Universitat Autònoma de Barcelona

# ESSAYS ON UNCERTAINTIES AND ITS IMPLICATIONS ON EMERGING MARKETS

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# Abstract

In three novel essays focusing on “emerging markets”, this thesis aims to explore the implications of multiple uncertainty indexes on economic and financial variables. More precisely, the first chapter discusses the influence of geopolitical risk (GPR) on the banking sector profitability of "oil and nonoil dependent" emerging markets. To takle this, we used annual macro-level data of all the countries listed in the GPR index for the period 1998 to 2017. The fixed effect model indicates a significant negative impact of GPR on banking sector's profitability. Moreover, we found that oil rent mitigates the negatie impact of GPR on the banking sector profitability. In the second chaper of the thesis, we investigate the impact of financial development and GPR on renewable energy consumption in emerging markets from 1996 to 2015. In doing so, we adopted a two-step system GMM model to control for the problem of endogeneity, which is a common phenomenon in such studies. Findings of this chapter reveals a significant positive influence of both financial markets and institutions development indicators on renewable energy consumption. Furthermore, unexoectedly we found a positive influence of GPR on renewable energy consumption in emerging markets. Additionally, both financial development and GPR are found to be more pronounced in the long-run. In the third chapter, thesis evolved to explore the asymmetric impact of corruption on financial development in emerging markets, while taking BRICS economies as sample. In this chapter, we utilized the novel panel non-linear autoregressive distributed lag model (PNARDL). Our results indicate that corruption asymmetrically impacts financial development in BRICS economies. Long-run negative shocks of the control of corruption index have significant negative impact on financial development. However, long-run positive shocks of the control of corruption index are insignificant. Moreover, both positive and negative shocks of corruption in short-run results are insignificant. Generally, our findings are robust having carried out several robustness checks and in favor of “sand in the wheels” hypothesis. Finally, we concluded the

thesis by providing future research avenues through acknowledging our limitations and signifying the practical implications.

# Resum

En tres nous assajos centrats en els "mercats emergents", aquesta tesi proposa explorar les implicacions dels múltiples índexs d'incertesa sobre les variables econòmiques i financeres. Més precisament, el primer capítol tracta la influència del risc geopolític (GPR) en la rendibilitat del sector bancari dels mercats emergents "depenents del petroli i no del petroli". Per fer-ho, hem utilitzat dades anuals a nivell macro de tots els països que figuren a l'índex GPR per al període 1998-2017. El model d'efectes fixos indica un impacte negatiu significatiu del GPR en la rendibilitat del sector bancari. A més, es va trobar que el lloguer del petroli mitiga l'impacte negatiu del GPR en la rendibilitat del sector bancari. En el segon capítol de la tesi, investiguem l'impacte del desenvolupament financer i la GPR en el consum d'energia renovable als mercats emergents des del 1996 fins al 2015. En fer-ho, es va adoptar un model GMM de sistema de dos passos per controlar el problema de l'endogenitat, que és un efecte comú en aquests estudis. Els resultats d'aquest capítol revelen una influència positiva significativa tant dels mercats financers com dels indicadors de desenvolupament de les institucions en el consum d'energia renovable. A més, de manera inesperada, vam trobar una influència positiva del GPR en el consum d'energia renovable als mercats emergents. A més, tant el desenvolupament financer com el GPR són més pronunciats a llarg termini. En el tercer capítol, la tesi va evolucionar cap a explorar l'impacte asimètric de la corrupció en el desenvolupament financer dels mercats emergents, tot prenent com a mostra les economies BRICS. En aquest capítol, hem utilitzat el nou model de retard distribuït autoregressiu no lineal de panells (PNARDL). Els nostres resultats indiquen que la corrupció afecta de manera asimètrica el desenvolupament financer de les economies BRICS. Els xocs negatius a llarg termini de l'índex de control de la corrupció tenen un impacte negatiu significatiu en el desenvolupament financer. Tanmateix, els xocs positius a llarg termini de l'índex de control de la corrupció no són significatius. A més, els xocs positius i negatius de la corrupció en els

resultats a curt termini tampoc són significatius. En general, els nostres resoultats són robustos després de realitzar diverses comprovacions de robustesa i a favor de la hipòtesi de la "sorra a les rodes". Finalment, es va concloure la tesi proporcionant vies de recerca futures reconeixent les limitacions i significant-ne les implicacions pràctiques.

# Resumen

En tres novedosos ensayos centrados en los “mercados emergentes”, esta tesis tiene como objetivo explorar las implicaciones de múltiples índices de incertidumbre sobre las variables económicas y financieras. Más precisamente, el primer capítulo analiza la influencia del riesgo geopolítico (GPR) en la rentabilidad del sector bancario de los mercados emergentes "dependientes del petróleo y no petroleros". Para abordar esto, utilizamos datos anuales a nivel macro de todos los países incluidos en el índice GPR para el período 1998 a 2017. El modelo de efectos fijos indica un impacto negativo significativo del GPR en la rentabilidad del sector bancario. Además, encontramos que la renta del petróleo mitiga el impacto negativo del GPR en la rentabilidad del sector bancario. En el segundo capítulo de la tesis, investigamos el impacto del desarrollo financiero y el GPR en el consumo de energía renovable en los mercados emergentes de 1996 a 2015. Al hacerlo, adoptamos un modelo GMM de sistema de dos pasos para controlar el problema de la endogeneidad, que es un efecto común en tales estudios. Los hallazgos de este capítulo revelan una influencia positiva significativa de los indicadores de desarrollo de los mercados financieros y las instituciones sobre el consumo de energía renovable. Además, de forma inesperada encontramos una influencia positiva de GPR en el consumo de energía renovable en los mercados emergentes. Además, tanto el desarrollo financiero como el GPR son más pronunciados a largo plazo. En el tercer capítulo, la tesis evolucionó hacia la exploración del impacto asimétrico de la corrupción en el desarrollo financiero en los mercados emergentes, tomando como muestra las economías BRICS. En este capítulo, utilizamos el novedoso modelo de retardo distribuido autorregresivo no lineal de panel (PNARDL). Nuestros resultados indican que la corrupción impacta asimétricamente el desarrollo financiero en las economías BRICS. Los choques negativos a largo plazo del índice de control de la corrupción tienen un impacto negativo significativo en el desarrollo financiero. Sin embargo, los choques positivos a largo plazo del índice de control de

la corrupción no son significativos. Además, los impactos positivos y negativos de la corrupción en los resultados a corto plazo tampoco son significativos. En general, nuestros hallazgos son robustos después de haber realizado varios controles de robustez a favor de la hipótesis de "arena en las ruedas". Finalmente, concluimos la tesis proporcionando futuras vías de investigación reconociendo las limitaciones y expresando las implicaciones prácticas.

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# Introduction

The emerging markets' research was instigated in the early eighties shortly after the world noticed the unprecedented upswing of swiftly embryonic economies extended in major continents of the world including Asia, Latin America, and Eastern Europe (Cavusgil, 2021). The top Asian economies took the lead from their advanced peers by opening their markets and following the footsteps of financial institutes with a determined sense of industrialization and infrastructural up-gradation. As these emerging markets exhibit a significant economic and financial rise, many other developing markets followed the same trend. In the context of current globalization and profitable business opportunities such emerging markets attracted both multinational firms and entrepreneurs. Emerging markets, despite several international upheavals, have recorded better GDP development than many developed countries, turning into a preferred business destination for growth seeking organizations (Cavusgil, 2021).

A rise in their global GDP share from 30% in 1990 to more than 40% in 2019 with 55% population of the world, emerging markets' significance to the world is obvious. Moreover, Figure 1 depicts the growing importance of emerging markets to global economy in comparison to their advanced counterparts (Cavusgil, Ghauri, & Liu, 2021). Alongside the businesses and organizations, emerging markets equally intrigued the research scholars. Thus, researchers continue studying the global implications of emerging markets which makes these economies interesting research context for them (e.g. Akdeniz, Zhang, & Cavusgil, 2019; Cavusgil, 2021; Luo, Zhang, & Bu, 2019).

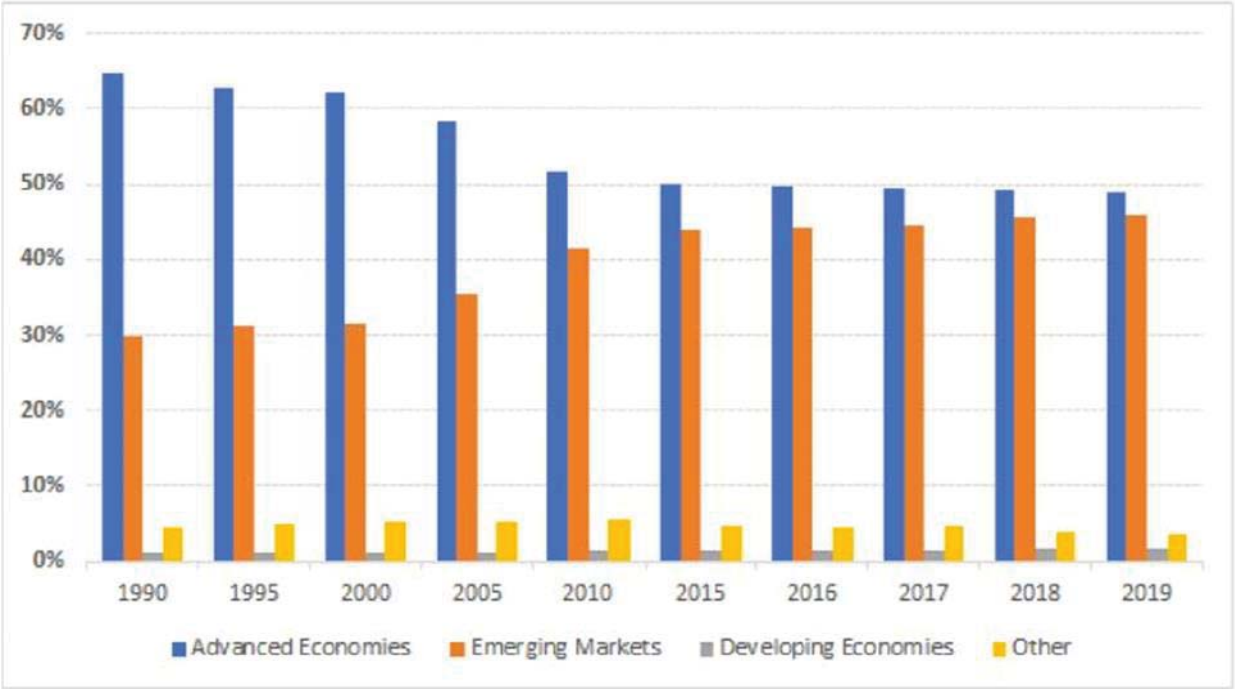


Figure 1: Comparative participation of Emerging Markets in global GDP.

Source:(Cavusgil, Ghauri, & Liu, 2021).

Besides many other characteristics, emerging markets are more prone to risks and uncertainties as compared to their developed peers. According to Bloom (2014) uncertainty is a broader concept that reflects ambiguity in the minds of decision-makers and policymakers about the possible future which spreads across macroeconomic to microeconomic levels. For instance, volatility in GDP growth affects investment decisions, plants' production schedule and individual's consumption habits. According to Knight Frank (1921), uncertainty is peoples' inability to forecast the probability of the unfolding of events (Bloom, 2014). Researchers use different proxies of uncertainty that ranges from economic data such as volatility of stock markets and GDP (e.g. Bekaert, Hoerova, & Duca, 2013) to news published in daily papers (e.g. Baker, Bloom, & Davis, 2016) since its broader existence implies no specific measures (Bloom, 2014). Extant empirical literature affirms significantly negative effects of uncertainty on the entire economy (e.g. Bloom, 2009).

As compared to developed countries, economies of less developed countries are more susceptible to adverse impacts of uncertainty (World Bank Group, 2014; Koren & Tenreyro, 2007). Bloom (2014), discusses a triad that makes less developed countries more vulnerable to uncertainty. Since most export products such as rubber, sugar, and oil have instable prices during a period of uncertainty. Moreover, these countries lack in resources and infrastructure to combat natural disasters such as floods, political adversities such as wars, and economic problems such as instable fiscal policies. Therefore, investors hold their investment decisions during uncertain circumstances (Cheng & Chiu, 2018). The irrevocable nature of investments influences investors to adopt a 'wait and see' strategy in response of persistent uncertainty (Gilchrist, Sim, & Zakrajšek, 2014).

'Uncertainty' has always caused concern for economists, businesses, and policy makers all over the world. However, it becomes a more immediate and accentuated matter in the aftermath of a global financial crisis (Bloom, 2009; Stock and Watson, 2012; Baker and Bloom, 2013). Since reaching its peak in 2008-09, global uncertainty has declined rather remarkably. However, country specific spikes can still be observed occasionally in recent years (Ozturk and Sheng, 2018). Emerging economies are notably more prone to uncertainty than the developed economies (Bloom, 2014). A comprehensive study on 1500 banks of 34 emerging market, during the period of 2000-2016 affirmed that bank risks escalate when economic uncertainty rises in emerging markets (Wu, Yao, Chen, & Jeon, 2020). Thereby, the purpose of this thesis is not to engage in a meta-analysis but to explore the implications of different uncertainties on economic and financial variables in emerging markets.

Caldara and Iacoviello (2018), have introduced a news-based global uncertainty index, which covers country-specific and region-specific uncertainties measures. They included all words, linked with geopolitical tensions and are exogenous to macroeconomic uncertainties, published in 11 prominent newspapers. This geopolitical risk (GPR) index identified events such as 'Paris assaults',

'Iraq invasion', 'tensions during Gulf Wars', and '9/11 WTC attacks in USA'. Geopolitical risks (GPR) such as wars, terrorist acts, military attacks, or diplomatic conflicts around the world are of major concern to businesses, financial market participants, public media, and policy makers. The emerging economies are more susceptible to sudden changes in capital flows and trade that can be triggered by geopolitical risks. Geopolitical upheavals/ uncertainties can cause consumers to defer consumption and dissuade firms to invest due to precautionary savings motive. (Bloom, 2009). Events such as terrorism and wars end up reducing the value attributed to the future compared to the present, hence leading to economic contraction. (Eckstein and Tsiddon, 2004).

Considering the novelty and the significant of GPR, the first two chapters focus on the impact of GPR on two key elements of emerging economies that also have global implications: banking sector performance and renewable energy consumption.

The first chapter aims to identify whether the banking sector performance is affected by GPR differently, given a country's economic nature. We evaluate and study the impact of GPR on the (banking sector) profitability of "oil and nonoil dependent" emerging markets. To tackle this, we aim to identify whether there is an oil rent threshold beyond which GPR is positively associated with banking sector performance. We made use of the annual macro-level data of countries featuring in the GPR index, from 1998 to 20017. The impact of geopolitical risk on the banking sector performance is examined by employing a fixed-effects panel data regression model, with which heterogeneity is controlled. This model controls for possible omission of country-specific traits (Farag & Mallin, 2017).

In line with the previous literature, we use country-level annual data of banking sector Return on Asset (ROA) as our measure of banking sector profitability. To capture geopolitical risk, we use the annual country average of the geopolitical risk index for Caldara and Iacoviello (2018). The annual oil rent was used to gauge an economy's reliance on its oil sector, with the oil rent variable representing

the net contribution of oil proceeds to a country's GDP. We additionally control the following macro-environmental and banking sector-specific variables: Gross domestic product, exchange rate, inflation, non-performing loans, and bank deposits.

The empirical findings show a significant adverse effect of geopolitical risk on the profitability of the banking sector in the emerging markets. Furthermore, we find a significant moderation effect of oil rent in the relationship of geopolitical risk and banking sector profitability. Particularly, 'oil rent' is weakening the negative relationship between geopolitical risk and banking sector profitability. To further validate our empirical results, we split our sample and find a significant positive association between geopolitical risk and banking sector profitability in oil-dependent countries.

After revealing the impact of GPR on the banking sector performance for petro (oil-dependent) and non-petro (non-oil-dependent) emerging economies, second chapter of this thesis focuses on the impact of financial development and GPR on the renewable energy consumption patterns in emerging markets.

Emerging markets play a significant role in the global environment when it comes to economic productivity and CO2 emission patterns. Although pollution remains a significant health hazard in developed countries, yet its encumbrance is greater in emerging nations because of their rapid population growth and industrialization, in conjunction with urbanization that has led to megacities with poor atmosphere qualities (Bertazzi, 2013; Mannucci & Franchini, 2017). Additionally, in rural areas of such countries, people are unprotected from dense indoor pollution because they are compelled to use coal, wood, and other cheaper agricultural energy resources due to their poor financial circumstances (Smith et al., 2014; Smith & Mehta, 2003). This has left emerging markets in a quest for cleaner and more secure energy resources (Lidula, Mithulananthan, Ongsakul, Widjaya, & Henson, 2007; Tolón-Becerra, Lastra-Bravo, & Bienvenido-Bárcena, 2011). Conversely, transitioning to renewable sources of energy involves significant financial investments in new energy infrastructures.

However, financial development and renewable energy consumption share a complex relationship that remains vague.

Considering financial constraints as a prevalent challenge of the renewable energy industry of emerging markets (Ji & Zhang, 2019), researchers have stressed the significance of financial support for the success of clean energy ventures in China (S. Zhang, Andrews-Speed, Zhao, & He, 2013). The renewable energy sector demands diverse funding sources: for example, D. Zhang, Cao, and Zou (2016) argue that equity financing is appropriate for technology-related small projects, whereas nuclear energy related mega-ventures need debt-financing from banks. Hence, transitioning to renewable energy sources cannot be accomplished without a well-developed and robust financial system.

Besides financial development, geopolitical risk is significant in the process of the energy transition for emerging markets. Geopolitical risks create an atmosphere of uncertainty and discontent. Such uncertainties force firms to put their future plans on hold hence reducing current production to the minimum capacity in anticipation of lower consumption. Major players of economic activities (bankers, equity market traders, and industrialists) believe that geopolitical risks change the dynamics of capital markets and slow the decision-making speed of investors (Caldara & Iacoviello, 2018). Hence, to meet the global environmental needs, a shift to the renewable energy sources is critical. However, financial restraints and geopolitical risks can act as possible hurdles to the required transition.

Thus in this chapter, we assess the impact of financial development and geopolitical risk on renewable energy consumption in the emerging markets. To takle this, we used a panel annual dataset that covers a period of 20 years starting from 1996 to 2015, for all 19 emerging countries listed in the geopolitical risk index. 'Renewable energy consumption' is the dependent variable of our study. As proposed by preceding literature (Anton & Nucu, 2020; Charfeddine & Kahia, 2019), we used the share of renewable energy in the total energy consumption as a proxy of our dependent variable.

Similarly, relying on existing studies (Gaies, Kaabia, Ayadi, Guesmi, & Abid, 2019; King & Levine, 1993), we used four proxies: private credit by deposit money banks to GDP, bank credit to bank deposits, domestic credit to private sector by banks, and stock market turnover ratio for the measurement of our first key independent variable, financial development. Subsequently, we measure our second main independent variable geopolitical risks by using GPR index of Caldara and Iacoviello (2018). Extant literature has indicated the impact of GDP per capita, consumer price index (CPI), and foreign direct investment (FDI) on renewable energy consumption (e.g. Anton & Nucu, 2020; Best, 2017; Çoban & Topcu, 2013; Sadorsky, 2010). Hence, we control these variables in the current chapter. The results of the two-step system GMM models highlighted a significant positive impact of FD and GPR on REC. Furthermore, the computed long-run elasticities reported a stronger and more dominant effect than its short run.

