. However, economic compatibility ($\beta_0=0.152$, $p < 0.1$) has a greater influence on economic compatibility as compared to information flows ($\beta_0=0.044$, $p < 0.1$). CE and other constituent factors such as IF, CP, and PE do not seem to significantly influence the comprehensive power of countries. The overall r-squared of the model seems to also indicate that the model has been well specified.

The results of the fixed effects model seem to indicate that economic capability has a stronger effect on comprehensive power. However, to evaluate the relative effect of cultural influence and its constituents as well as economic capability on comprehensive power, the SFA model was employed. The SFA model predicts the maximum comprehensive power of the countries in the model as predicted by the chosen variables. Table 5 provides the results of the SFA regression model as below:

Table 5: Stochastic Frontier Analysis (SFA) results

lnCI	0.017**
	0.037
lnPE	-0.011
	0.017
lnCP	0.066**
	0.026
lnIF	0.037*
	0.021
lnEC	0.392***
	0.027
Constant	2.168***
	0.074
Mu (μ)	0.139086
	0.13894
Lnsigma ²	-3.243***
	0.763603
llgtgamma	3.061***
	0.842404
Sigma ²	0.03905
	0.029819
Gamma (γ)	0.955249
	0.036011

Ssigma_u ²	0.037302
	0.029855
Sigma_v ²	0.001748
	0.000325
Akaike Information Criterion (AIC)	-200.075
Bayesian Information Criterion (BIC)	-176.255
Observations	80
Chi-square	1087.5
Probability Chi-square	0
Significance level; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.$	

The results from the SFA in Table 5 indicate that the model is robust and that there is a satisfactory model fit based on a Gamma (γ) of close to 1. The relative TE of the variables in the model however is shown in Figure 2 below:

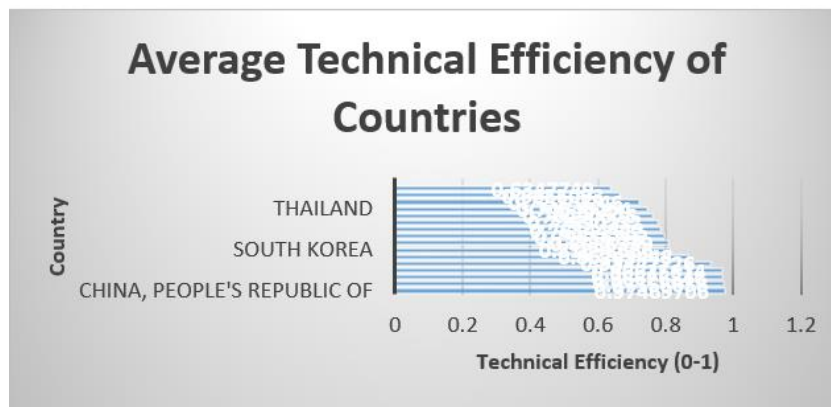
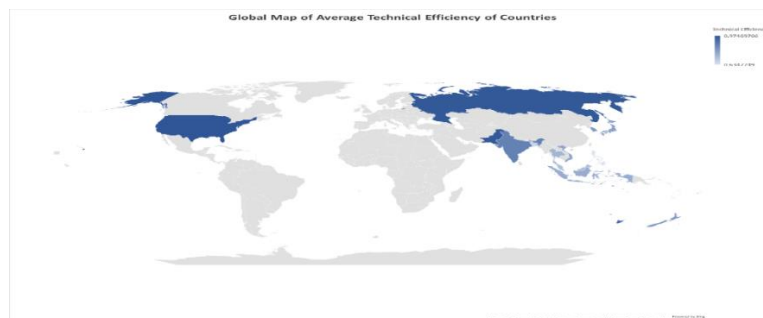


Figure 2: Average technical efficiency
Source: Author illustration.

The summary results from Figure 1 indicate that superpowers such as China and the United States have the highest level of technical efficiency at 97.47% and 97.16% respectively. Middle-power countries such as the Philippines and Bangladesh have lower technical efficiency at 63.48% and 66.55% respectively.