Other than GPR, corruption has its deep roots in emerging markets (e.g. Chen, Jeon, Wang, & Wu, 2015; Ionescu, 2013; Peyton & Belasen, 2012 among others). Many authors seem to define corruption as: "a manipulation/misuse of powers that belong to the government, or the sale of governmental property, or both, by the government officials for their personal gains" (Shleifer & Vishny, 1993; Jain, 1998). The aforementioned definition is almost identical to that proposed by Morris: "a misdemeanor of public official(s) that deviates from the public interest" (1991). The World Bank has also had a say on the matter. They see corruption as "the use/abuse of public office(s) for personal gains" (World Bank, 1997: 8). Therefore, corruption is generally known as the misappropriation of public mandate for private benefits (Lambsdorff, 2007). Caution needs to be taken though; for there may exist a certain room for discord in the aforementioned definitions of "corruption". For instance, certain researchers have only studied corruption between private firms. Hence, they did not involve the public office. We do not focus on such cases. Other researchers have opted to take a much broader perspective of corruption (Ashforth, Gioia, Robinson, & Travino, 2008).

Instead of using the World Bank's term: "abuse of private office", they use "authority" (Rodriguez, Siegel, Hillman, & Eden, 2006). By broadening the connotation of the term, they inculcate various kinds of corruption in their studies. The third chapter of this thesis focuses on assessing the impact of corruption on financial development in emerging markets.

The importance of financial development in any economy is well known and extensively discussed as an important factor of economic growth and development (e.g. Chiu & Lee, 2019; C.-C. Lee, 2013; Mishra & Narayan, 2015). Financial development helps with savings and supports their distribution into profitable investments by promoting industrial trades (Cooray & Schneider, 2018). Financial development fosters economic growth by facilitating the overall development process of a country (e.g. Greenwood & Smith, 1997; King & Levine, 1993; Levine, 2005).

Two major school of thoughts exist about corruption-financial development connection. One believes that corruption "grease the wheels" of financial development. This idea was first introduced by Leff (1964) and then grabbed ample attention of scholars. Researchers discuss the "Grease the wheel" hypothesis of corruption mainly in the context of emerging economies. The Prevalent understanding is that corruption enhances the possibility of constructive transactions which would not otherwise occur. In such cases, value is created by individuals generating efficiencies illegally via corrupt practices such as bribery. Supporters of this hypothesis further argue that corruption helps bypass complex legislations of inefficient institutes, and fosters economic activities in emerging countries (e.g. Dreher & Gassebner, 2013). Moreover, corruption may enhance investments in the private sector and serve as a buffer to counter poor strategies, thus fostering economic growth in countries with weak legal infrastructure (Leff, 1964, Cooray and Schneider, 2018).

"Sand in the wheels" hypothesis opposes the idea of "grease the wheel" with evidence of a negative correlation between corruption and development of an economy. A representative study is Mauro (1995), who has found a notable negative correlation between corruption and profitable

investments. He further argued that corruption primarily hinders private investment, which leads to a decrease in economic growth. The "sand in the wheels" hypothesis proposes that corruption is detrimental to financial sector operations. For instance, prior studies have reported the diminishing impact of corruption on investments, growth, and economic certainty (e.g. Aghion, Alesina, & Trebbi, 2004; Blackburn, Bose, & Haque, 2006; C. M. Lee & Ng, 2009). De Rosa, Gooroochurn, and Görg (2010), have asserted that achieving a target production rate and evading administrative needs by offering bribes to officials is not the best solution.

Prior empirical literature assumes that the level of corruption has symmetric effects on financial development. Hence, this assumption implies that positive changes in corruption boosts or degrades financial development, and conversely, negative changes in corruption must degrade or boost financial development with an equal magnitude. However, Alfada (2019) and Ali et al. (2020) suggest that the impact of corruption on the financial system and the overall economic activities is of a nonlinear nature. Additionally, the contemporary study of by Zangina and Hassan (2020) confirms that the impact of corruption on FDI inflows is asymmetric while studying Nigeria. Considering the importance and potential existence of nonlinear impact of corruption, we extend the theoretical understanding about the opposing views be inspecting the direct relationship between corruption and financial development in the emerging markets by the empirical investigation of the asymmetric impact of corruption on the financial development in the BRICS economies.

Chapter three used an annual panel dataset ranging from 1991 to 2018. Financial development is the dependent variable of our study. To capture this, we used two proxies to measure financial development. Aligned with prior literature, we used money supply (M2) as the first proxy of financial development (e.g. Cooray & Schneider, 2018; Levine & Zervos, 1998). Then, we included the newly constructed financial development index (FD) by the IMF as second proxy of financial development. The FD index is a comprehensive measure since it covers depth, accessibility, and efficiency of the

financial institutions and the financial markets. The level of corruption is the main independent variable of concern in our research. Following the previous literature, we used the International Country Risk Guide (ICRG) control of corruption index as a measure of corruption (e.g. Cooray & Schneider, 2018 among others). The ICRG control of corruption index ranges from 0 to 6, where higher values denote better control of corruption.

Finally, we included a set of macro-level control variables in our analysis. For instance, GDP per capita growth, educational attainment, and institutional quality. We used GDP per capita growth that reflects the standard of living and also holds a considerable position in development measures (Cooray & Schneider, 2018). Moreover, according to Acemoglu and Robinson (2008, pp. 137-140), institutional quality is a significant determinant of the economic and overall development structure of emerging countries. Therefore, we controlled for institutional quality as an explaining factor of financial development of BRICS economies by using law and order index and bureaucratic quality index of ICRG as two proxies of institutional quality. Educational attainment reflects people's ability to improve their living standards and prior literature has confirmed the contribution of educational attainment in the development and growth process. (e.g. Aghion, Howitt, & Mayer-Foulkes, 2005; Gupta, Pattillo, & Wagh, 2009). Consequently, we controlled for educational attainment by taking average years of schooling as a proxy.

We employed an asymmetric panel ARDL approach which is estimated by the Pooled Mean Group (PMG) technique. The baseline results revealed that a negative change in the corruption index (an increase in corruption) has a significant negative influence on the M2 and FD index. The PNARDL findings also support the "sand in the wheels" hypothesis in BRICS economies because an increase in corruption significantly decreased the financial development. While a positive change in the corruption index (a decrease in corruption) insignificantly influences M2 and FD. Moreover, a chance (an increase

or a decrease) in corruption doesn't change the M2 or the FD index in the short run. Hence, long-run results are more effective and stronger as compared to the short-run estimates.

Finally, these three chapters of the thesis comprehensively cover identifiers of emerging markets: geopolitical risk, financial development, renewable energy consumption, and corruption. Maintaining the exclusiveness of each chapter, the thesis explores the implications of different uncertainties on economic and financial variables in emerging markets, which not only work as key economic factors of the emerging economies but assert global implications. Apart from the establishment of theoretical arguments, we employed different well-known empirical methodologies on data extracted from reliable and validated resources such as IMF, World Bank, and ICRG. The review of related literature, empirical findings, contributions, and implications are discussed within each chapter.

Next, we present the main body of the thesis (the published empirical manuscripts) as three chapters, ranging from chapter 1 to chapter 3. Afterwards, we display the conclusion of the whole thesis by highlighting overall implications of this research along with future research direction and limitations of our research work.

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# Chapter 1: Oil Rent, Geopolitical Risk and Banking Sector Performance

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## Abstract

This paper aims to assess and compare the impact of geopolitical risk (GPR) on the banking sector profitability of "oil and nonoil dependent" emerging markets. For empirical estimation, we used annual macro-level data of all the countries listed in the GPR index from the period 1998 to 2017. The results of the fixed effect model indicate a negative significant impact of GPR on banking sectors' profitability. Additionally, the results highlight the significant weakening moderation role of oil rent in the negative impact of GPR on the banking sector profitability. Multiple contributions arise from this study: Firstly, it explains and compares the impact of geopolitical risk on the banking sector profitability in non-oil-dependent. and oil-dependent economies. Secondly, our study sheds the light on the moderation effect of oil rent in the relationship between geopolitical risk and banking sector profitability. Indeed, the oil "curse or blessing" argument was neither revealed nor clarified in the relevant literature.

**Keywords:** Geopolitical Risk, Banking Sector Profitability, Oil Rent, Oil Dependent, Nonoil Dependent, Emerging Markets.

**Jel Classification:** Q4; G21; P48.

## 1.1. Introduction

Macroeconomic uncertainty significantly influences firms' performance. This holds for both financial and non-financial sectors. Previous studies state that the main ingredient in the success of economies is macro certainty. Stable periods attract massive investments that spur emerging markets' economic growth and the profits of financial institutions (e.g. banks) (Belkhir, Grira, Hassan, & Soumaré, 2019; Gaibulloev & Sandler, 2008; Ghosh, 2016; Jude, 2010; Lee & Lee, 2019; Murdoch & Sandler, 2002). One factor that has been used to gauge economic conditions is political risk. Recently, geopolitical risk was introduced as an alternative measure of political risk. It is different from other measures of political instability and macroeconomic risks in multiple ways. Firstly, geopolitical risk is broader in nature because it covers all domestic and international events, rather than merely focusing on domestic political issues. Secondly, geopolitical risk captures occasional but menacing incidents which may remain concealed for longer time periods (Dissanayake, Mehrotra, & Wu, 2018; Guttentag & Herring, 1997). Thirdly, the evaluation of geopolitical risk causes stronger adverse effects than geopolitical acts themselves, probably because the latter are perceived as resolving uncertainty (Dissanayake et al., 2018). Geopolitical risk is a key element of a country's economic decisions (ECB, 2017; IMF, 2017). Its adverse effects on economic growth has been highlighted (Mansour-Ichrakieh & Zeaiter, 2019; Soybilgen, Kaya, & Dedeoglu, 2019).

The ample literature encompassing the effects of geopolitical risk on determinants of economic and financial growth (Baker, Bloom, & Davis, 2016; Bernanke, 1983; Gulen & Ion, 2016; Julio & Yook, 2012; Rodrik, 1989). Geopolitical risk is regarded as a main driver of financial markets' performance and a core investment decision making factor by traders, market managers and central banking executives (Bouri, Demirer, Gupta, & Marfatia, 2019; Caldara & Iacoviello, 2018). Indeed, the Bank of England highlighted its importance while referring to the trinity of uncertainty, stating the adverse effects of economic uncertainty, policy uncertainty and geopolitical risks on financial growth

(Carney, 2016). Similarly, the European Central Bank in its Economic Bulletin, IMF in World Economic Report and the World Bank in the Global Economic Prospects, have regularly outlined and tracked the impacts of geopolitical risks on the economy (Caldara & Iacoviello, 2018). In a survey conducted by Gallup (2017), thousands of investors have placed worries regarding geopolitical risks above economic and political instability. Nevertheless, rigorous empirical studies have not yet been conducted to investigate the significance of geopolitical risks on the performance of the banking sector in emerging markets.

The limited scholarly attention given to the effect of geopolitical risk on the banking sector performance stems from the absence of a reliable measurement index that captures geopolitical risk as viewed by strategic planners, international financiers, and public communities. Using aggregate data, Caldara and Iacoviello (2018) demonstrated that increased levels of geopolitical risk diminish investments and profit earnings. A decomposition of this data highlights that unprotected industrial sectors experience stronger aftermaths and are more sensitive to geopolitical risk. However, how does geopolitical risk affect the banking sector? To the best of our knowledge, we do not know of any study scrutinizing the role that geopolitical risk might play on the banking sector performance. Moreover, we still lack knowledge on how the effect of geopolitical risk might differ given a country's economic nature. In this regard, oil producing countries have always been a point of attention and discussion for financial practitioners and researchers. Colgan (2014), termed oil producing countries as "petro-states" and argued that such petro-states are likely to face domestic and international political issues but their oil rents (i.e. oil generated incomes) may channel such political instability to provide sound performance. This leads us to hypotezise that the banking sector in oil-dependant economies would respond to geopolitical risk differently. Hence, there remains a need to explain how geopolitical risk (e.g. conventional and non-conventional wars, terrorist attacks, tensions within and between states) might affect the financial performance of banks (i.e. bank profitability) differently in oil dependent

and non-oil dependent economies. In our analysis, we explore if oil rents moderate the effect of geopolitical risk on the banking sector performance. Specifically we test the extent to which oil rents of oil rich economies mitigate the adverse effects of geopolitical risk on banks' profitability.

Different schools of thoughts discuss the impact of oil rents on different indicators of economic growth. One group of researchers support the theory of "resource curse" and argue that resource abundant countries show lesser growth compared to those lacking this natural endowment (Gylfason, Herbertsson, & Zoega, 1999; Rodriguez & Sachs, 1999; Sachs & Warner, 1995). They contend that resources become a curse for the economic development because such countries wholly focus and invest on resource exploration projects and do not plan for other projects which would produce other exportable products. Contrary to this, experts and scholars who believe on the theory of "resource blessing" propose that resources rich countries regularly generate huge incomes from the export of their surplus natural resources (e.g. oil rents from the export of oil) and these incomes help them in two ways. Firstly, they use these incomes to start new mega projects which bring business and employment opportunities together. Secondly, these resources work as supporting blood for their economic development during uncertain situations (Alexeev & Conrad, 2009; Ali, 2009; Brunnschweiler & Bulte, 2008; Esfahani, Mohaddes, & Pesaran, 2013; Stijns, 2005; Van der Ploeg & Poelhekke, 2009, 2010). Thus, they believe that resources, such as oil reserves, work as "resource blessings" resulting in uninterrupted economic development, as would be the case of the oil rich countries even during the times of uncertainty. The current study considers both viewpoints regarding the "resource abundance". Since, financing for the economies of emerging countries depends more on their banking system than on capital market (Creane, Goyal, Mubarak, & Sab, 2006; Gaies, Goutte, & Guesmi, 2019; Gaies, Kaabia, Ayadi, Guesmi, & Abid, 2019) therefore, we intend to test the impact of geopolitical risk on the banking sector profitability taking to account the moderating role of oil rent in emerging markets.

Focusing on the time period from 1998 to 2017, the contribution of the current study is a nuanced understanding of the impact of geopolitical risks on banking sector profitability by accounting the weight of oil rent in 19 emerging countries, which constitutes a well-established available sample of oil dependent and non-oil dependent countries from the newly constructed Geopolitical Risk Index of 2018. Our study is first in sheding light on the moderation effect of oil rent in the relationship between geopolitical risk and banking sector profitability, thus adding to the oil "curse or blessing" debate.

The rest of the manuscript will be structured in the following manner. Section 1.2 will be devoted to the literature review and hypothesis development. In section 1.3 we will introduce our data and methodological framework. Section 1.4 will discuss empirical results and discussion. Finally, we will conclude our study in section 1.5.

## 1.2. Brief Literature Review and Hypotheses Development

### 1.2.1. Geopolitical risk and Bank Profitability

Different macro uncertainty indicators (e.g. political transition, policy uncertainty, corruption) have been used to investigate their relationship with banking sector performance. For instance, Ghosh (2016), used data from 2000 through 2012 to investigate the impact of "Arab Spring", which he used as a proxy of uncertainty, on banking sector performance in the countries of the Middle East and North Africa (MENA). Empirical findings of his study not only revealed a significant diminution in profit earnings, but also witnessed a significant surge in bank risk during the 13 year period of the study. Likewise, Şanlısoy, Aydın, and Yalçınkaya (2017) studied the impact of political riks on banks performance and reported the negative correlation of political risk and bank profitability in Turkish banks.

Recently, Ihaddaden, M. E. F. (2020) investigated the effect of macro uncertainty on the Tunisian banking sector using the "Jasmin Revolution" as a proxy. A negative impact on the Tunisian banking system over the period 2007-2017 was observed. Furthermore, Belkhir et al. (2019) conducted

a comprehensive study, covering total 35,697 of banks- year observations from listed conventional and Islamic banks throughout 1999-2013, to identify a negative association of political risk and banking performance indicators. Similarly, Lee and Lee (2019) used an international rating system of banking sector, called, CAMEL, for the period of 2000-2014 and affirmed that political stability positively impacts on bank profitability whereas political risk is negatively associated with the profitability of Chinese banks.

Various studies in the field of finance and investment indicated that investors generally choose to defer new investments and decrease expenses of existing investments during times of higher macro uncertainty (Baker et al., 2016; Gulen & Ion, 2016; Julio & Yook, 2012; Tadeu, Silva, & Jamil, 2020). Moreover, contemporary empirical evidence shows that geopolitical risk cycles more critically impact the corporations' funding decisions related to debt financing in comparison to those related to equity financing (Lee, Lee, & Xiao, 2020).They use a panel data of listed Chinese companies for a period of 5 years ranging from 2013 to 2017 to test their study hypotheses. Hence, on account of reduced investment preference, investors choose to avoid taking any debt financing that eventually decreases the profitability of banks.

Thus, the current study examines the existence of a direct relationship between a newly developed geopolitical risk index and banking sector profitability in emerging markets by testing this hypothesis:

***Hypothesis 1.1:*** *Geopolitical risk is negatively impacting the banking sector profitability.*

### 1.2.2. Geopolitical risk and Bank Profitability: The Moderating Role of Oil Rent

Literature has discussed two opposing views on the exact impact of natural resources on the overall economic growth of resource rich countries. Starting with the theory of "resource curse" or "paradox of plenty" (Gylfason et al., 1999; Rodriguez & Sachs, 1999; Sachs & Warner, 1995) it evolved to the more contemporary notion of "resource blessing" (Alexeev & Conrad, 2009; Brunnschweiler

& Bulte, 2008; Esfahani et al., 2013; Stijns, 2005; Van der Ploeg & Poelhekke, 2009, 2010) or "pleasure of the treasure" (Ali, 2009).

Richard (1993), introduced the "resource curse" theory in his book "Sustaining Development in Mineral Economies: The Resource Curse Thesis". He argues that not only do resources fail to make favourable contributions to the economic development of many developing countries; but that indeed the economy in resources rich countries performs worse than in resource poor countries.This argument was the basis for "resource curse" studies. The "Resource curse" literature commonly argues that when an abundance of natural resources fails to bring economic and societal growth and turns out to be a liability, then natural resources are not a "blessing", but rather a "curse" (Congleton, Hillman, & Konrad, 2008).

The theory of "resource blessing" contradicts the concept of "resource curse". It looks to the logic of using the treasure of resources to foster economic activity and the banking system. A state might exploit it's under the earth resources, for example oil, and use them to develop human resources through industrialization which can be used to further the state's economic growth, (Asif et al., 2020; Venables, 2016). A meta-analytic study of Havranek, Horvath, and Zeynalov (2016) on empirical researches of two decades, refuted the "resource curse" theory. They reported that sufficient volume of past studies have established a positive correlation between resource generated revenues (e.g. oil rents) and the economic development of the country. Findings of Havranek et al. (2016) meta-analysis demonstrated that when it comes to "resource curse", oil is less vulnerable as compared to other resources like valuable metals and diamonds. Some contemporary studies further supported the "resource blessing" theory while discussing the impact of resource wealth on economic growth (Adams, Adams, Ullah, & Ullah, 2019; Alexeev & Conrad, 2009; Asif et al., 2020; Smith, 2015; Venables, 2016). Similarly, de. V. Cavalcanti, Mohaddes, and Raissi (2011), covered a period of 27 years from 1980 to 2006 for 53 countries from a yearly managed database of "World Bank" (i.e. World

Development Indicators), and confirmed, these oil exporting states jointly represent 85% of global GDP, a 77% share of world's daily oil production and 81% of proven oil reserves worldwide. This worldwide economic share of oil exporting states supports the notion of "resource blessing" for oil rent. Additionally, oil based earnings facilitates the starting of mega projects of industrializations for petro-states (oil rich states), which eventually improves economic activity and banking sector performance.

According to previous studies, geopolitical risks lead to oil price fluctuations and a significant increase in oil prices can result from a substantial and serious geopolitical risk shock (Abdel-Latif & El-Gamal, 2019). Moreover, consumer preferences in the oil sector and the stock market strategies of investors are also influenced by geopolitical risk (Noguera-Santaella, 2016). Similarly, Mei, Ma, Liao, and Wang (2020) used the econometric regression model of mixed data sampling (MIDAS) to test the contextual impact of a geopolitical risk index. Their study uncovered the impact of geopolitical uncertainty on future unpredictability of oil prices and found that the GPR index is valuable for the prediction of increases in future oil prices.

Omar, Wisniewski, and Nolte (2017), related oil price surges with uncertainty (e.g. geopolitical risk). They discuss three factors. First, countries increase oil buying to avoid the effects of any supply cut in the future that may hinder all types of transport facilities. Second, countries which aspire to defend their independence and preserve energy needs might build up oil storage during political unrest. Third, the expected future oil purchase restrictions coming from its use as a combat weapon during international conflicts, forces countries to buy surplus oil. Likewise, Bouoiyour, Selmi, Hammoudeh, and Wohar (2019) asserted a significant and positive impact of times of uncertainty geopolitical risk on oil prices. This effect is highly anticipated, considering that geopolitical risk is troubling in oil rich countries and poses key question on their capacity to maintain long-term supply to the international market in times of increased crises or conflicts, which could have significant consequences for the

evolution of oil prices (Bouoiyour et al., 2019). This surge in oil price provides an opportunity for oil dependent countries to earn more oil rent during periods of geopolitical risk that might improve government spending and eventually result in more economic and financial activities in these oil dependent countries.

Moreover, Su, Khan, Tao, and Nicoleta-Claudia (2019), discussed the impact of oil prices on the liquidity situation of financial institutions in a major oil dependent country, Saudi Arabia, and proved that higher oil prices are an antecedent of higher financial liquidity. While increases in oil prices yield stronger financial liquidity, reductions in oil prices can result in liquidity problems for financial institutions, and serious economic disaster for an oil dependent country like Saudi Arabia (Su et al., 2019). Hence, financial liquidity in oil dependent countries increases when oil prices rise due to geopolitical risk. Therefore, oil rent of oil dependent countries not only mitigates the bad impact of geopolitical risk on bank profitability but might help banks which operate in oil dependent countries to continue profit generation with an increasing rate.

Thus, based on the above literature and theory of "resource blessings" we make our next hypothesis:

***Hypothesis 1.2:*** *Oil rent attenuates the negative impact of geopolitical risk on banking sector profitability***.**

## 1.3. Data and Methodological Framework

### 1.3.1. Data

In our study, we performed our quantitative analysis on the population of emerging countries included in the GPR index (Caldara & Iacoviello, 2018). This newly developed index covers 19 emerging countries with different economic natures. Since our current study attempts to investigate the impact of geopolitical risk on bank profitability for oil dependent and non-oil dependent countries, a representation of oil dependent and non-oil dependent countries in the GPR index makes it a fit sample for our analysis. In our empirical analysis, due to data availability, we cover the period 1998 - 2017. Our merged dataset, consists of the GPR index obtained from Matteo Iacoviello database.

Banking sector measures and macroeconomic indicators were collected from the St. Louis Federal Reserve Bank, which is amongst the 12 national reserve banks of the US Central Bank and provides reliable banking sector and macroeconomic data. Annual data on a country's oil rent has been collected from the World Bank database. Moreover, annual reports of the IMF were collected to supplement our data, further improving the reliability and validity of our study sample.

### 1.3.2. Variable definitions and measurement

In line with previous literature, we use country-level annual data on banking sector Return on Asset (ROA) as our measure of banking sector profitability. To capture geopolitical risk, we use the annual country average of geopolitical risk index (GPR) proposed by Caldara and Iacoviello (2018). This measure was constructed by Caldara and Iacoviello (2018) through an analysis of a series of newspapers that cover all global incidents since 1985 (i.e., plane hijackings, Iraq invasion). The use of this measure in recent literature provides enough support for the reliability of this index (Caldara & Iacoviello, 2018). The annual oil rent (OilR) was used to gauge an economy's reliance on its oil sector, with our oil rent variable representing the net contribution of oil proceeds to a country's GDP. Due to the skewness in the continuous variables and zero values encountered, we have transformed variables by using the inverse hyperbolic sine transformation. Table 1.1 illustrates the descriptions, measurements, and sources of all variables used in this study. In line with prior studies, we additionally control for macro-environmental and banking sector-specific variables, namely: Gross Domestic Product (GDP), inflation, exchange rate, non-performing loans, and bank deposits.

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*Insert Table 1.1 about here*

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### 1.3.3. Methods

This paper aims to identify whether the banking sector performance is affected by GPR differently given a country's economics nature. More precisely, we aim to investigate whether the banking sector in oil dependant countriesis affected by GPR. To tackle this question, we aim to

identify whether there is an oil rent threshold beyond which GPR is positively associated with banking sector performance.

The impact of geopolitical risk on the banking sector performance is examined by we employing a fixed-effects panel data regression model, with which heterogeneity is controled for[1]. This model controls for possible omission of country-specific traits which might result in incoherent and incorrect estimates due to endogenous problems (Farag & Mallin, 2017). To test Hypothesis 1.1, the following panel data econometric model will be employed :

$$\pi_{jt} = \alpha_i + \beta_1 GPR_{jt} + \sum_{k=1}^{K} \delta_k X_{it}^k + \sum_{l=1}^{L} \theta_l X_{jt}^l + \epsilon_{jt} \quad (1)$$

To address the potential moderating effect of oil rent as proposed by Hypothesis 1.2, the following estimation will be performed:

$$\pi_{jt} = \alpha_i + \beta_1 GPR_{jt} + \beta_2 OilR_{jt} + \beta_3 GPR_{jt} \times OilR_{jt} + \sum_{k=1}^{K} \delta_k X_{jt}^k + \sum_{l=1}^{L} \theta_l X_{jt}^l + \epsilon_{jt} \quad (2)$$

where:

$\pi_{jt}$ =Profitability (*ROA*) of the banking sector of country ***j*** at the end of the year ***t***.

$GPR_{jt}$=Geopolitical risk index (*GPR*) of country ***j*** at the end of the year ***t***.

$OilR_{jt}$=Oil rent (*OilR*) of country ***j*** at the end of the year ***t***.

$X_{jt}^k$ =K control variables related to the banking industry characteristics of the banking sector of country ***j*** at the end of the year ***t***.

$X_{jt}^l$ = L control variables related to macroeconomic conditions of country ***j*** at the end of the year ***t***.

[1] The model selection is performed according to the Hausman test that is set for assessment of fixed and random effects. The findings of the test do not show correlation between errors and repressors and refute the null hypothesis statement. This provides a rational of choosing fixed effect model against the alternative random effect model.

For robustness checks and further validity of our empirical results, we split our sample given the oil rent threshold identified by equation (2). Then we repeat the estimation model presented in equation (1) for oil dependant and non-oil dependant economies separately.

## 1.4. Empirical Results and Discussion

### 1.4.1. Descriptive Statistics

Table 1.2 shows the mean, standard deviation, maximum, and minimum values for the variables of the current study. As a result, the banking sector return on asset (ROA) reaches a mean of (0.90), a astandard deviation value of (2.57), while the maximum value is (7.04), and a minimum value of (-29.11). The geopolitical risk index (*GPR*) mean value is (98.46). It touches a standard deviation of (24.78), and a maximum value touches (261.26), with a minimum value of (38.47). The annual mean value of economic growth (*GDP*) of the sample is (0.047), with a standard deviation reaching (0.17). The average maximum value of the economic growth rate is (0.34), while the minimum value is (-1.75). With regards to oil rent (*Oil*R), it reaches a mean value of (4.56), a standard deviation value of (9.28), a maximum of approaching (54.26), and a minimum value of (0).

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*Insert Table 1.2 about here*

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### 1.4.2. Estimation Framework

#### 1.4.2.1. Multicollinearity Problem Tests

Before proceeding with testing our hypothesis, we perform Pearson's correlation to check for any potential causes of concern regarding multicollinearity. Pearson's correlation best defines the correlation for interval data. Table 1.3 provides the correlation coefficients matrix for all the study variables including the control variables. The multicollinearity values of these correlation coefficients exhibit relatively weak correlations amongst the variables as we noted 0.2840 as the highest value of a correlation coefficient, which reassures us that multicollinearity should not pose any concerns in our

analysis. Multicollinearity problem can only be declared when the value of Pearson correlation coefficients amongst explanatory variables surpasses the upper limit of 0.80 (Gujarati & Porter, 2003).

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*Insert Table 1.3 about here*

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**1.4.2.2. Emperical Estimation**

In our analysis, we aim to test for our first and second hypotheses and in so doing identifying whether there is an oil rent threshold beyond which GPR is positively associated with banking performance. We run a fixed effect panel data regression. Table 1.4 reports the fixed effect panel data regression results.

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*Insert Table 1.4 about here*

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Model 1 shows the results of the banking sector's profitability regressed on all control variables. As a result, Model 1 reports that all control variables (GDP, Inflation, exchange rate, non-performing loans, and bank deposits) are significantly associated with banking sector profitability. As seen in Model 1, the relationship between GDP and ROA and the exchange rate and ROA are positively significant at ( $p$ <.01), while the relationship between ROA and the other control variables such as inflation, non-performing loans, and bank deposits are negatively significant. These results are consistent with previous literature on the relationship of these macroe-economic variables and banking sector profitability (Al-Homaidi, Tabash, Farhan, & Almaqtari, 2019; Bhattarai, 2018; El-Chaarani, 2019; Zampara, Giannopoulos, & Koufopoulos, 2017).

In Model 2, we add GPR and oil rents to the control variables presented in Model 1. As proposed by Hypothesis 1.1, we find supporting evidence that geopolitical risk is negatively impacting banking sector performance (B= -.012, $p$ < .05). This result is aligned with prior empirical findings

on the negative effects of macro-level uncertainty on banking performance (Ghosh 2016; Belkhir, Grira, Hassan, and Soumaré 2019; lee & lee 2019). Model 2 better explains a larger percentage of the variation in our dependent variable relative to Model 1 as depicted by the increase in the R-squared (increases from 38.01% to 39.45%).

In Model 3, we add an interaction term GPR x Oil Rents to Model 2 presented earlier. This is done to investigate the moderating role of oil rent in mitigating the adverse effects of GPR. Results show that oil rents moderate the relationship between GPR and banking sectors performance (B=.01, $p$ <.01). The positive significant coefficient supports our argument that oil rent mitigates the adverse effect that GPR has on the banking sector performance. Given that, prior literature argued the role of natural resources "curse or blessing" in different settings implicitly on economic performance, this study shows primary evidence that oil rent as a natural resource serves as a blessing in terms of alleviating the adverse effects of geopolitical risk.

Worth mentioning is also that looking at the coefficient of the interaction term alone is not sufficient. Ai and Norton (2003) suggest the need to complement such an analysis with a plot of the marginal effects. In Figure 1.1, we present the marginal effects of GPR on banking sector performance given different levels of oil rent. As we can see from the plot, there is an oil rent threshold beyond which GPR is positively associated with banking sector performance. Specifically, GPR exhibits a negative association with banking sector performance for countries with oil rents below 1.86%. In contrast, for countries with higher levels of oil rents, GPR exhibits a positive relationship with banking sector performance. Model 3 explains a higher percentage of the variation in our dependent variable as shown by the increase in the R-square value. Relevant prior studies reported rather lower $R$-square values (Al Shboul, Maghyereh, Hassan, & Molyneux, 2020; Bitar, Madiès, & Taramasco, 2017; Effendi, 2019; Safiullah & Shamsuddin, 2018; Zins & Weill, 2017).

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*Insert Figure 1.1 about here*

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#### 1.4.2.3. Robustness checks

After identifying the oil rent threshold in Model 3, we proceed to robustness checks to further validate our empirical results and introduce a dummy variable for countries above the specified threshold (1.86%). *Oil dependant Dummy* equals 1 for countries with average oil rents above the specified oil rent threshold and 0 otherwise. This is used to further test whether GPR exhibits a positive association with banking sector performance for oil dependant countries. Estimation results are presented in Table 1.5.

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*Insert Table 1.5 about here*

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It can be noted from Model 4 that geopolitical risk (GPR) has a significantly negative impact on the banking sector's profitability (ROA) for non-oil dependant countries while exhibiting a positive association with the banking sector performance for oil dependant countries as shown by the interaction term. This is illustrated in Figure 1.2 below. We can observe from the plot that for non-oil dependant countries the relationship is negative as shown by the downward sloping line. In comparison, the positive association of GPR and banking performance for oil dependant countries is shown by the upward sloping line. Thus, oil rent alleviates the adverse effects of geopolitical risk on banking sector profitability for oil dependent countries. Hence, providing additional support for Hypothesis 1.2.

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*Insert Figure 1.1 about here*

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As a follow-up, we proceed by splitting our samples into oil and non-oil dependant countries. The distinction is made upon a holistic notion of dependency, which integrates both the straightforward participation of oil rents on total GDP, along with the observed robustness that oil rents provide to the banking sector when exposed to GPR. This rends a group of 12 countries which are identified as non-oil dependent economies, with 7 countries being included in the group of oil dependent economies. Model 5 and 6 report the results of the split sample. In Model 5 with the non oil dependent economies, we observe that geopolitical risk is negatively associated with banking sector performance (B=-.02, $p$ <.01). This is inline with prior findings and supports Hypothesis 1.1. Contrary to prior findings, in Model 6 our analysis shows that geopolitical risk is positively associated with banking sector performance (B=.03, $p$ <.05) for oil dependent economies. The remaining control factors exhibit the same relationship with banking sector performance for both oil and non-oil dependant economies. It should be noted that Model 6 reports the highest *R*-squared level, with our model being able to explain 58% of the variation in the banking sector performance for oil dependant economies.

Empirical results show that oil rent in oil dependent countries not only extenuate the negative impact of geopolitical risk on banking sector profitability but actually helps banks to generate profits. The possible reason could lay on the specific dynamics of geopolitical risk and the oil price nexus. According to a previous study, a significant increase of oil prices is likely due to a substantial and serious geopolitical risk shock (Abdel-Latif & El-Gamal, 2019). Moreover, oil sector's consumer preferences, investment strategies of investors and their decision making techniques are also sensitive to geopolitical risk (Noguera-Santaella, 2016). Similarly, Mei et al. (2020), used a mixed data sampling econometric regression model technique (MIDAS) developed by Ghysels, Santa-Clara, and Valkanov (2004) and Ghysels, Sinko, and Valkanov (2007), for conducting a study dealing with the contextual

impact of geopolitical risk index. Their study uncovered the impact of geopolitical uncertainty on future oil prices and found that GPR index worth is proven for the prediction of increase in future oil prices.

## 1.5. Conclusion and Policy Implications

Using an annual macro-level dataset for 19 emerging economies from the period 1998-2017, the current paper investigates and compares the impact of geopolitical risk on the banking sector's profitability of oil and non-oil dependent countries. We used the return on assets as a measure of banking sector profitability and regressed it using fixed effect panel estimations on the geopolitical risk wheel accounting for banking sector and country macro-level control variables. The empirical findings show a significant negative impact of geopolitical risk on banking sector profitability in emerging markets, which support our first hypotheses. Furthermore, we find a significant moderation effect of oil rent in the relationship of geopolitical risk and banking sector profitability. Particularly, oil rent is weakening the negative relationship between geopolitical risk and banking sector profitability, which supports our second hypothesis. To further validate our empirical results, we split our sample and find a significant positive association between geopolitical risk and banking sector profitability in oil-dependent countries.

As for policy implications, primarily, policymakers of emerging oil dependent economies should comprehend that geopolitical risk, especially terrorism, is not easy to foresee, and a country affected by such unforeseen geopolitical shock might trigger its persistent cash flow to and from its banking system. Secondly, the potential distraction in the oil rent of oil dependent countries is expected because of such geopolitical tensions. For instance, terrorist attacks in the Saudi oil facilities triggered a significant impact on its oil revenues (i.e. oil rent) in 2019. Based on energy-related geopolitical viewpoint, the current study further recommends that legislators of oil reliant emerging

countries should speed up the worldwide energy shift, improve decarbonization cycles, boost renewable energy production, and reduce their extreme oil dependence for economic development because oil related geopolitical tensions particularly have increased dramatically in recent decades. They might achieve this by investing a portion of oil generated revenues (i.e. oil rent) in nonoil renewable and sustainable energy megaprojects which may result in diversified economic dependence. Another feasible investment avenue is to launch public-private partnership (PPP) mega projects to draw massive future investments from investors of economically developed markets. Consequently, emergent economies may benefit from technological transition and possible enormous banking sector cash inflows.

Regarding the study limitations and avenues for future research. We have used macro-level indicators of banking sector performance, which is a limitation. Micro-level data could further validate our results. Modern literature has shown that Islamic banks are less exposed by macro uncertainty (Al Shboul, Maghyereh, Hassan, & Molyneux, 2020; Belkhir et al., 2019). By employing micro-level data a comparison study between Islamic and conventional banks would reveal interesting results. Furthermore, we have used the whole population of the newly built geopolitical risk index for emerging economies (Caldara & Iacoviello, 2018). Expanding the sample and comparing developed to developing economies could be another outlet for future research.

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# Tables

## Table 1.1 Description, Measurement, and Sources of our data

| Variable | Description | Measurement | Sources |
|---|---|---|---|
| Return on Assets (ROA) | Bank profitability | Commercial bank's net income of country (j) to yearly averaged total assets of the year (t) | FRED Database |
| Geopolitical Risk Index (GPR) | Geopolitical Risk | Geopolitical risk index for the country (j) of the year (t) | Source: Iacoviello (2019)[2] Methodology: Caldara & Iacoviello (2018) |
| Oil Rents | Contribution of Oil to GDP | Contribution of Oil to GDP for the country (j) of the year (t) | World Bank Data |
| Gross Domestic Product % (GDP) | Economic Growth | Annual (GDP) growth for the country (j) of the year (t) | FRED Database |
| Inflation | Inflation Rate | Inflation rate of the country (j) of the year (t) | International Monetary Fund |
| Exchange Rate | Exchange Rate | Exchange Rate of country (j) of the year (t) | FRED Database |
| Non-performing loan | Non-performing loan | Non-performing loan of Commercial bank's for the country (j) of the year (t) | FRED Database |
| Bank Deposits | Bank Deposits | Bank Deposits of Commercial bank's for the country (j) of the year (t) | FRED Database |

[2] The full database can be found in: https://www.matteoiacoviello.com/gpr.htm. Accessed 01/11/2019

## Table 1.2. Descriptive Statistics

| Variable | Mean | S.D. | Min | Max |
|---|---|---|---|---|
| Return on Assets (ROA) | .9076828 | 2.5733 | -29.1169 | 7.0444 |
| Geopolitical Risk Index (GPR) | 98.46662 | 24.78173 | 38.47771 | 261.2572 |
| Gross Domestic Product % (GDP) | .0474331 | .1781574 | -1.749547 | .3410681 |
| Oil Rents | 4.563557 | 9.287083 | 0 | 54.26021 |
| Inflation | 8.844947 | 18.11994 | -4.0094 | 254.948 |
| Exchange Rate | 688.0457 | 2249.78 | .2648796 | 13795 |
| Non-performing loan | 6.748544 | 7.670117 | .484156 | 54.5413 |
| Bank Deposits | 57.13817 | 57.38609 | 5.97223 | 353.393 |

## Table 1.3 Correlation Matrix

| Variable | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Return on Assets | 1.0000 | | | | | | | |
| 2 | Geopolitical Risk Index | -0.2309 | 1.0000 | | | | | | |
| 3 | Gross Domestic Product | 0.2840 | -0.1546 | 1.0000 | | | | | |
| 4 | Oil Rents | 0.2174 | -0.0056 | 0.0843 | 1.0000 | | | | |
| 5 | Inflation | -0.0982 | 0.0840 | -0.2182 | -0.0340 | 1.0000 | | | |
| 6 | Exchange Rate | -0.0973 | -0.1544 | -0.0100 | -0.0536 | -0.0100 | 1.0000 | | |
| 7 | Non-performing loan | -0.5326 | 0.2376 | -0.2504 | -0.1180 | 0.2280 | 0.0847 | 1.0000 | |
| 8 | Bank Deposits | -0.0215 | -0.0179 | -0.0173 | -0.2396 | -0.1758 | -0.1198 | -0.1427 | 1.0000 |