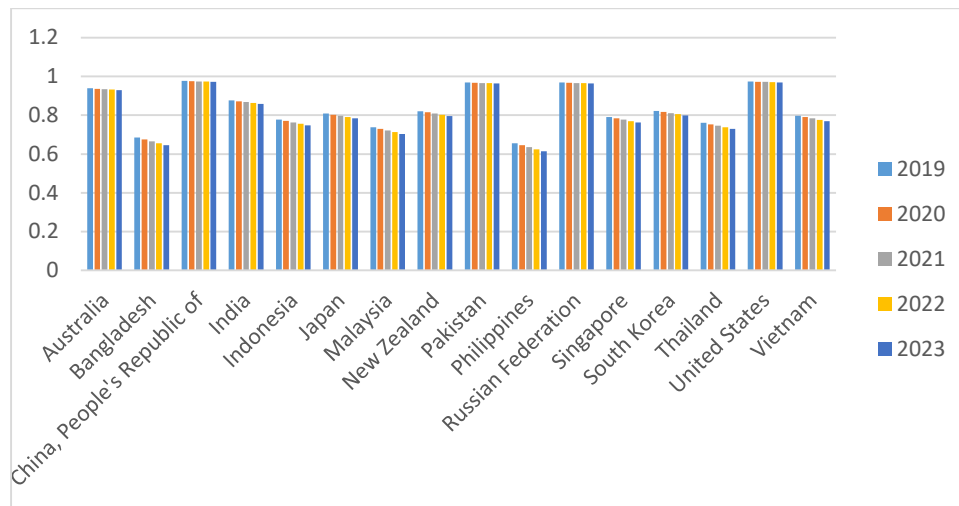
The relative technical efficiencies of the selected countries are further illustrated in a global map of technical efficiencies of the selected countries in Figure 3 below:



Source: MS Excel Map Chart.

Figure 2 seems to indicate that countries in the global south a less technically efficient as compared to the United States and Russia. These results are further corroborated by yearly results of technical efficiencies of the selected countries in Figure 3 below:

Figure 3: Country technical efficiency by year



Source: Authors' illustration.

CONCLUSION AND FUTURE DIRECTION

The effect of cultural influence on the comprehensive power and dominance of a country is an important area that requires further study. This study provides novel interpretations of findings based on analyzing the relationship between cultural influences and their effect on comprehensive power of countries. The approach taken by the study in analyzing this relationship is motivated by the methods applied by the Lowy Institute Asia Power index in measuring the relative comprehensive power and dominance of countries based on 8 thematic measures of power.

To answer **RQ1**, a fixed-effects regression model was performed on countries selected from the Institute Asia Power index. The overall results of the regression indicate that there is a positive but insignificant relationship between cultural influence and comprehensive power. However, the fixed-effects regression results seem to indicate that information flows have a significant effect on comprehensive power and should be the focus of policymakers and the business sector when it comes to improving comprehensive power. Nonetheless, economic compatibility seems to have a higher degree of significance on a country's overall comprehensive power. The results of the study support assertions made by Csurgai (2009), Bialowolski et al. (2023) as well as Aggarwal and Goodell (2010) in finding that economic prowess and dominance have a greater influence on a country's power as compared to other measures such as cultural influence.

RQ2 analyzes the relative technical efficiency of selected countries using the stochastic frontier analysis model. Results from the stochastic frontier analysis indicate that various countries such as Japan, South Korea, and India could improve their overall comprehensive power by focusing efforts on improving cultural influence based on relative technical efficiency scores.