## Table 1.4 Fixed Effects Panel Estimation Results

| | **Dependent Variable: Banking Sector Profitability (ROA)** | | |
|---|---|---|---|
| | Model (1) | Model (2) | Model (3) |
| Geopolitical Risk Index (GPR) | | -0.0112** | -0.0199*** |
| | | (0.0049) | (0.0061) |
| Oil Rents | | 0.5899 | -0.3871 |
| | | (0.3639) | (0.5469) |
| GPR x Oil Rents | | | 0.0102*** |
| | | | (0.0043) |
| Gross Domestic Product % (GDP) | 0.0354*** | 0.0102*** | 0.0303*** |
| | (0.0079) | (0.0081) | (0.0081) |
| Inflation | -0.0332*** | -0.0321*** | -0.0346*** |
| | (0.0130) | (0.0129) | (0.0128) |
| Exchange Rate | 0.0011*** | 0.0011*** | 0.0011*** |
| | (0.0002) | (0.0002) | (0.0002) |
| Non-performing loan | -0.1643*** | -0.1555*** | -0.1575*** |
| | (0.0183) | (0.0184) | (0.0183) |
| Bank Deposits | -0.0133** | -0.0115** | -0.0130** |
| | (0.0075) | (0.0075) | (0.0074) |
| Constant | 1.8900*** | 2.1064*** | 3.0157*** |
| | (0.5931) | (0.9597) | (1.0268) |
| N Observations | 361 | 361 | 361 |
| R-Squared | 0.3801 | 0.3945 | 0.4046 |

** p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01*

## Table 1.5. Fixed Effects Panel Estimation Results

| | **Dependent Variable: Banking Sector Profitability (ROA)** | | |
|---|---|---|---|
| | Model (4) | Model (5) | Model (6) |
| Geopolitical Risk Index (GPR) | -0.0174*** | -0.0213*** | 0.0315** |
| | (0.0055) | (0.0046) | (0.0124) |
| GPR x Oil Dependent Dummy | 0.0274** | | |
| | (0.0114) | | |
| Gross Domestic Product % (GDP) | 0.0333*** | 0.0163** | 0.0475*** |
| | (0.0079) | (0.0084) | (0.0154) |
| Inflation | -0.0345*** | -0.0207** | -0.0461** |
| | (0.0128) | 0.0131 | (0.0128) |
| Exchange Rate | 0.0011*** | 0.0002** | 0.000877*** |
| | (0.0002) | (0.0035) | (0.0002) |
| Non-performing loan | -0.1615*** | -0.1068*** | -0.286*** |
| | (0.0183) | (0.0182) | (0.0385) |
| Bank Deposits | -0.0133** | -0.0064** | -0.0130** |
| | (0.0075) | (0.0064) | (0.0074) |
| Constant | 2.7081*** | 4.0149*** | 0.7901 |
| | (0.7790) | (0.8052) | (1.9027) |
| N Observations | 361 | 228 | 133 |
| R-Squared | 0.3801 | 0.2955 | 0.5754 |

** p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01*

# Figures

**Figure 1.1 Marginal effects of GPR**

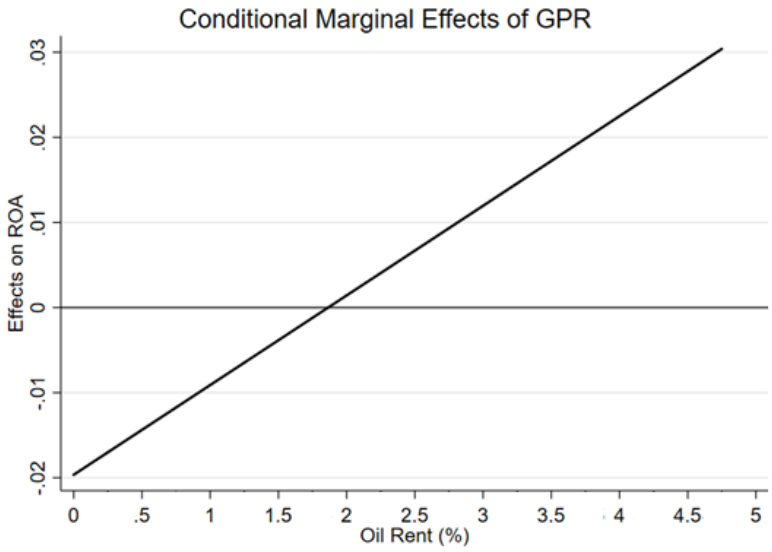
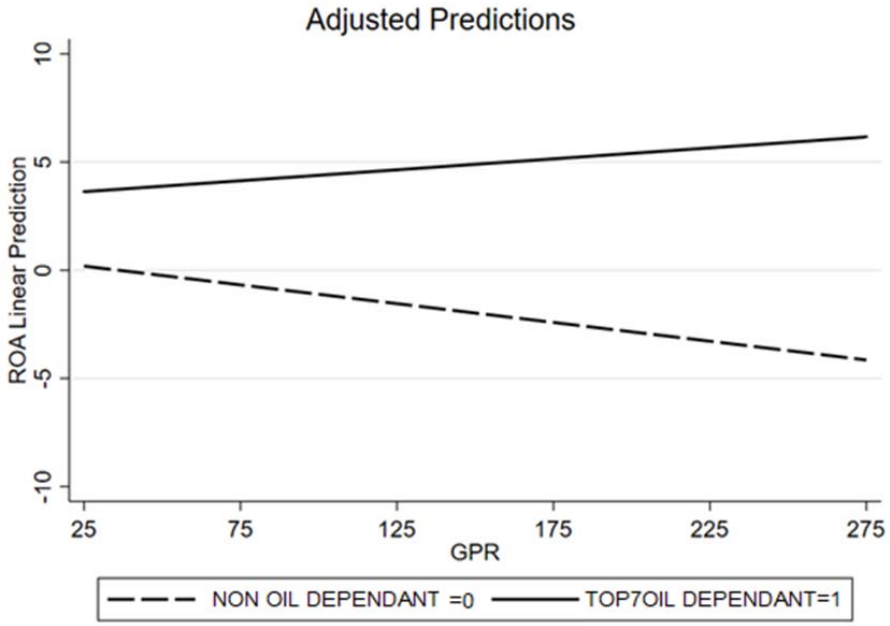


**Figure 1.2 GPR and oil dummy interaction**



# Chapter 2: The Impact of Financial Development and Geopolitical Risk on Renewable Energy Consumption: Evidence from Emerging Markets

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## Abstract

In the past three decades, the significance of large industrialized emerging economies has been highlighted. In terms of economic productivity and CO2 emissions, these markets play an important role in the global environment. Hence, to achieve global environmental needs, transition to renewable energy sources is essential. However, financial constraints along with geopolitical risks could act as possible barriers to the required transition. Thereby, in this paper we aim to assess the impact of financial development and geopolitical risk on renewable energy consumption in emerging markets from 1996 to 2015. A two-step system GMM is tested, revealing a positive significant effect of financial development on transition to renewable energy. Moreover, contrary to the expected negative effect of geopolitical risk, our results reveal significant positive effect of geopolitical risk on renewable energy consumption. We highlight that the effects of both financial development and geopolitical risk are more pronounced in the long run. Finally, imperative policy implications are highlighted.

**Keywords:** *Renewable energy consumption, Financial development, Geopolitical risk, Emerging markets, Two-step system GMM.*

**Jel Classification:** Q41; Q42; Q43;P48.

## 2.1. Introduction

Energy consumption is the root of development for any country (Belke, Dobnik, & Dreger, 2011; B. Zhang, Wang, & Wang, 2017). However, it also accounts for a significant amount of greenhouse gas emissions (GHG). Carbon dioxide discharge has increased globally in few years (Kahia, Jebli, & Belloumi, 2019; Seetanah et al., 2019). Developing countries' fossil fuel combustion obtrusively contribute to these emissions. For instance, according to Climate Watch Data (Historical GHG Emission, 2016) statistics, China ranks first in the list of the top 10 emitters from 2006 to 2016 with more that 24% of worldwide greenhouse gas emissions alone in 2016. Taking into account other developing countries, such as Brazil, India, Indonesia, Iran and Russia, which are also included in the list of top 10 emitters for a decade, they collectively emitted more than 45% of the GHG in 2016. This has serious implications for human beings and the economy (Acheampong, 2019; Alshehry & Belloumi, 2017; Mezghani & Haddad, 2017). According to Apergis and Garzón (2020) policymakers are committed to design policies and take national initiatives which help in reducing the adverse impacts of GHG emissions on global environment.

Although historical and ongoing pollution is a significant health hazard in developed countries, the encumbrance of this issue is greater in emerging nations. In these nations, rapidly growing population and industrialization in conjunction with urbanization has led to industrialized mega cities with poor environmental quality (Bertazzi, 2013; Mannucci & Franchini, 2017). Additionally, in rural areas of such countries people are unprotected from dense indoor pollution because they use coal, wood and other cheaper agricultural energy resources due to poor financial situations (Smith et al., 2014; Smith & Mehta, 2003). This has left emerging markets in a quest for cleaner and more secure energy resources (Lidula, Mithulananthan, Ongsakul, Widjaya, & Henson, 2007; Tolón-Becerra, Lastra-Bravo, & Bienvenido-Bárcena, 2011).

Developing renewable energy and modernizing older energy infrastructures significantly back accomplishment of developing world's climate change commitments. This makes the growth of renewable and cleaner energy sources increasingly relevant for these economies. Indeed, political leadership of emerging markets made considerable strides to accomplish renewable energy development targets.

Transitioning to renewable sources of energy involves significant financial investments in new energy infrastructures. However, the relationship between financial development (FD) and renewable energy consumption (REC) is complex and remains unclear. Some studies argue that renewable energy consumption enhances financial and economic development (Kemmler & Spreng, 2007; Vasylieva, Lyulyov, Bilan, & Streimikiene, 2019). Whereas, other extant literature found that FD spurs REC (Apergis, Alam, Paramati, & Fang, 2020; Ji & Zhang, 2019; Qamruzzaman & Jianguo, 2020). Since developed countries work on zero-carbon emission plan (for example see Shahbaz, Nasir, Hille, & Mahalik, 2020), emerging economies still account for a significant portion of GHG emissions worldwide (Apergis & Garzón, 2020; Chen et al., 2020). Therefore, we intend to highlight the relationship between FD and REC in emerging countries.

Considering financial constraints as prevalent challenge of renewable energy industry of emerging markets (see Ji & Zhang, 2019), researchers have accentuated the significance of financial support for the success of clean energy ventures in China (S. Zhang, Andrews-Speed, Zhao, & He, 2013). Indeed, the renewable energy sector demands diverse funding sources; for example, D. Zhang, Cao, and Zou (2016), argue that equity financing is appropriate for technology related small projects; whereas, nuclear energy related mega ventures need debt financing from banks. Hence, transitioning to renewable energy sources cannot be accomplished without a well-developed financial system. Previous studies saw the renewable energy consumption through a glass of economic development

while discussing the bidirectional causal relationship of economic and FD with the REC (e.g. Ohler & Fetters, 2014; Salim & Rafiq, 2012).

Although the idea of FD and REC has attracted scholarly attention, the contextual scope of the literature remains obscured by the countries analyzed. (for example Burakov & Freidin, 2017; Ji & Zhang, 2019; Khoshnevis Yazdi & Shakouri, 2017 studied single country context for Russia, China and Iran respectively), multi-country studies focus mainly on developed economies (Topcu & Tugcu, 2020; Tugcu, Ozturk, & Aslan, 2012; Yildirim, Saraç, & Aslan, 2012) whereas the focus on emerging market is still limited. Hence, we still lack a clear understanding of the dynamics of this relationship for emerging markets that disproportionately contribute to GHG emissions worldwide. According to United Nations report, the lack of international support has made less developed economies at risk to the Covid-19 pandemic (UN, 2020). Additionally, with the ongoing health crisis, it would be even harder to mobilize external funding or technical transformation to support cleaner energy plans in those countries (Barbier & Burgess, 2020). In absence of foreign external financial support, emerging and developing economies are in ever higher need of finding domestic innovative financing solutions. Thus, this situation enhances the importance of clear understanding of FD-REC nexus.

Beside financial development, geopolitical risk is significant in the process of energy transition for emerging markets. Caldara and Iacoviello (2018) define geopolitical risks as the risks associated with armed fights, terrorism and state-to-state conflicts which impact regular and diplomatic level international affairs. Geopolitical risks create an atmosphere of uncertainty and unrest. This uncertainty drives firms to put their future plans on hold which reduce current production to their minimum capacity in anticipation of lower consumption. This dimension has been used by Carney (2016) along with economic and policy instability proxies to discuss the adverse economic consequences of this triad of instability. Major players of economic activities (bankers, equity market traders, and industrialists) believe that geopolitical risks change the dynamics of capital markets and

slow the decision making speed of investors (Caldara & Iacoviello, 2018). Furthermore, geopolitical risk is a two-sided sword for economy, on one side it may adjourn consumers' usage, and on the other side it stops companies from making investments in an attempt to maintain a minimum level of protective savings (Bloom, 2009). Hence, it is argued that geopolitical risks are lead indicators to economic and business swings.

It goes without saying, emerging economies are most prone to abrupt shifts in trade and capital flows (Cheng & Chiu, 2018). Considering the significance of GPR and its impact on investment plans, production rate and overall economy, we aim to extend the literature by investigating the impact of FD and geopolitical risk on the REC in a sample of 19 emerging markets for a time period of 20 years from 1996. In our analysis, we consider several proxies of FD (from banking sector and capital markets) and the novel GPR index of Caldara and Iacoviello (2018) alongside macroeconomic controls. Our empirical strategy involves adopting the two-step system GMM to control for endogeneity problems, which are a common phenomenon in such studies. Furthermore, we complement our analyses by computing the long run elasticities for the main variables of interest (financial development, geopolitical risks).

The contribution of this paper is multifold. Firstly, the current study addresses the importance of renewable energy consumption in the context of emerging economies and emphasizes how enhancements in renewable energy consumption helps emerging economies fulfill their responsibilities in combating climate challenges. Secondly, we discuss the role of financial development on renewable energy consumption which not only enhances the FD-REC literature but helps policymakers of emerging countries in designing realistic energy transition plans without affecting their production targets. Thirdly, considering the uncertain political situation of most of the developing countries, the present study reveals how geopolitical risks, as proxied for by the novel GPR index, also impact the consumption of renewable energy in these countries. Our last contribution

resides in the study sample and methodology, namely, a comprehensive inclusion of 19 emerging economies for a period spanning twenty years (1996 – 2015) using a two-step system GMM model.

The rest of the manuscript is arranged accordingly. In the next section (2.2) we review the relevant literature. We then introduce data, model, and methodology in section 2.3. Section 2.4 is devoted to the estimation framework used. Finally, in section 2.5, we present the policy implications of our study.

## 2.2. Relevant Literature

### 2.2.1. Financial Development and Renewable Energy Consumption

Changing climate as a result of nonrenewable energy consumption brings a harmony in the emerging world to increase renewable energy consumption and decrease fossil fuels usage (Ji & Zhang, 2019). Rafindadi and Ozturk (2017), argued clean energy make substantial contribution to overall environment friendly accomplishments because consumption of renewable energy delivers secure human and environment growth as a sustainable source. Despite an upward trend of global consumption (International Energy Outlook, 2013), the proportion of renewable energy usage in developing countries is still low. A significant volume of recent literature highlighted the importance of renewable energy consumption (Ali, Khan, & Khan, 2018; Omri & Nguyen, 2014; Zhao & Luo, 2017). New clean energy projects witness substantial investments (Bloomberg New Energy Finance, 2014) but FD continues to be a big concern in REC (Ji & Zhang, 2019).

According to Sadorsky (2010), FD removes the financial risks, minimizes the cost of credits and facilitates transparent accountability. These outcomes of FD have good effects on cost of clean energy and respectably highlights the importance of FD in consumption of renewable energy (Anton & Nucu, 2020). Financial sector developments enhance usage of renewable energy (Khan, Khan, & Binh, 2020; Mukhtarov, Humbatova, Hajiyev, & Aliyev, 2020; Qamruzzaman & Jianguo, 2020). According to Pata (2018) FD positively affects economic and economic growth may increase environmental pollution. However, by supporting the usage of new technologies and enforcing the

climate control regulations, FD mitigates its negative impacts on environment (Pata, 2018). Moreover, REC also reduces CO2 emmission (Liu, Ma, Ren, & Zhao, 2020) and improves economic growth (Khoshnevis Yazdi & Shakouri, 2017). Likewise, Apergis (2019) argued that that renewable is the cornerstone for combating environment change caused by massive energy usage.

Both banking and stock market developments are important for enhancement of renewable energy consumption. On the one hand, the banking sector derives funds for production of green energy. On the other hand, a sound stock market attracts new investors, which can mobilize extra resources to support energy investments and build reliance in the financial system that in turn increases energy requirement (Sadorsky, 2010). For instance, Alsaleh and Abdul-Rahim (2019) found a positive nexus between financial markets and bio-energy consumption in developing countries whereas in developed countries this relationship is positive for both financial markets and financial institutions.

Therefore, some researchers discuss the causal relationship between FD and renewable energy consumption (e.g. Ari & Cergibozan, 2017) but most of them included FD in the list of factors which may influence energy consumption transition. For instance, Lin, Omoju, and Okonkwo (2016) have reported a positive correlation of FD with REC in the Chinese context. Paramati, Ummalla, and Apergis (2016), took sample of 20 countries between 1993 and 2012 and analyzed the influence of both FD (i.e. stock market) and FDI respectively on clean energy consumption and demonstrated that development in each stock market and FDI has a significant role to play in rising the use of renewable energy. Similarly, the development in financial structure offers less costly funds to businesses and government for green climate ventures through renewable energy consumption (Zagorchev, Vasconcellos, & Bae, 2011).

Following the same line, Wu and Broadstock (2015), have demonstrated that renewable energy positively affected by both, FD and institutional quality, based on data from 22 countries between 1990 and 2010. Likewise, Best (2017) used data from as many as 137 countries to investigate the

impact of FD on overall energy consumption and found that high-income economies shifting from non-renewable to renewable energy consumption because of their financial development. Kutan, Paramati, Ummalla, and Zakari (2018), covered Brazil, China, India and South Africa, for the time span of 1990 to 2013 to examine the effect of FDI inflows and development of stock markets on the usage of renewable energy and findings of their different panel data analyses methods, such as, Fisher-Johansen panel cointegration, fully modified ordinary least squares - OLS and panel non-causality test, demonstrated that FDI inflows and stock market growth play vital role in enhancing the usage of renewable energy. Considering the importance of Gulf Cooperation Council (GCC) countries, Hassine and Harrathi (2017) have analyzed the FD-REC nexus in this region and found a significantly positive correlation between financial energy consumption.

More recently, Razmi, Bajgiran, Behname, Salari, and Razmi (2020), have used ARDL model on a 25 years long data from 1990 to 2014 to investigated and affirmed positive relationship of stock market development and economic growth with REC in Iranian context. Raza et al. (2020), used panel smooth transition regression method on yearly panel data ranging from 1997 to 2017, affirmed that an increase in every indicator of FD results an increase in consumption of renewable energy, in the top 15 renewable energy consumer countries context. Anton and Nucu (2020), in a panel data of twenty-eight European Union countries, analyzed the effect financial growth on consumption level of renewable energy from year 1990 to year 2015. Panel data fixed effect model of their study, provides results which confirm that usage of renewable energy depends upon income level, energy rates, financial development, and FDI. Empirical findings indicate that all the studied proxies of financial development, namely bank, bond market, and capital market, positively affect consumption level of renewable energy.

Thus, extant REC literature mainly focuses on single country studies (for example see Burakov & Freidin, 2017; Eren, Taspinar, & Gokmenoglu, 2019; Ji & Zhang, 2019; Razmi et al., 2020), and/or

developed economies (for example see Topcu & Tugcu, 2020; Tugcu et al., 2012; Yildirim et al., 2012), whereas the focus on emerging markets is limited. Therefore, in this paper we aim to extend the literature by looking at the impact of FD on REC in emerging markets. Furthermore, we provide the insight understanding of how do different FD indicators (Banking sector, stock market) contribute to REC in emerging markets.

### 2.2.2. Geopolitical Risks and Renewable Energy Consumption

The significance of geopolitical risk and its unexplored impact on renewable energy consumption derived us to explore that how geopolitical risks (wars, terrorism and state level conflicts which increase level of uncertainty in all aspects of business and routine life) impact consumption of renewable energy (e.g. solar, wind, hydropower etc.).

Regions with certain and secure political and social conditions witness more consumption and new investments. On the other hand, detrimental impacts of uncertainty on new investment are have been discussed since many decades. Therefore, Leahy and Whited (1995) confirmed the relationship between uncertainty and investment dip from theoretical and empirical perspective. Blomberg and Mody (2005), verified that in developing countries the effects of violence are more harmful and that investors stop trading in periods of increased violence. Moreover, such circumstances result in capital outflows because when violence prevails in emerging economy then investors shift their capital to other developed and politically stable countries which offer secure return on investments. In the same manner, recent literature also confirmed that uncertain circumstances and appalling peace situation, drop overall consumption and investment infrastructure in developing countries (Cheng & Chiu, 2018).

Consequently, consumption of renewable energy, which needs uninterrupted investment plans and financial development, falls due to such tensions and uncertain economic forecasts. For example, an important study of Bloom (2009) empirically demonstrates that surprises of uncertainty influence

overall demand across real life because of the 'wait and see' strategy of both producers and consumers. Likewise, Gilchrist, Sim, and Zakrajšek (2014), who analyzed data of uncertainty-facing mixed companies with a quantitative general equilibrium model, reported that due to the irrevocable nature of investments companies adopt 'wait and see' strategy in response of upward uncertainty trend. This happens because firms want to hold liquid assets to prevent future insolvency in case of unproductive investments. Literature affirms that uncertainty, irrespective of its nature, generate negative impacts on overall economic and business activities. For example, economic policy uncertainty adversely impacts general business cycle and reduces new investments, employment opportunities and production level (e.g. see Baker, Bloom, & Davis, 2016 ). In the same way, Azzimonti (2018), used chronological stats from 1929 to 2013 for USA and affirmed that in the presence of political uncertainty private businesses reduce their investments.

In a recent study, Al Mamun, Uddin, Suleman, and Kang (2020), used GPR as proxy of uncertainty and argued that GPR break investors' confidence on continuity of state's economic policies. According to them (Al Mamun et al., 2020), ongoing clashes between USA and China about a disputed region in Southern Chinese sea not only halted business and investment plans of many big companies in these two countries but also impacted plans of international investment groups. GPR has a negative impact not only on investment, however, economic theory suggests that overall consumption of a country also decreases in prevalence of uncertainty. For instance, Balta, Fernandez, and Ruscher (2013), used the European Commission Business and Consumer Survey for all European countries and found that uncertainty significantly reduces both investments and consumption. Additionally, delays or likely decline in new investment plans further reduce overall consumption in a country, including energy consumption ( for example see He, Gao, & Wang, 2012; Zhanfeng & Zhiying, 2009).

Hence, along-with earlier findings, and theoretical argument, we suggest that renewable energy consumption significantly decreases in a time of higher political and social tensions (i.e. geopolitical risks) which adversely affect overall business activities.

## 2.3. Data, Model and Methodology

### 2.3.1. Data

This study is based on a panel annual dataset that covers a period of 20 years starting from 1996 to 2015 for all 19 emerging countries listed in the geopolitical risk index including Argentina, Brazil, China, Columbia, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, Philippines, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Ukraine, and Venezuela.

Renewable energy consumption (REC) is the dependent variable of our study. As proposed by preceding literature (e.g. Anton & Nucu, 2020; Charfeddine & Kahia, 2019), we use the share of renewable energy in the total energy consumption as a proxy of our dependent variable, renewable energy consumption. Similarly, relying on existing studies (e.g. Gaies, Goutte, & Guesmi, 2019; King & Levine, 1993; Levine & Zervos, 1998), we used four proxies, precisely, private credit by deposit money banks to GDP, bank credit to bank deposits, domestic credit to private sector by banks and stock market turnover ratio for the measurement of our first key independent variable, financial development. Subsequently, we measure our second main independent variable geopolitical risks, by using GPR index of Caldara and Iacoviello (2018), who developed it by using an algorithm that counted the publishing frequency of words denoting geopolitical risks in globally renowned international daily newspapers. GPR comprise of wars, terror attacks, and political conflicts that constrain both internal and foreign ties (Caldara & Iacoviello, 2018).

Extant literature has indicated the impact of GDP per capita, consumer price index (CPI) and foreign direct investment (FDI) on renewable energy consumption (for example see Anton & Nucu, 2020; Best, 2017; Çoban & Topcu, 2013; Sadorsky, 2010). Hence, we control these variables in the

current study. Moreover, we use reliable data sources such as the World Bank database (for consumption share of renewable energy from the total energy consumption, GDP per capita and FDI as a percentage of GDP), and the FRED database (for CPI) to measure all the country-level variables of interest. A summary of the study variables measurement, abbreviation and sources is displayed in table 2.1.

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*Insert Table 2.1 about here*

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### 2.3.2. The Model & Methodology

The current study aims to examine the impact of financial development and geopolitical risk on renewable energy consumption by testing the dynamic linear effects in a sample of 19 emerging economies. To further enhance the interpretation of our research, we compute the long-run elasticities resulting from the linear modeling.

Based on microeconomic theory and relevant literature (e.g. Anton & Nucu, 2020; Chang, 2015; Çoban & Topcu, 2013; Sadorsky, 2010; Topcu & Payne, 2017), the function of "renewable energy consumption" (*REC*) is given as "foreign direct investments" (*FDI*), "consumer price index" (*CPI*) as a proxy of "renewable energy prices" and "income" measured by "GDP per capita" (*GDPPC*).

Consequently, the addition of "financial development" ($FD$) and "geopolitical risk" (*GPR*) are anticipated to serve as important factors for renewable energy consumption in emerging markets. The following is the research's linear model:

$$REC_{jt} = \alpha_1 + \alpha_2 CPI_{jt} + \alpha_3 GDPPC_{jt} + \alpha_4 FDI_{jt} + \alpha_5 FD_{jt} + \alpha_6 GPR_{jt} + \epsilon_{jt} \quad (1)$$

Since prior literature affirmed that the level of energy consumption in the current year is strongly affected by the level of energy consumed in last year, the model is adjusted to the following:

$$REC_{jt} = \alpha_1 + \alpha_2 REC_{jt-1} + \alpha_3 CPI_{jt} + \alpha_4 GDPPC_{jt} + \alpha_5\, FDI_{jt} + \alpha_6 FD_{jt} + \alpha_7 GPR_{jt} + \epsilon_{jt} \quad (2)$$

In order to estimate Equation (2), three problems could be encountered since our study is based on panel data. Firstly, the unforeseen heterogeneity problem at the country level that occurs when compared with the CPI, per capita GDP and/or FDI. Secondly, causality biases among consumer price index, GDP per capita, and/or foreign direct investments (explanatory variables). Thirdly, the problem of endogeneity biases may occur because of error term correlation with the lagged dependent variable (*REC*).

To control for the above three problems, we adopt the two-step system GMM which is first proposed by Arellano and Bond (1991) and further developed by Arellano and Bover (1995), and Blundell and Bond (1998). Combining both variables in levels and in first difference, which can be expressed in the following two equations:

$$y_{jt} = \gamma y_{jt-1} + \beta x_{jt} + \mu_{jt} \quad (3)$$

$$y_{jt} - y_{jt-1} = \gamma(y_{jt-1} - y_{jt-2}) + \beta(x_{jt} - x_{jt-1}) + (\mu_{jt} - \mu_{jt-1}) \quad (4)$$

Where, Equation (3) involves variables in levels, while variables in first difference are conveyed in Equation (4).

Furthermore, the 'Hansen test' is used for over-identification of restrictions for which the null hypothesis states that the research instruments are not correlated with residuals. Nonetheless, we performed the Arellano-Bond test for the second-order correlation in the first-differenced residual. One of the problems associated with the GMM estimator system is the presence of several instruments which may result in a finite sample bias. By reducing the Hansen test's power and over-fitting the endogenous variable of the study help to identify this issue (for example Roodman, 2009 ).

## 2.4. Estimation Framework

### 2.4.1. Descriptive Statistics of data variables

Table 2.2 exhibits the mean, standard deviation, maximum and minimum values of all study variables.

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*Insert Table 2.2 about here*

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As for as, the variable of interest is concerned, the mean value and standard deviation of the REC are found as 16.858% and 15.055% respectively with the highest value of 53.767% and lowest value 0.006%. In case of explanatory variables, GPR has a mean value of 97.288 with 22.443 variations in GPR. The second explanatory variable is measured by four different proxies; with the mean and standard deviation values of, 56.116% and 43.688% for PCDMB, 106.905%, and 53.71% for BCBD, 64.871% and 49.546% for DCPS then 65.214 and 68.666% for TOR. Furthermore, figure 1 and figure 2 of the appendix graphically displays the geopolitical risk and renewable energy consumption respectively amongst the 19 countries from 1996 to 2015.

### 2.4.2. Multicollinearity Test

We first assess the existence of multicollinearity problem before performing the estimation of current study model. Multicollinearity problem can only be declared when the value of Pearson correlation coefficients amongst explanatory variables surpasses the upper limit of 0.80 (Belkhaoui, Alsagr, & van Hemmen, 2020; Gujarati & Porter, 2003). Table 2.3 displays values of Pearson's correlation coefficients for all independent variables which show that correlation among explanatory variables is substantially below the cut-off value of 0.8, except between *PCDMB* and *DCPS*[3].

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*Insert Table 2.3 about here*

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[3] Higher correlation value (.937) between PCDMB and DCPS is not an indication of multicollinearity because both are two different measures of financial development. Thus, PCDMB and DCPS are two proxies of financial development, which are regressed in two different models.

## 2.5. Results and Discussion

Table 2.4 illustrates the dynamic linear impacts of FD and geopolitical risk on consumption of renewable energy in sample of 19 developing countries using the two-step system GMM estimates.

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*Insert Table 2.4 about here*

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Model (1) reports the liner impact of the lagged renewable energy consumption, CPI, GDP per capita, FDI, without including any component of FD or the GPR. The lagged renewable energy consumption remains significantly positive at 1% level. Earlier researchers has shown that energy consumption in current year is highly influenced by the level of energy consumed in the previous year (for instance see Gaies, Kaabia, Ayadi, Guesmi, & Abid, 2019; Sadorsky, 2011).

In line with prior literature (for example Anton & Nucu, 2020; Doytch & Narayan, 2016), the coefficient of FDI shows a significant and negative impact on renewable energy consumption at 5% significant level. Similarly, the coefficient of CPI positively and significantly affects the renewable energy consumption. This finding is in-line with the extant literature, for instance, Moreno, López, and García-Álvarez (2012) as well as Wu and Broadstock (2015). Moreover, the coefficient of economic development (GDP per capita) shows a negative and statically significant impact on renewable energy consumption at 1% confidence, which is consistent with the findings by Anton and Nucu (2020) in the European context.

In Model 2 to 5 we added the four FD indictors along-with the control variables. All four financial development proxies positively impact renewable energy consumption and statically significant at a 1% level. Our findings affirm results of previous FD-REC study in 15 top renewable energy consumption countries (Raza et al., 2020). We may therefore conclude that both banking sector development and capital market growth have substantially positive effects on renewable energy consumption.

In model 6 we added the geopolitical risk to our baseline model. As expected, all the control variables remain significant with similar sign to model 1, the geopolitical risk significantly impacts the consumption of renewable energy at 5% acceptance level but the directions of this impact is positive, which contradicts the expected negative impact of GPR on REC.

Two possible explanations exist for the ratification of positive impact of GPR on REC. First, a rising body of literature established the positive relationship of geopolitical risk with oil prices (Ji, Li, & Sun, 2019; D. Zhang, Ji, & Kutan, 2019). Oil price is an indicator of conventional energy price (see Gaies, Kaabia, et al., 2019 among others ). By linking the GPR and oil price nexus with economics' law of demand. As economist, Marshall (1892), presented the economic law of demand that posits, by controlling other conditions, when the price of a commodity increases the demand of that commodity decreases which eventually yields reduction in its consumption. Therefore, based on law of demand and its substitution effect, the positive association of GPR and oil prices reduces the consumption of non-renewable energy, and elevates the consumption of renewable energy.

Second explanation relies on energy security. For instance, Bompard et al. (2017), argued that a country's ability to secure the availability of required energy is an important prerequisite for that country's economic development and for the prosperity of people. Hence the positive correlation of geopolitical risks with renewable energy consumption on the bases of energy security is justified on two reasons. On the one hand, existence of higher geopolitical risk in major oil producing countries such as Middle East OPEC members which represent 81% of OPEC production (Petersson & Törnquist-Plewa, 2008) make them unreliable and uncertain because of political instability. This scenario forces major developing energy consumers such as Brazil, India and China to reduce their dependence on oil imports and invest in development of renewable energy in order to achieve their energy requirements. On the other hand, major petro-states need to make regular investments to prevent their fossil fuel resources (e.g. pipelines and oil wells) which might be soft target of terrorist

attacks. Therefore, instead of bearing higher investments of their non-renewable energy resources, developing oil producers also make investments on development of renewable energy resources. Thus under pressure of the increasing oil prices and energy insecurity these developing countries are shifting towards increased generation and consumption of renewable energy to ensure their energy security and development.

To further provide insight knowledge, we computed the long run elasticities of our main independent variables. Table 2.5 reports both short and long-run elasticity of our main variables of interest namely, FD and geopolitical risks. Short run elasticity values are derived from the linear modeling from model (2) to model (6) of Table 2.4. Then, in order to calculate the value of long-run elasticity, we divide the short-run elasticity value with a value obtained by subtracting value of lagged renewable energy consumption coefficient from 1. Model 2 indicates positive elasticity of PCDMB rises from its short run value of (0.186) to its long run value of (1.039). Also positive short run and long run elasticity values of BCBD significantly increases from (0.453) to (2.448). Likewise, positive short run elasticity value of DCPS (0.436) reaches to (2.435) for the long run. The value of TOR also remains positive and evidences a rise from it short run value of (0.197) to the long run value of (1.186). Hence, the effect of FD on REC, in our sample of emerging economies, is superior in the long run in comparison to the short run.

Like proxies of first independent variable, financial development, elasticity values of second independent variable, geopolitical risks, also remain positive and demonstrate a substantial rise from (0.119) to (0.672), which implies that for a pool of 19 emerging economies the long run effect of geopolitical risks on renewable energy consumption is greater than the short run.

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*Insert Table 2.5 about here*

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Our results are robust and consistent across the four proxies of financial development. For additional robustness checks and to further validate our empirical results, we re-estimated our models by controlling for financial crisis. Table 2.6 states our liner models result which we controlled for the crisis period. These results do not indicate any qualitatively different findings from our previous results, listed in table 2.4.

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*Insert Table 2.6 about here*

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## 2.6. Conclusions & Policy Implications

The aim of this study was to investigate the impact of FD and geopolitical risk on REC using a panel data of 19 emerging markets over the period 1996 to 2015. Four proxies of FD of both the banking sector and capital market were considered. The results of the liner two-step system GMM models highlighted a significant positive impact of FD and GPR on REC. Furthermore, the computed long-run elasticities reported a stronger and more dominant effect then it's short-run. The robustness of the findings was tested by controlling for the financial crises period and the fact of using four proxies of financial development.

This study provides important policy implications for the policymakers of emerging economies whether they are known as energy producer or energy consumer. Primarily, policymakers of emerging countries should execute their renewable energy consumption strategies and also FD plans considering the importance of the later for the former. As advantages of renewable energy consumption are multifold. First of all, renewable energy consumption improves the atmosphere. Therefore, emerging markets, which lack separate environment budgets, may decrease air pollution by increasing renewable energy consumption in the country. Discouraging the business level usage of non-renewable may also increase renewable energy consumption. For instance, imposing an air

pollution tax on production plants may shift them towards renewable energy consumption. Secondly, the transfer of renewable energy is much easier as compared to non-renewable energy which reduces the energy transfer cost and also security expenses of non-renewable energy reservoirs. Thirdly, renewable energy consumption ensures the continuous availability of required amount of energy.

Political leaders in emerging countries should be very vigilant while introducing energy transition dogmas. They should realize the importance of FD in the energy transition process. A shortsighted and imperative energy transition plan, without availability of required financial resources, may disrupt the production capacity of firms. Thus, governments should progressively enforce renewable energy consumption policies while offering appropriate financial via their financial institutions and/or capital markets. Focusing on the importance of financial development, legislator of emerging economies may introduce some incentive plans, such as easy loans, and tax rebates for businesses which want to enhance the consumption of renewable energy in their production plants. This may encourage businesses not only to enhance renewable energy consumption but also to invest in small projects of renewable energy production to fulfill their own energy demands. Similarly, dedicated incentive schemes, should be introduced for investors who wants to invest in mega renewable energy projects. Intricate and lengthy bank credit procedures may daunt renewable energy projects, on the other hand, swift loans, with lower or zero interest rates, may fulfill the financial demands of renewable energy investments. Therefore, for successful execution of energy transition from non-renewable to renewable, governments in developing countries should imply policies that enhance the financial capacity of businesses to invest in renewable energy plants instead of forcing hasty and unrealistic targets of minimizing fossil fuel consumption.

As far as study limitations and future research lines, we considered three of the most used control variable, researchers could include some more controls to further validate our results. We based our research on all the 19 emerging markets that are listed in the geopolitical risk index,

expanding the scope, and introducing a sample of developing and developed economies could be another avenue for future work. Furthermore, due to data availability of our study sample, we considered 20-year period spanning from 1996 to 2015. Another potential extension of the current study is to incorporate more recent data once available, and including the direct and indirect impact of Covid-19, through technology transformation, R&D, and investments etc. Additionally, we provided two possible explanations of the positive impact of geopolitical risk, scholars could extend the current paper by qualitatively addressing the issue.