The theoretical implications of the study can be inferred from the findings taken from the fixed-effects regression and the stochastic frontier analysis model. The relationship between cultural influence and comprehensive power was expected to have a positive impact on comprehensive power and supports assertions made by Bajwa (2008), Bloor (2022), Tsegaye, Su and Malik (2019), and Zarghani, D. H. (2017) as well as recent work by researchers (Fattoumi et al. (2023), Mugurta

and Muftuler-Bac (2023), Zhong et al. (2023), Tsyvk and Tsyvk (2022) in suggesting that cultural influence has a positive impact on Comprehensive power of countries. This positive relationship between cultural influence and comprehensive power improves on previous studies by Zarghani (2009) as a composite score for cultural influence seems to have a positive relationship with comprehensive power. Whereas, Zarghani (2017) focused on military cultural characteristics and their relationship to comprehensive power. Nonetheless, Beckley (2018) did allude to the fact that cultural measures used as a means to proxy for the effect of culture on comprehensive power could lead to results that are empirically unreliable and this could explain the insignificant results.

An analysis of the sub-measures of cultural influence found similar results for all three sub-measures. Firstly, the results from the fixed-effects regression model also indicate that there is a positive and insignificant relationship between cultural projections and comprehensive power. The positive relationship between cultural projection and comprehensive power supports earlier studies made by Gil (2015), Zhang (2010), Tam and Kim (2020) and Ullah (2022), Wang (2024), and Teughels (2023) in suggesting that cultural projection in influencing people's perception and using soft power domestic policy has a positive impact on comprehensive power. Furthermore, whilst other studies focused on country-specific cultural factors such as Albro (2018) which focused on soft power projection in the US as well as Valieva's study on cultural projection in the context of the Russia and Ukraine war, the empirical results from this study seem to concur with theory when viewed from the perspective of the various countries selected in this study.

Secondly, the next sub-measure of cultural influence, information flows, however, produces results that seem to indicate that it is important in influencing comprehensive power. This finding reaffirms previous results from Schiller (1975), Rothkopf (1998), Braman (2009) Vasist and Krishnan (2024), Feng et al. (2023), and Weinberg et al. (2023). Furthermore, the measures used by the previous researchers focusing on the application of information flows and the media for political purposes correlate and are relevant to the information flow composite measure used by the Lowy Institute. The significant results from the fixed-effects regression would support the arguments made by the aforementioned researchers and the growing importance of information flows in influencing the cross-country dominance of nations.

Thirdly, the results from the fixed-effects regression indicate that people exchange has a positive and insignificant relationship with comprehensive power. The positive relationship was hypothesized based on previous work performed by Johnstone et al., (2018) and Bing (2015). Furthermore, the positive association between PE and comprehensive power corroborates findings made by Bing (2015), Baldwin (1978), Nunkoo, and Ramkissoon (2012) which focused on the effect of migrant people exchanges between countries and its corresponding effect on the political and economic strength of a country. These results also concur with recent literature which focused on the effect of people exchanges from the point of view of education, cultural exchanges, and student exchanges by Mateleshko (2023) and Hajdari (2023). Similar to cultural projections, the results would indicate that people exchange, though positive in terms of its regression coefficient results, would not be a reliable measure to predict comprehensive power.

Nonetheless, the final measure used in the study, economic capability seems to provide important justification for the overall results of the study. Previous study results seem to emphasize and underscore the importance and significance of economic strength and dominance in influencing a country's power and dominance over other nations. The positive and significant relationship between EC and comprehensive power in Table 4 reinforces previous findings by Aggarwal and Goodell (2010), Russo et al. (2005), Bialowolski et al. (2023) Travkina et al. (2023), Anna (2021), Zhang and James (2023) and Nicholson (2023) in agreeing to the hypothesis that EC is the most important factor influencing growth and country domination. Furthermore, the regression

coefficient seems to indicate that economic capability has a greater influence on comprehensive power as compared to cultural influence as well as all three cultural influence sub-measures.

The results from the stochastic frontier analysis however provide some interesting ruminations relating to the relative technical efficiency of cultural factors in selected countries in the study. The absence of previous literature would indicate that the results from this study would be beneficial in understanding the impact of culture on a country's power and dominance. Nonetheless, some cues from recent work performed by Li et al. (2023) and Jalali (2024) were useful in interpreting the relative technical efficiency performance of countries.