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# Tables

**Table 2.1: Abbreviation , Measurement, and Sources of data**

| Variable | Abbreviation | Measurement | Sources |
|---|---|---|---|
| Renewable Energy Consumption | *REC* | Country (j) share of renewable energy in the total energy consumption at year (t) | World Bank Data |
| Private Credit by Deposit Money Banks | *PCDMB* | Country (j) private credit by deposit money banks to gross domestic product at year (t) | WDI of World Bank |
| Bank Credit to Bank Deposit | *BCBD* | Country (j) Bank Credit to Bank Deposit at year (t) | WDI of World Bank |
| Domestic Credit to Private Sector by Banks | *DCPB* | Country (j) domestic credit to private sector by banks to gross domestic product at year (t) | WDI of World Bank |
| Stock Market Turnover Ratio | *TOR* | Country (j) stock market turnover ratio at year (t) | WDI of World Bank |
| Geopolitical Risks | *GPR* | Country (j) geopolitical risk index at year (t) | Methodology: Caldara & Iacoviello (2018)[4] |
| Foreign Direct Investments | *FDI* | Country (j) contribution of foreign direct investments to GDP at year (t) | World Bank Data |
| Consumer Price Index | *CPI* | Country (j) Consumer Price Index at year (t) | FRED Database |
| GDP Per Capita | *GDPPC* | Country (j) Gross Domestic Product Per Capita at year (t) | World Bank Data |

[4] The full database can be found in: https://www.matteoiacoviello.com/gpr.htm. Accessed 01/11/2019

## Table 2.2: Descriptive Statistics

| Variable | Mean | S.D. | Min | Max |
|---|---|---|---|---|
| Renewable Energy Consumption | 16.858 | 15.055 | 0.006 | 53.767 |
| Private Credit by Deposit Money Banks | 56.116 | 43.688 | 1.259 | 219.117 |
| Bank Credit to Bank Deposit | 106.905 | 53.71 | 20.223 | 337.198 |
| Domestic Credit to Private Sector by Banks | 64.871 | 49.546 | 1.385 | 233.396 |
| Turnover Ratio | 65.214 | 68.666 | 0.251 | 557.038 |
| Geopolitical Risks | 97.288 | 22.443 | 38.478 | 261.257 |
| Foreign Direct Investments | 3.571 | 6.141 | -2.757 | 58.519 |
| Consumer Price Index | 85.475 | 69.932 | 2.352 | 1246.36 |
| Gross Domestic Product Per Capita | 11196.661 | 11516.61 | 399.95 | 56770 |

## Table 2.3: Correlation Matrix

| | REC | GPR | PCDMB | BCBD | DCPS | TOR | FDI | CPI | GDPPC |
|---|---|---|---|---|---|---|---|---|---|
| Renewable Energy Consumption (REC) | 1.000 | | | | | | | | |
| Geopolitical Risk (GPR) | -0.110* | 1.000 | | | | | | | |
| Private Credit by Deposit Money Banks (PCDMB) | -0.257* | 0.028 | 1.000 | | | | | | |
| Bank Credit to Bank Deposit (BCBD) | -0.111* | 0.005 | 0.326* | 1.000 | | | | | |
| Domestic Credit to Private Sector by Banks (DCPS) | -0.256* | 0.014 | 0.937* | 0.343* | 1.000 | | | | |
| Stock Market Turnover Ratio (TOR) | -0.021 | 0.136* | 0.212* | 0.392* | 0.203* | 1.000 | | | |
| Foreign Direct Investments (FDI) | -0.231* | -0.096* | 0.552* | -0.073* | 0.464* | -0.039* | 1.000 | | |
| Consumer Price Index (CPI) | 0.018 | 0.041* | -0.342* | -0.232* | -0.354* | -0.020 | -0.137* | 1.000 | |
| Gross Domestic Product Per Capita (GDPPC) | -0.388* | 0.038* | 0.560* | 0.506* | 0.474* | 0.401* | 0.402* | -0.174* | 1.000 |

Note: * p-value < 0.05

## Table 2.4: Two-Step System GMM

**The Dynamic Linear Modeling (**Dependent Variable: Renewable Energy Consumption**)**

| | **Model(1)** | **Model(2)** | **Model(3)** | **Model(4)** | **Model(5)** | **Model(6)** |
|---|---|---|---|---|---|---|
| Renewable energy t-1 | 0.832***<br>***(0.006)*** | 0.821***<br>***(0.010)*** | 0.815***<br>***(0.010)*** | 0.821***<br>***(0.009)*** | 0.834***<br>***(0.012)*** | 0.823***<br>***(0.012)*** |
| Foreign Direct Investment | -0.028***<br>***(0.014)*** | -0.070**<br>***(0.031)*** | -0.086***<br>***(0.033)*** | -0.070**<br>***(0.029)*** | -0.050*<br>***(0.029)*** | -0.044**<br>***(0.023)*** |
| Consumer Price Index | 0.305***<br>***(0.025)*** | 0.209***<br>***(0.046)*** | 0.215**<br>***(0.115)*** | 0.214***<br>***(0.050)*** | 0.478***<br>***(0.042)*** | 0.213***<br>***(0.048)*** |
| Gross Domestic Product Per Capita | -0.767***<br>***(0.078)*** | -0.704***<br>***(0.110)*** | -0.715***<br>***(0.175)*** | -0.841***<br>***(0.105)*** | -0.839***<br>***(0.098)*** | -0.726***<br>***(0.080)*** |
| Private Credit by Deposit Money Banks | | 0.186***<br>***(0.040)*** | | | | |
| Bank Credit to Bank Deposit | | | 0.453***<br>***(0.070)*** | | | |
| Domestic Credit to Private Sector by Banks | | | | 0.436***<br>***(0.065)*** | | |
| Stock Market Turnover Ratio | | | | | 0.197***<br>***(0.012)*** | |
| Geopolitical Risks | | | | | | 0.119**<br>***(0.055)*** |
| Observations | 342 | 341 | 341 | 341 | 331 | 342 |
| *P*-value of Arellano-Bond (2)Test | 0. 928 | 0.957 | 0.959 | 0.635 | 0.351 | 0.935 |
| *P*-value of Hansen Test | 0.456 | 0.434 | 0.457 | 0.451 | 0.338 | 0.431 |

Note: *p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01
Bold and italic values in brackets represent standard errors of the respective coefficient.

## Table 2.5: Renewable Energy Consumption Short and Long run Elasticities

| | Model (2) | Model (3) | Model (4) | Model (5) | Model (6) |
|---|---|---|---|---|---|
| ***Short-run Elasticities*** | | | | | |
| **Financial Development:** | | | | | |
| Private Credit by Deposit Money Banks | 0.186 | | | | |
| Bank Credit to Bank Deposit | | 0.453 | | | |
| Domestic Credit to Private Sector by Banks | | | 0.436 | | |
| Stock Market Turnover Ratio | | | | 0.197 | |
| **Geopolitical Risks** | | | | | 0.119 |
| ***Long-run Elasticities*** | | | | | |
| **Financial Development:** | | | | | |
| Private Credit by Deposit Money Banks | 1.039 | | | | |
| Bank Credit to Bank Deposit | | 2.448 | | | |
| Domestic Credit to Private Sector by Banks | | | 2.435 | | |
| Stock Market Turnover Ratio | | | | 1.186 | |
| **Geopolitical Risks** | | | | | 0.672 |

Note: The long-run elasticities are computed based on the short-run elasticities obtained from **Table 4**.

## Table 2.6: Two-Step System GMM (Controlling for Financial Crises)

**The Dynamic Linear Modeling** (Dependent Variable: Renewable Energy Consumption)

| | Model(1) | Model(2) | Model(3) | Model(4) | Model(5) | Model(6) |
|---|---|---|---|---|---|---|
| Renewable energy t-1 | 0.827*** ***(0.007)*** | 0.828*** ***(0.014)*** | 0.804*** ***(0.008)*** | 0.812*** ***(0.007)*** | 0.821*** ***(0.009)*** | 0.826*** ***(0.011)*** |
| Foreign Direct Investment | -0.035** ***(0.014)*** | -0.060** ***(0.022)*** | -0.128*** ***(0.024)*** | -0.113*** ***(0.026)*** | -0.025* ***(0.020)*** | -0.029** ***(0.014)*** |
| Consumer Price Index | 0.169*** ***(0.028)*** | -0.017** ***(0.025)*** | 0.023 ***(0.070)*** | -0.059 ***(0.087)*** | 0.405*** ***(0.031)*** | 0.103*** ***(0.028)*** |
| Gross Domestic Product Per Capita | -0.696*** ***(0.084)*** | -0.600*** ***(0.065)*** | -0.575*** ***(0.151)*** | -0.741*** ***(0.151)*** | -0.899*** ***(0.078)*** | -0.601*** ***(0.089)*** |
| Private Credit by Deposit Money Banks | | 0.173*** ***(0.078)*** | | | | |
| Bank Credit to Bank Deposit | | | 0.466*** ***(0.032)*** | | | |
| Domestic Credit to Private Sector by Banks | | | | 0.430*** ***(0.072)*** | | |
| Stock Market Turnover Ratio | | | | | 0.173*** ***(0.008)*** | |
| Geopolitical Risks | | | | | | 0.236** ***(0.042)*** |
| Observations | 304 | 303 | 303 | 303 | 295 | 304 |
| *P*-value of Arellano-Bond (2) Test | 0.890 | 0.910 | 0.858 | 0.538 | 0.406 | 0.886 |
| *P*-value of Hansen Test | 0.463 | 0.466 | 0.694 | 0.441 | 0.405 | 0.351 |

Note: *p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01.
Bold and italic values in brackets represent standard errors of the respective coefficient.

# Figures

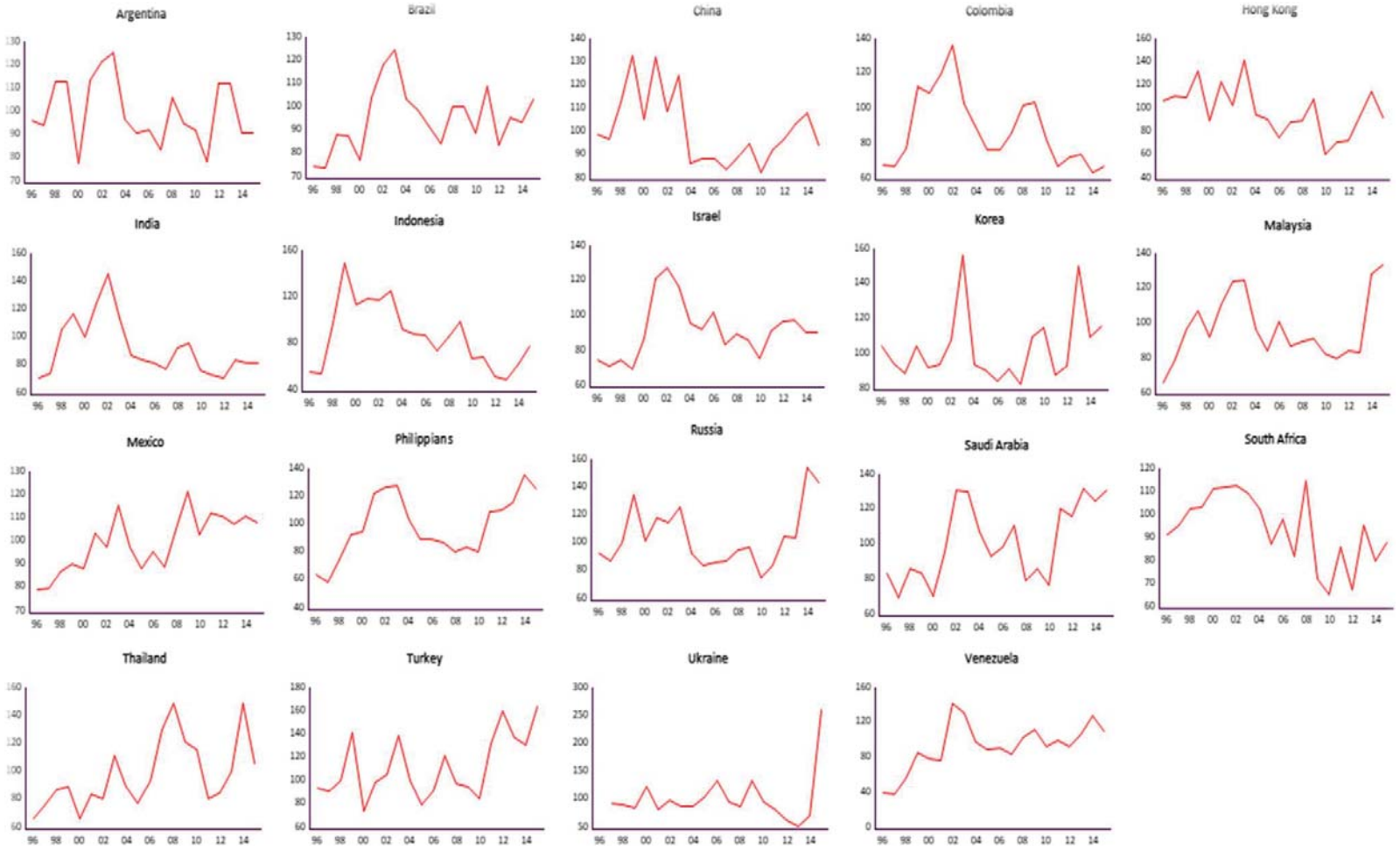


**Fig. 2.1 Geopolitical risk amongst the sample countries**

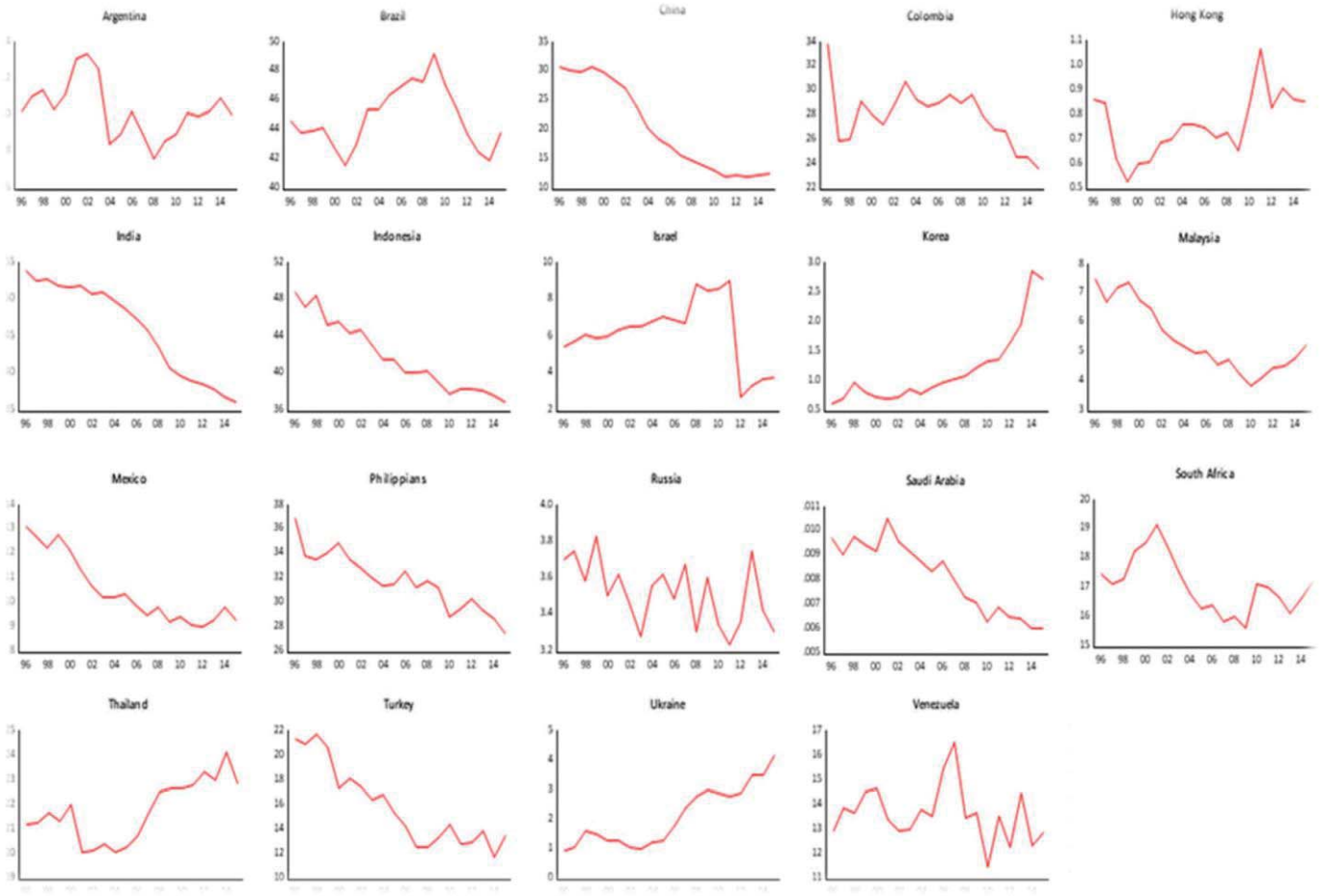


**Fig. 2.2 Renewable energy consumption amongst the sample countries**

# Chapter 3: The Asymmetric Influence of Corruption on Financial Development: Fresh Evidence from BRICS Economies

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## Abstract

**Purpose –** This paper aims to assess the asymmetric impact of corruption on financial development in BRICS economies context.

**Design/Methodology/Approach –** We have adopted the novel panel non-linear autoregressive distributed lag (PNARDL) model of Shin, Yu, and Greenwood-Nimmo (2014), covering the period 1991-2018.

**Findings –** Our findings confirm that corruption asymmetrically impacts financial development in BRICS economies. More precisely, long-run negative shocks of the control of corruption index have significant negative impacts on financial development. However, long-run positive shocks of the control of corruption index are insignificant. Moreover, both positive and negative shocks of corruption in short-run results are insignificant. Generally, our findings are robust having carried out several robustness checks and in favor of "sand in the wheels" hypothesis.

**Originality/Value –** This study makes a novel contribution by developing insight on how corruption asymmetrically impacts financial development. To the best of our knowledge, this is the first attempt to use the PNARDL, which decompose the main independent variable (corruption) into positive and negative shocks. The PNARDL approach is a dynamic robust estimate that controls for the problem of endogeneity, which is a common phenomenon in such studies. Additionally, we believe that the findings are important for policy makers, scholars, and practitioners. Finally, we utilized the most recent available dataset covering the BRICS context.



**Keywords:** *Corruption; Financial development; Asymmetry analysis; BRICS countries.*

**JEL Classification:** *D73; C39; G21*.

## 3.1. Introduction

The importance of financial development in any economy is well known and extensively discussed as an important factor of economic growth and development (e.g. Chiu & Lee, 2019; C.-C. Lee, 2013; Mishra & Narayan, 2015). Financial development helps with savings and supports their distribution into profitable investments by promoting industrial trades (Cooray & Schneider, 2018). Financial development fosters economic growth by facilitating the overall development process of a country (e.g. Greenwood & Smith, 1997; King & Levine, 1993; Levine, 2005). Similarly, lack of savings, lesser investments, and poor distribution of limited resources during the 2008-2009 financial crises had adverse impacts on economic development (Bordo, Meissner, & Stuckler, 2010; Hale, 2012). Nascent literature is focusing on the correlation between corruption and financial development, parallel to the literature of financial development and economic growth link. Many scholars have proved the relationship between corruption and financial development through different methods (e.g. Altunbaş & Thornton, 2012; Shahbaz, Hye, & Shabbir, 2013; Song, Chang, & Gong, 2021 among others).

According to Song et al. (2021), corruption occurs throughout every phase of development in all governments. Early researchers in the field have experienced difficulties in measuring the precise impact of corruption on different variables. This is due to their reliance on country level case studies in absence of dominant corruption related data (Song et al., 2021). The world today is not unaware of corruption, the advent of the international country risk guide (ICRG), in addition to other corruption indexes[5], has played an important role in bringing corruption to the global policy agenda and provided a useful platform for cross-country research in the field (Peyton & Belasen, 2012). Corruption, an abuse of entrusted public power for private benefits, is a globally prevalent social, political, and

5 Corruption Perceptions Index of Transparency International spanning from1995, and the annual World Bank control of corruption index spanning from 1995 to date.

economic phenomenon. This has become pervasive in emerging economies (Peyton & Belasen, 2012) such as Brazil, Russia, India, China, and South Africa (BRICS). Corruption has grown throughout these five countries in different ways, but their increasing relevance in the world economic system now makes them more prevalent than ever. Although some BRICS countries are better at coping with the corruption[6], Transparency International (2020) still ranks them mid to high in the list[7]. However, the role of corruption in financial development may not be as simple as previously assumed. While prior literature provides evidence for the impact of corruption in emerging economies, these do not offer clear insight around the beneficial or deteriorating effect of corruption on financial development.

The existing literature confirms that corruption fosters development under certain settings. This wave of literature argues that corruption spurs the economic growth and development by becoming the "grease" in the wheels of development, which was first introduced by Leff (1964). The Prevalent understanding is that corruption enhances the possibility of constructive transactions which would not take place otherwise. The mechanism that drives this benefit are individuals creating efficiencies illegally via corruption such as bribery. The alternate view in the literature believes that a significant negative correlation exists between the presence of corruption and the development processes of an economy. A representative study is Mauro (1995), who has found a notable negative correlation between corruption and profitable investments. He further argued that corruption primarily hinders private investment, which leads to the decrease of economic growth.

Extensive empirical literature supports both hypotheses of corruption, "grease the wheels" (Arif, Khan, & Waqar, 2020; Leff, 1964; Leys, 1965; Méon & Weill, 2010) and "sand in the wheels" (e.g. Del Monte & Papagni, 2007; Mauro, 1995 ). Therefore, the impact of the corruption on financial development is still uncertain. Beneficial and detrimental impacts of corruption on financial

[6] Support for International Cooperation against Corruption and BRICS Anti-Corruption Working Group are examples of BRICS work against corruption.
[7] South Africa (69), China (78) India (86), Brazil (94) and Russia (129) out of 180 countries.

development blend together and blur the lines of greasing the wheels and sand in the wheels until it becomes unclear how corruption affects the financial development overall. This blurred relationship of corruption with financial development motivates us to revisit this connection in the context of BRICS economies.

Prior empirical literature assumes that the level of corruption has symmetric effects on financial development. Hence, this assumption implies that positive changes in corruption boosts or degrades financial development, and conversely, negative changes in corruption must degrade or boost financial development with an equal magnitude. However, Alfada (2019) and Ali, Fhima, and Nouira (2020) suggest that the impact of corruption on the financial system and overall economic activities is of a nonlinear nature. Additionally, the contemporary study by Zangina and Hassan (2020) confirms that the impact of corruption on FDI inflows is asymmetric while studying Nigeria. Thus, we extend the literature by investigating the asymmetric impact of corruption on the financial development in the BRICS context from 1991 to 2018. To achieve this, we adopt the novel PNARDL proposed by Shin et al. (2014). Building on prior literature, broad money (M2) and newly constructed financial development index (FD) by the International Monetary Fund (IMF) are used as proxies of financial development. Likewise, we consider the ICRG control of corruption index as a proxy of corruption, alongside macro controls.

As prior research discussed the impact of corruption on financial development with inconsistent results, this study makes multiple contribution in the corruption-financial development related literature. To our best knowledge, no existing study has examined asymmetric influence of corruption on financial development. This study makes the novel contribution by developing insight on how corruption asymmetrically impacts financial development. As we know, this is the first attempt to use the PNARDL of Shin et al. (2014), which breaks down the main independent variable (corruption) into positive and negative shocks. The PNARDL approach is a dynamic robust estimate

that controls for the problem of endogeneity, which is a common phenomenon in such studies. Moreover, we believe that the findings are very important for policy makers, scholars, and practitioners. The final contribution of this study lies with its context and period. BRICS, is a group of five major emerging economies which make up 42% of the global population, with 23% of the global GDP, and more than 16% participation in the global trade (World Investment Report, 2017). Finally, we use the most recent available dataset covering a period from 1991 to 2018.

In the next section (3.2), we review the grease and sand in the wheel hypotheses and the relevant empirical findings. We then present our data, model, and method in section 3.3. In section 3.4, we report our empirical findings and discuss the results. We then conclude our study with policy implications and future research in section 3.5.

## 3.2. Literature Review

Prior literature supports two opposing hypotheses regarding corruption. One prominent theory in the literature is the idea that corruption "greases the wheels" of financial development while another school of thoughts supports the opposing philosophy that corruption is "sand in the wheels" of financial and economic development. In this section, we discuss both contradictory hypotheses and related empirical literature.

### 3.2.1. Grease the Wheels Hypothesis

The "grease the wheels" hypothesis presumes that corruption helps mitigate the malfunctioning institutions in the developing world (e.g. Huntington, 1968; Leff, 1964; Leys, 1965; Méon & Weill, 2010). This hypothesis views bribery, a medium of corruption, as a significant factor in influencing activities that account for economic development. It argues that players of economic development avoid bureaucratic processes and red tape, to enhance their efficiency when they engage in corrupt practices (Méon & Weill, 2010). According to Dreher and Gassebner (2013), corruption helps bypass complex legislations of inefficient institutes, and fosters economic activities in emerging

countries. Moreover, corruption may enhance investments in the private sector and serve as a buffer to counter poor strategies, thus fostering economic growth in countries with weak legal infrastructure (Leff, 1964, Cooray and Schneider, 2018).

Usage (e.g. consumption vs reinvestment) and destination (e.g. home vs abroad) of money generated by corrupt practices, such as bribery, also play a significant role in deciding the impact of corruption on an economy (Cooray & Schneider, 2018; Wedeman, 1997). "Looting", "rent scraping", and "dividend collection" are three types of corrupt practices (Cooray and Schneider, 2018, Wedeman, 1997). Looting induces devastation that triggers investment of bribery payment on domestic projects or on foreign ventures. Similarly, rent scraping either creates capital outflow because of decline in capital gains or it helps initiates new or expanding projects. Dividend collecting relies on corporations' progress in profit-generation, which motivates policymakers to promote policies which support investment. Likewise, to avoid an enterprise's closure or seizure, businesses can resort to either bribery or building production units in countries with inadequate property laws (O'Driscoll Jr & Hoskins, 2006; 2003). Thus, based on the arguments above, corruption helps economic development when money generated by these practices remain at home for reinvestment in domestic projects. Moreover, Colombatto (2003) has found that corruption supports the use of 'speed money' that reduces development impeding conditions in politically unstable developing countries where institutions are weak. According to Huang, Wang, Wu, and Wang (2013), among the thirteen Asia-Pacific countries, economic development of China and South Korea show significant growth despite higher degrees of corruption. Similarly, Kato and Sato (2015) have found support for "grease the wheels" hypothesis in Indian firms. Moreover, Dreher and Gassebner (2013) argue that when corruption becomes an effective way of mitigating the adverse effects of complex and lengthy regulatory business policies operating in strongly controlled economies, it supports the philosophy of "grease the wheels". Hence,

we cannot disregard the positive relationship between corruption and financial development, based on the above literature.

### 3.2.2. Sand in the Wheels Hypothesis

In contrast, the "sand in the wheels" hypothesis proposes that corruption is detrimental to financial sector operations. For instance, while supporting the "sand in the wheels" hypothesis, prior studies have reported the diminishing impact of corruption on investments, growth, and economic certainty (e.g. Aghion, Alesina, & Trebbi, 2004; Blackburn, Bose, & Haque, 2006; C. M. Lee & Ng, 2009). For example, De Rosa, Gooroochurn, and Görg (2010), have asserted that achieving a target production rate and evading administrative needs by offering bribes to officials is not the best solution. They have conducted a comprehensive study upon 11,000 firms from 28 emerging and developed economies and found an adverse impact of corruption on corporate performance. Similarly, according to Gächter and Schulz (2016), corrupt practices lead to a detrimental cycle of corruption (Arshad & Rizvi, 2013; Asiedu, 2003; Dike, 2005).

Increased government interference in controlling loans makes it harder for private enterprises to raise external funding (e.g., bank loans) in countries with weak supervisory authorities (Thorsten Beck, Asli Demirgüç-Kunt, & Ross Levine, 2006a; Thorsten Beck, Aslı Demirgüç-Kunt, & Ross Levine, 2006b). Hence, businesses secretly bribe officials to prevent such complicated procedures and institutional obstructions. Researchers argue that poor monitoring procedures, insider trading, complex legislation, and a lack of accountability are key to spreading corruption (Barth, Caprio, & Levine, 2004; Beck et al., 2006b; Wei, 2000), and such factors of corruption degrade overall operations of the financial sector.

Corruption diminishes financial development due to the involvement of many individuals in secret briberies for unlawful project authorizations (Cooray and Schneider, 2018, Shleifer and Vishny, 1993).Kaufmann (2010), discussed that corrupt practices reduce the level of accountability and

transparency, which creates an ambiguity about the real financial status of an economy. Additionally, Wei and Sievers (1999) reported incidences of banking sector volatility in economies that permit corrupt practices.

Evidence has shown that banking sector profitability is more prone to the adverse impacts of corruption (Arshad & Rizvi, 2013). Therefore, widespread government control of banks enhance political involvement in the distribution of funds, which harms both economic growth and financial sector development of a country (Barth et al., 2004; La Porta, Lopez-de-Silanes, & Shleifer, 2002). According to Aburime (2008), increases in corruption is linked with decreasing banking sector profitability in Nigeria. Similarly, Pagano (2008) has confirmed the impact of corruption on the distribution of bank credit rates in Latin America. Consequently, increased corruption is unfavorable for the financial system that supports the sand in the wheels hypothesis. Therefore, after reviewing the literature about the opposing impact of corruption, this study cannot disregard the "sand in the wheels" hypothesis of corruption on financial development.

There is still a lack of clarity on the relationship between corruption and financial development due to the contradictory evidence in the existing literature. Conceivably, the use of linear estimations is a potential reason these studies are indecisive on the direct impact of corruption on development (e.g. Alfada, 2019; Ali et al., 2020). Furthermore, they argue that linear estimations indicate differences in the conditions of institutional efficiency and production arrangements, which might result in opposing impacts of corruption. Indeed, focusing only on linear effects and ignoring the possible presence of a nonlinear relationship might be a reason for the opposing evidence of corruption on different development variables. Alfada (2019) and Ali et al. (2020) respectively investigated the impact of corruption on economic growth and banking stability by adopting the threshold models.

Considering the importance and potential existence of nonlinear impact of corruption, the current study extends the theoretical understanding about the opposing views by examining the direct

relationship between corruption and financial development in emerging markets by empirically investigating the asymmetric impact of corruption on the financial development in the BRICS economies.

## 3.3. Data, Model, and Methods

### 3.3.1. Data

This study used an annual panel data set ranging from 1991 to 2018 for the BRICS economies. Financial development is the dependent variable of our study. To capture this, we used two proxies to measure financial development. Aligned with prior literature, we used money supply (M2) as first proxy of financial development (e.g. Cooray & Schneider, 2018; Levine & Zervos, 1998). Then, we included the newly constructed financial development index (FD) by the IMF as second proxy of financial development. The FD index is a comprehensive measure since it covers depth, accessibility, and efficiency of both financial institutions and financial markets.

The level of corruption is the main independent variable of concern in our research. Following the previous literature, we used the International Country Risk Guide (ICRG) control of corruption index as a measure of corruption (e.g. Cooray & Schneider, 2018 among others). The ICRG control of corruption index ranges from 0 to 6, where higher values denote better control of corruption.

Finally, we included a set of macro level control variables in our analysis. For instance, GDP per capita growth, educational attainment, and institutional quality. We used GDP per capita growth (Ggrowth) that reflects the standard of living and also holds a considerable position in development measures (Cooray & Schneider, 2018). Moreover, according to Acemoglu and Robinson (2008, pp. 137-140), institutional quality is significant determinant of economic and overall development structure emerging countries. Therefore, we controlled for institutional quality as an explaining factor of financial development of BRICS economies by using law and order index (lorder) and bureaucratic quality index (Bquality) of ICRG as two proxies of institutional quality. Educational attainment reflects people's ability to improve their living standards and prior literature have confirmed the contribution

of educational attainment in the development and growth process. (e.g. Aghion, Howitt, & Mayer-Foulkes, 2005; Gupta, Pattillo, & Wagh, 2009). Consequently, we controlled for educational attainment by taking average years of schooling (AYS) as a proxy.

We extracted our dataset from multiple reliable sources such as the World Bank, ICRG and IMF. Table 3.1 shows details regarding definitions and sources of all the variables.

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*Insert Table 3.1 about here*

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### 3.3.2. Model and Methods

Empirical research of corruption and financial development nexus has now arrived at a new route of asymmetric analysis. Hence, this study attempts to investigate the asymmetric impact of corruption on financial development in the context of BRICS economies. Based on the arguments in the data section and the well-established literature (e.g. Cooray & Schneider, 2018; Song et al., 2021), financial development ($\mathrm{FD_{jt}}$) can be explained by corruption denoted by $\mathrm{Corruption_{jt}}$, GDP per capita growth denoted by $\mathrm{Ggrowth_{jt}}$, educational attainment denoted by $\mathrm{HC_{jt}}$, and institutional quality denoted by $\mathrm{IQ_{jt}}$, respectively. The following is our base linear econometric model:

$$\mathrm{FD_{jt}} = \alpha_0 + \alpha_1 \mathrm{Corruption_{jt}} + \alpha_2 \mathrm{Ggrowth_{jt}} + \alpha_3 \mathrm{HC_{jt}} + \alpha_4 \mathrm{IQ_{jt}} + \mu_{jt} \quad (1)$$

Based on the theoretical and empirical literature, we expect that an estimate of $\alpha_1$ to be positive or negative, supporting either "sand in the wheels" or "grease the wheels" hypothesis. Additionally, prior empirical literature revealed that short and long run estimates of corruption can be of different magnitude, direction, and significance (Al Qudah, Zouaoui, & Aboelsoud, 2020; Ewetan, Osabohien, Matthew, Babajide, & Urhie, 2020). However, equation (1), does not take into consideration both

short-run and long-run estimates, thus we reconstructed the equation (1) in the format of error corrections as follows:

$$\Delta FD_{jt} = \gamma + \sum_{p=1}^{n1} \gamma_{1p}\ \Delta FD_{jt-p} + \sum_{P=0}^{n2} \gamma_{2p}\ \Delta Corruption_{jt-p} + \sum_{p=0}^{n3} \gamma_{3p}\ \Delta Ggrowth_{jt-p} +$$

$$\sum_{p=0}^{n4} \gamma_{4p}\ \Delta HC_{jt-p} + \sum_{p=0}^{n5} \gamma_{5p}\ \Delta IQ_{jt-p} + \pi_1 FD_{jt-1} + \pi_2 Corruption_{jt-1} + \pi_3 Ggrowth_{jt-1} +$$

$$\pi_4 HC_{jt-1} + \pi_5 IQ_{jt-1} + \beta_1 \mathcal{E}_{jt-1} + \alpha_i + \mu_{jt} \qquad (2)$$

The above arrangements have now become panel ARDL proposed by Pesaran, Shin, and Smith (2001). In panel ARDL we can get short-run and long-run estimates in a single equation. While $\alpha_i$ is the group-specific effect and error-correction term $\mathcal{E}_{jt-1}$ captures the long-run equilibrium in the linear panel ARDL. A key assumption behind equation (2) is that a change in corruption has symmetric effects on financial sector development. This assumption implies that if a decrease in corruption improves financial development, an increase in corruption must worsen it or vice versa. However, institutional quality, political system, and governance may react differently to high corruption versus low corruption, and therefore corruption could have asymmetric impacts on financial development. Thus, we break down our main independent variable, namely corruption, into its positive and negative changes to determine whether the impact of corruption on financial development in the BRICS economies is asymmetric or not. For that purpose, we apply the partial sum procedure as shown below:

$$Corruption^{+}_{jt} = \sum_{n=1}^{t} \Delta Corruption^{+}_{jt} = \sum_{n=1}^{t} \max\left(\Delta Corruption^{+}_{jt}, 0\right) \qquad (3)$$

$$Corruption^{-}_{jt} = \sum_{n=1}^{t} \Delta Corruption^{-}_{jt} = \sum_{n=1}^{t} \min\left(\Delta Corruption^{-}_{jt}, 0\right) \qquad (4)$$

In the above specifications, $\mathrm{Corruption}^{+}_{jt}$ represents a positive change or increase in corruption index and $\mathrm{Corruption}^{-}_{jt}$ demonstrates a negative change or decrease in the corruption index. We then replace these partial sum variables in place of the original $\mathrm{Corruption}_{jt}$ variable in equations (2) as follow:

$$\Delta FD_{jt} = \gamma + \sum_{p=1}^{n1} \gamma_{1p}\ \Delta FD_{jt-p} + \sum_{P=0}^{n2} \gamma_{2p}\ \Delta Corruption^{+}_{jt-p} + \sum_{p=0}^{n3} \gamma_{3p}\ \Delta Corruption^{-}_{jt-p} +$$

$$\sum_{p=0}^{n4} \gamma_{4p}\ \Delta Ggrowth_{jt-p} + \sum_{p=0}^{n5} \gamma_{5p}\ \Delta HC_{jt-p} + \sum_{p=0}^{n6} \gamma_{6p}\ \Delta IQ_{jt-p} + \pi_1 FD_{jt-1} +$$

$$\pi_2 Corruption^{+}_{jt-1} + \pi_3 Corruption^{-}_{jt-1} + \pi_4 Ggrowth_{jt-1} + \pi_5 HC_{jt-1} + \pi_6 IQ_{jt-1} +$$

$$\beta_1 \mathcal{E}_{jt-1} + \alpha_i + \mu_{jt} \qquad (5)$$

Equation (5) is known as the asymmetric panel ARDL model projected by Shin et al. (2014). According to Shin et al. (2014), the asymmetric model is subject to the base symmetric panel ARDL model. Salisu and Isah (2017), show that an asymmetric depiction of the dynamic heterogeneous panel data model is more appropriate for the modelling of the large time period (t) compared to cross-sectional (j), as in our study. The primary techniques used in the estimation of dynamic heterogeneous panel data are the Mean Group (MG) and Pooled Mean Group (PMG) estimators. The MG estimator takes averaging the coefficients and relies on estimating N time-series regressions, whereas the PMG estimator includes the combination of averaging and pooling of coefficients (Blackburne III & Frank, 2007). The Hausman test is used to choose the estimators for the dynamic heterogeneous panel model.

## 3.4. Estimation framework

### 3.4.1. Data descriptive and diagnosis

There are few things to take care of before estimating our model. First, Table 3.2, provides the details about the mean, standard deviation, minimum, and maximum value of each variable. The mean of M2, FD, and corruption are 4.144, 0.507, 2.542, while the standard deviations are 0.614, 0.142, and 0.909, respectively.

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*Insert Table 3.2 about here*

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Next, we assess the existence of the multicollinearity problem. Table 3.3 reports the correlation matrix of our variables. The correlations between our independent variables do not impose any source of concern. According to prior literature, the problem of multicollinearity occurs when the correlation amongst variables exceeds 0.80 (e.g. Belkhaoui, Alsagr, & van Hemmen, 2020; Gujarati & Porter, 2003)

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*Insert Table 3.3 about here*

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Furthermore, we have performed various stationary tests with regards to panel data which include Levin-Lin-Chu (LLC) unit root test by Levin, Lin, and Chu (2002), and Im-Pesaran-Shin (IPS) unit root test of Im, Pesaran, and Shin (2003). LLC is a preferable option if the number of periods falls from 5 to 250. The IPS assumes that the data has a normal distribution, finite heterogeneous variance, and zero mean. The values of these tests are provided in Table 3.4, which suggests that variables are either stationary at level or in first difference, implying that PNARDL is a suitable technique.

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*Insert Table 3.4 about here*

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### 3.4.2. Results and discussions

This study focuses on the asymmetric impacts of corruption on financial development in BRICS economies. First, we discuss the non-linear estimates of the baseline model reported in Table 3.5. From the long-run estimates, we see that the positive changes in the corruption index have an insignificant and positive influence on M2 and FD in models (1) and (2). Conversely, negative changes

of corruption index suggest that a 1-point decrease in corruption index has a significantly negative impact on M2 and FD and the magnitudes of the impacts are 0.108 and 0.049. In simple words, our findings suggest that as corruption goes up, financial development decrease in BRICS economies. In general, these findings support the 'sand in the wheel' hypothesis according to which the higher level of corruption has an adverse impact on the financial development (e.g. Beck et al., 2006a; Beck et al., 2006b; Cooray & Schneider, 2018; Wei, 2000) which in turn affects overall economic activity. According to Cooray and Schneider (2018), corruption is a rent-seeking activity that will divert the flow of cash from productive activities to non-productive ones, hindering economic activities. Moreover, due to corruption, most of the funds will be taken away by the most affluent class of society and most of the working class will remain empty-handed and as a result, the overall welfare of the society is compromised at the benefit of a few people.

Apart from the main variable, some control variables are also included. Models (1) and (2), related to M2 and FD, is augmented with GDP per capita growth (Ggrowth), average years of schooling (AYS), and law and order (Lorder). The long-run estimated coefficient (0.006) of Ggrowth, in model (2), has a positive and significant effect on FD implying that increased economic activity boosts the financial development in BRICS. This upheld the hypothesis of 'demand-following' supported by Gurley and Shaw (1967), Goldsmith (1969), and Jung (1986) according to which a positive growth of the economy pushes the demand for financial services, improving the financial development (Calderón & Liu, 2003).