Results from the efficiency study provide empirical evidence to support previous studies performed by Patience (2014), Cesa (2011), Camerer and Vepsalainen (1988), and others. Nonetheless, the efficient management of cultural factors and their influence on comprehensive power has not been measured comprehensively as that which is in this study. Moreover, whilst previous authors such as Jalali (2024) and Fotova et al. (2023), Li et al. (2023), as well as Zhou, Xia, and Lao (2023), argued for an emphasis on the development of cultural sectors or national government policies to enhance cultural industries and sectors, these studies were limited to single nation studies. Overall, the results indicate that larger superpowers are on average more culturally efficient in terms of the relative cultural influence over smaller countries.

Having said that, this study has managed to provide some useful empirical evidence relating to country technical efficiency scores based on composite cultural influence scores and their influence on comprehensive power by further categorizing countries based on classifications such as major, middle, and minor powers. The results improve on previous results from Patience (2014) and Cesa (2011) who focused on the level of technical efficiency of cultural influence in conducting foreign policy and military effectiveness. Furthermore, the results from this study support assertions made by both Patience (2014) as well as Cesa (2011) that developed countries are more inclined to efficiently manage cultural policies and sectors to improve their power and dominance as compared to middle and minor powers.

Nonetheless, a middle-power country such as Pakistan seems to have a high level of technical efficiency. This would also suggest that countries that do not have a high rating in terms of overall comprehensive power may have high cultural influence. The results would also indicate that there could be other factors contributing towards low overall comprehensive powers for countries such as Pakistan.

Several practical implications could be inferred from this study. Firstly, although results from the study indicate that cultural influences do not have a significant impact on a country's comprehensive power, nevertheless, the results seem to indicate that cultural influences can have a positive impact on power and dominance. As such, countries should place a greater emphasis on ensuring there is a focus on cultural factors in developing national policies.

Policymakers should concentrate their efforts on improving cultural projection by investing in developing industries that will enhance global reputation, and improve activities relating to people exchanges such as promoting tourism, student exchange, and international work-related opportunities. However, the most important means to project power and dominance which needs to be developed is to encourage information flows. This can be achieved through various means including improvements and investments in internet services, to developing and creating positive and beneficial data portals and networks for domestic and international companies, individuals, and government agencies.

Another important implication of the study is that countries that have a relatively low degree of technical cultural efficiency but higher levels of economic capability such as Japan, India, and South Korea could benefit the most from focusing on improving their cultural influence. This could be

achieved by focusing on improving information flows by increasing the amount of information available through websites for national government agencies on tourism and education facilities. Furthermore, these countries could also encourage people exchanges through student exchange programs and international placements for company executives.

The results from the study would also suggest that there are numerous benefits for the corporate and business sectors. Investments in areas in the form of cultural exports and cultural heritage would be beneficial in many ways to improve the cultural influence of countries. Furthermore, increased investments in the tourism sector would also be useful for this purpose. However, the business sector should be incentivized to improve investments and activities in areas that would improve a country's information flow. This could be achieved through increasing investments in information technology activities such as computer operations and data management or the development of information portals and websites.

In retrospect, there is evidence to suggest that the findings from this study could be further improved by considering other factors that influence the comprehensive power of countries. From the perspective of the Lowy Institute Asia Power Index, this could be achieved by including other factors in modeling the relationship between cultural influences and comprehensive power such as diplomatic influence, defense networks, economic relationships, future resources, resilience, and military capability.

Furthermore, results from previous studies by Beckley (2018) suggest that a reduced-form approach in identifying other country-level indicators could be considered when it comes to explaining the balance of power between countries. In addition, an important element that needs to be considered when it comes to determining the relative comprehensive power of a country is the change in the world order as a result of geopolitical issues facing various countries throughout the world. The direct and spillover effects of these developments could also motivate future studies in this area.

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