Furthermore, as average years of schooling, in models (1 and 2) rises by 1-point, M2 moves upward by 0.076%. From these findings, we can confer that as people become more educated, financial development surges due to increased financial awareness and literacy (Cooray and Schneider, 2018). Finally, our results suggest that 1-point improvement in law-and-order index enhances both M2 and FD by 0.090% and 0.046% respectively. Thus, consolidating the legal and institutional

structures and presenting a competent supervisory atmosphere to ease financial inclusion will help speed up the process of financial growth (Abubakar, Mustapha, & Ajiboye, 2020). This positive role of governance in improving financial development is also supported by most of the previous studies as pointed out by Sayılır, Doğan, and Soud (2018). These long-run results are valid only if the estimate attached to $ECM_{t-1}$ is negatively significant, which is the case in both models. This implies that long-run results are co-integrated, meaning they are supporting reliability.

One of the advantages of the PNARDL methodology is that we do not need to put any extra effort to get the short-run estimates and they are available besides the long-run results by estimating a single equation. In short-run estimates, positive and negative components of corruption do not have a significant effect either on M2 nor FD. Among the control variables, only ΔAYS significantly and negatively affected the M2 and FD in models (1 and 2).

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*Insert Table 3.5 about here*

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### 3.4.3. Robustness checks

To observe the robustness of our results, Table 3.6 reports the non-linear estimates for models of M2 and FD by controlling for the crises period. Hence, asymmetric impacts of corruption on financial development findings of both baseline models in table 3.5 and robustness checks in table 3.6 are complementing each other. Generally, we can interpret that as the corruption in the society goes up the trust of the investors and creditors does not establish in the system and as a result financial sector does not flourish. Thus, both models justify the hypothesis that corruption is 'sand in the wheels' of financial development.

Furthermore, we re-estimated our models using an alternative proxy of institutional quality. More specifically, we used the bureaucratic quality index (Bquality) of ICRG as an alternative measure of institutional quality. Our models yielded similar conclusions to those documented in Tables V and

VI[8]. Thus, our results are robust and consistent having applied several checks and confirm the asymmetric impact of corruption on financial development in favor of the 'sand in the wheels' hypothesis.

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*Insert Table 3.6 about here*

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## 3.5. Concluding remarks

In this study, we assess the asymmetric impact of corruption on financial development for a sample of BRICS economies over the period 1991–2018. For that purpose, we employ an asymmetric panel ARDL approach which is estimated by the PMG technique. The baseline results revealed that a negative change in the corruption index (meaning an increase in corruption) has a significant negative influence on the M2 and FD index. The PNARDL findings also support the "sand in the wheels" hypothesis in BRICS economies because an increase in corruption significantly decreased the financial development. While a positive change in the corruption index (a decrease in corruption) insignificantly influences M2 and FD. The robustness checks also indicate that a negative change in the corruption index has significant negative effects on both M2 and FD in BRICS economies. Moreover, an increase or decrease in corruption does not change either the M2 or the FD index in the short run. Hence, we can say that long-run results are more effective and stronger as compared to the short-run estimates. These findings are of direct practical relevance for BRICS and other emerging economies.

Based on empirics, our study offers a few important policy implications for control of corruption and financial development in BRICS countries which are also applicable to other emerging economies. Our findings suggest that the governments of BRICS must take the necessary steps to reduce the level of corruption. BRICS economies could reduce corruption through good governance and by improving the quality of domestic institutions combined with educational attainment. The

[8] Estimated models output will be made available upon request.

combat against corruption must be on all levels in BRICS economies, international pressure on corrupt countries can be beneficial. The BRICS economies can control corruption meaningfully by changing the regulatory system. A combination of social, economic, and institutional policies can effectively lower the impacts of corruption on financial development. Overall, our results suggest that policies to reduce corruption will show their efficacy in the long-run and not much in the shorter period.

As a result, this study lays the foundation for upcoming empirical studies on the connection between corruption and different development variables. A similar study can be conducted for other economies. Furthermore, future research should consider financial sector activity and banking sector efficiency, or different kinds of financial sector development, as that dissect might augment the policy implications. Based on the notable findings existing in this paper, forthcoming empirical research will need to consider asymmetries in the analysis of corruption-financial development nexus for other countries in various political regimes. Future empirical works may also address the issue of governance in highly corrupted economies concerning corruption.

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# Tables

## Table 3.1: Definitions and sources

| Variables | Abbreviations | Definitions | Sources |
|---|---|---|---|
| Money supply | M2 | Broad money (% of GDP). | World Bank |
| Financial development index | FD | An index that captures both financial institutions and financial markets development. | IMF |
| Corruption index | Corruption | Control of corruption index ranging from 0 denoting (maximum corrupt) to 6 (no corrupt). | ICRG |
| GDP per capita growth | Ggrowth | GDP per capita growth (annual %) | World Bank |
| Average years of schooling | AYS | Average years of schooling | World Bank |
| Law and order index | Lorder | Law and order index ranges from 0 to 6 | ICRG |
| Bureaucratic Quality index | Bquality | Bureaucratic quality index ranges from 0 to 4 | ICRG |

## Table 3.2: Descriptive statistics

| | M2 | FD | Corruption | Ggrowth | AYS | Lorder | Bquality |
|---|---|---|---|---|---|---|---|
| Mean | 4.144 | 0.507 | 2.542 | 3.298 | 12.28 | 3.293 | 2.186 |
| Std. Dev. | 0.614 | 0.142 | 0.909 | 4.727 | 2.054 | 0.989 | 0.713 |
| Min | 2.157 | 0.000 | 1.000 | -14.614 | 7.700 | 1.000 | 1.000 |
| Max | 5.336 | 0.791 | 5.000 | 13.636 | 15.500 | 5.000 | 4.000 |
| Observations | 140 | 140 | 140 | 140 | 140 | 140 | 140 |

## Table 3.3: Correlation matrix

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| (1) M2 | 1 | | | | | | |
| (2) FD | 0.773 | 1 | | | | | |
| (3) Corruption | -0.181 | -0.404 | 1 | | | | |
| (4) Ggrowth | 0.570 | 0.459 | -0.260 | 1 | | | |
| (5) Lorder | 0.194 | 0.135 | -0.111 | 0.537 | 1 | | |
| (6) Bquality | 0.094 | -0.394 | 0.598 | -0.046 | 0.086 | 1 | |
| (7) AYS | -0.039 | 0.165 | -0.146 | -0.322 | -0.520 | -0.499 | 1 |

## Table 3.4: Unit root tests

| | | M2 | FD | Corruption | Ggrowth | AYS | Lorder | Bquality |
|---|---|---|---|---|---|---|---|---|
| **LLC** | **I(0)** | -3.567*** | -1.270 | -3.241*** | -3.184*** | 1.504 | 0.131 | -3.131 *** |
| | **I(1)** | | -4.680 *** | | | -3.048*** | -2.579*** | |
| | **Decision** | I(0) | I(1) | I(0) | I(0) | I(1) | I(1) | I(0) |
| **IPS** | **I(0)** | -0.954 | -2.785 ** | -2.125* | -3.165*** | -0.556 | -3.920*** | -2.440** |
| | **I(1)** | -5.252*** | | | | -3.319*** | | |
| | **Decision** | I(1) | I(0) | I(0) | I(0) | I(1) | I(0) | I(0) |

**Notes:** *, **, *** denotes the level of significance at the 10%, 5%, and 1% respectively.

## Table 3.5: Nonlinear panel ARDL estimates

| | M2 | | | | FD Index | | | |
|---|---|---|---|---|---|---|---|---|
| | **Coefficient** | **S.E** | **t-Stat** | ***P*-value** | **Coefficient** | **S.E** | **t-Stat** | ***P*-value** |
| ***Long-run estimates*** | | | | | | | | |
| $Corruption^{+}$ | 0.020 | 0.045 | 0.453 | 0.651 | 0.010 | 0.012 | 0.818 | 0.415 |
| $Corruption^{-}$ | -0.108*** | 0.015 | -6.987 | 0.000 | -0.049*** | 0.004 | -11.65 | 0.000 |
| Ggrowth | -0.002 | 0.006 | -0.256 | 0.799 | 0.006*** | 0.002 | 3.752 | 0.000 |
| AYS | 0.076*** | 0.018 | 4.151 | 0.000 | 0.007 | 0.006 | 1.206 | 0.231 |
| Lorder | 0.090*** | 0.029 | 3.090 | 0.003 | 0.046*** | 0.009 | 5.039 | 0.000 |
| ***Short-run estimates*** | | | | | | | | |
| ECMt-1 | -0.217* | 0.130 | -1.669 | 0.100 | -0.457* | 0.257 | -1.778 | 0.079 |
| $\Delta Corruption_t^{+}$ | 0.037 | 0.041 | 0.908 | 0.366 | -0.015 | 0.012 | -1.232 | 0.221 |
| $\Delta Corruption_t^{-}$ | 0.055 | 0.043 | 1.296 | 0.198 | 0.013 | 0.015 | 0.913 | 0.364 |
| $\Delta Ggrowth_t$ | 0.001 | 0.005 | 0.220 | 0.826 | -0.001 | 0.001 | -0.974 | 0.333 |
| $\Delta AYS_t$ | -0.097*** | 0.034 | -2.892 | 0.005 | -0.040** | 0.016 | -2.448 | 0.016 |
| $\Delta Lorder_t$ | 0.052 | 0.042 | 1.216 | 0.227 | -0.008 | 0.005 | -1.475 | 0.144 |
| C | 0.680 | 0.435 | 1.564 | 0.121 | 0.092 | 0.061 | 1.512 | 0.134 |
| No. of cross-sections | 5 | | | | 5 | | | |
| No. of Obs. | 130 | | | | 130 | | | |
| Log likelihood | 220.1 | | | | 332.7 | | | |

**Notes:** *, **, *** denotes the level of significance at the 10%, 5%, and 1% respectively.

## Table 3.6: Nonlinear panel ARDL estimates (controlled for the crisis period)

| | M2 | | | | FD Index | | | |
|---|---|---|---|---|---|---|---|---|
| | **Coefficient** | **S.E** | **t-Stat** | ***P*-value** | **Coefficient** | **S.E** | **t-Stat** | ***P*-value** |
| ***Long-run estimates*** | | | | | | | | |
| $Corruption^{+}$ | 0.020 | 0.043 | 0.474 | 0.637 | 0.009 | 0.013 | 0.697 | 0.488 |
| $Corruption^{-}$ | -0.117*** | 0.016 | -7.399 | 0.000 | -0.048*** | 0.005 | -9.898 | 0.000 |
| Ggrowth | 0.001 | 0.006 | 0.237 | 0.813 | 0.006*** | 0.002 | 3.223 | 0.002 |
| AYS | 0.074*** | 0.018 | 4.172 | 0.000 | 0.008 | 0.006 | 1.275 | 0.206 |
| Lorder | 0.095*** | 0.030 | 3.195 | 0.002 | 0.046*** | 0.010 | 4.721 | 0.000 |
| ***Short-run estimates*** | | | | | | | | |
| ECMt-1 | -0.224* | 0.129 | -1.742 | 0.085 | -0.458* | 0.254 | -1.802 | 0.075 |
| $\Delta Corruption_t^{+}$ | 0.041 | 0.042 | 0.962 | 0.339 | -0.015 | 0.012 | -1.260 | 0.211 |
| $\Delta Corruption_t^{-}$ | 0.056 | 0.043 | 1.292 | 0.200 | 0.012 | 0.015 | 0.826 | 0.411 |
| $\Delta Ggrowth_t$ | -0.001 | 0.003 | -0.350 | 0.727 | -0.001 | 0.001 | -0.511 | 0.611 |
| $\Delta AYS_t$ | -0.089*** | 0.031 | -2.878 | 0.005 | -0.042** | 0.017 | -2.498 | 0.014 |
| $\Delta Lorder_t$ | 0.050 | 0.042 | 1.186 | 0.239 | -0.009 | 0.005 | -1.628 | 0.107 |
| C | 0.690* | 0.411 | 1.679 | 0.097 | 0.093 | 0.062 | 1.500 | 0.137 |
| No. of cross-sections | 5 | | | | 5 | | | |
| No. of Obs. | 120 | | | | 120 | | | |
| Log likelihood | 215.1 | | | | 320.3 | | | |

**Notes:** *, **, *** denotes the level of significance at the 10%, 5%, and 1% respectively.

# Conclusion of the Thesis

In this thesis, we have aimed to cover the implications of uncertainty on different financial and economic variables in emerging markets. Our work contributes to the existing literature by providing a methodical understanding of how different uncertainties impact various financial and economic conditions in emerging markets that eventually impact the whole world. We also show a specific direction to researchers who desire to contribute in this area by working on the future directions and limitation of the current study.

The first chapter of this thesis fills the gap in the literature by investigating the impact of geopolitical risk on banking performance on two different groups of emerging economies, oil-dependent and non-oil-dependent.

We still aren't fully aware as how the effects of geopolitical risks could lead to different outcomes given the economic nature a country. The oil producing countries has mostly been a rallying attention point for most finance experts and researchers. Colgan (2014), suggests that the petro-states may confront political issues (domestically and internationally) but their oil rents can ward off political instability to offer a more assured performance. As no study provided this deep comparative impact of geopolitical risk, we fill a gap in the literature by explaining the impact of geopolitical risk on banking performance with a moderating role of oil rent. We used a group of 19 emerging economies, presenting a balanced proportion of petro and non-petro states. Moreover, our study is unique in shedding light on the moderation effect of oil rent in the relationship between geopolitical risks and banking sector profitability, hence adding to the enduring debate of whether oil leads to "curse of a blessing". Different schools of thoughts discuss the impact of oil rents on different economic indicators.

A group of researchers lean towards the "resource curse" theory. They argue that the countries abundant in resources show a weaker growth pattern compared to the countries with lesser natural resources (Gylfason, Herbertsson, & Zoega, 1999; Rodriguez & Sachs, 1999; Sachs & Warner, 1995). They argue that abundance in resources can easily become a curse because it misleads countries into believing that they must entirely focus on resource exploration projects. Such an obsession can deter such countries from investing in projects that could yield better outcomes in terms of producing other exportable products.

Opposing these views, are experts who side with the "resource blessing" theory, which proposes that countries rich in resources tend to regularly generate a huge sum of income from their exports of surplus natural resources (e.g. oil rent) and such hefty incomes not only support their economy but also provide ample opportunities to invest in new mega projects (Alexeev & Conrad, 2009; Esfahani, Mohaddes, & Pesaran, 2013; Van der Ploeg & Poelhekke, 2010). Therefore, the first chapter tests the degree to which the oil rents of resource-intensive economies dilute the adverse effects of geopolitical risk on the profitability of banks.

The motivation for second chapter is based on the fact that besides financial development, geopolitical risk is significant in the process of energy transition for the emerging markets. Thus, along with importance of financial development, the second chapter of our thesis further highlights the role of geopolitical risk in emerging economies. Since developed countries work on zero carbon emission plan (Shahbaz, Nasir, Hille, & Mahalik, 2020), emerging economies still account for a significant portion of GHG emissions worldwide (Apergis & Garzón, 2020; Chen et al., 2020). Therefore, the findings of our second chapter are of great importance and generalizability to the both the emerging and the developed world. Firstly, we address the importance of renewable energy consumption in the context of emerging economies and emphasizes on how enhancements in renewable energy

consumption help the emerging economies in fulfilling their responsibilities towards combating climate challenges. Secondly, we discuss the role of financial development on renewable energy consumption which not only enhances the FD-REC literature but helps policymakers of emerging countries in designing realistic energy transition plans without affecting their production targets. Considering the uncertain political situation of most of emerging economies, the present study reveals how geopolitical risks also impact the consumption of renewable energy in these countries.

In the third chapter, we focus on another attention-grabbing and well prevalent phenomenon: corruption. We know contradictory views and debates among scholars regarding the impact of corruption. One group of scholars believe in the "grease the wheels" hypothesis while others support the hypothesis of "sand in the wheel". In this chapter, we discuss both the views theoretically. The empirical findings affirm "sand in the wheels" hypothesis in the emerging economies. Our findings reveal that an increase in corruption has a significant negative influence on financial development in the long run but in the short run the increase or decrease in corruption remains irrelevant to the financial development in BRICS economies. As prior research discussed the impact of corruption on financial development with inconsistent results, this study makes multiple contributions in the corruption-financial development-related literature. This study makes a novel contribution by developing insight on how corruption asymmetrically impacts financial development. This is the first attempt to use the PNARDL of Shin, Yu, and Greenwood-Nimmo (2014), which breaks down the main independent variable (corruption) into positive and negative shocks. The PNARDL approach is a dynamic and robust estimate that controls for the problem of endogeneity, which is a common phenomenon in such studies. Next contribution of this study lies with its context and period. BRICS, is a group of five major emerging economies that make up 42% of the global population, with 23% of the global GDP, and more than 16% participation in the global trade (World Investment Report,

2017). We conducted this study with the most recent available dataset covering a period from 1991 to 2018.

As for policy implications, the current thesis primarily helps the thinking process and strategy development of the policymakers in emerging economies but these implications exhibit significant importance for the global think-tanks as well.

Policymakers of the emerging petro-state economies must understand that geopolitical risks such as terrorist isn't easy to predict and a state afflicted by such a geopolitical shock might trigger its cash flow to and from the banking system. Such geopolitical tensions are expected to cause potential distraction in the oil rent of oil-dependent economies. For example, in 2019, the attacks on the Saudi oil facilities resulted in a significant effect on its oil revenues. The current study is based on the energy-related geopolitical viewpoint. It recommends that legislators and policy-makers of the oil-reliant countries must hasten their worldwide energy shift, focus on improvement in decarbonized cycles, enhance renewable energy production, and decrease their oil dependence for economic growth. All that is important because oil related geopolitical tensions have been on a rise in recent decades.

The policymakers of emerging countries should execute their renewable energy consumption strategies because it offers numerous advantages. First of all, renewable energy consumption improves the atmosphere. Therefore, they should discourage the business-level usage of non-renewables and increase renewable energy consumption. For instance, imposing an air pollution tax on production plants may shift them towards renewable energy consumption. Secondly, transferring renewable energy is much easier compared to non-renewable energy, which reduces the energy transfer cost and the security expenses of non-renewable energy reservoirs. Thirdly, renewable energy consumption ensures the continuous availability of required amount of energy.

At the same time, political leaders in emerging countries should be very vigilant while introducing energy transition dogmas. They should realize the importance of financial development

in the energy transition process. A shortsighted and imperative energy transition plan, without availability of required financial resources, may disrupt the production capacity of firms. Thus, governments should progressively enforce renewable energy consumption policies while offering appropriate financial means via their financial institutions and/or capital markets. Focusing on the importance of financial development, legislator of emerging economies may introduce some incentive plans, such as easy loans, and tax rebates for businesses that want to enhance the consumption of renewable energy in their production plants. This may encourage businesses to enhance renewable energy consumption and also to invest in small projects of renewable energy production to fulfill their own energy demands. Similarly, dedicated incentive schemes should be introduced for investors who want to invest in mega renewable energy projects. Intricate and lengthy bank credit procedures may daunt renewable energy projects; on the other hand, swift loans, with lower or zero interest rates, may fulfill the financial demands of renewable energy investments. Therefore, for successful execution of energy transition from non-renewable to renewable, governments in developing countries should imply policies that enhance the financial capacity of businesses to invest in renewable energy plants instead of forcing hasty and unrealistic targets of minimizing fossil fuel consumption.

Considering the importance of financial development, our study also offers a few important policy implications for control of corruption because corruption puts "sands in the wheels" of financial development in emerging economies. Emerging economies, such as BRICS may reduce corruption through good governance and by improving the quality of domestic institutions combined with educational attainment. The combat against corruption must be observed on all levels in the emerging economies. International pressure on corrupt countries can also be beneficial. The emerging economies can control corruption meaningfully by changing the regulatory system. A combination of social, economic, and institutional policies can effectively lower the impacts of corruption on financial development. Overall, our results suggest that policymakers in emerging economies need to exhibit a

promising and long term commitment to reduce corruption because policies to reduce corruption will show their efficacy in the long-run and not much in the shorter period.

Our study also helps research community by offering avenues of new research to and also by acknowledging our limitations that can be overcome in future studies. While investigating the impact of geopolitical risk on banking performance, we made use of macro-level indicators of banking sector performance, which is a limitation. Thus, micro-level data can further be used to validate results. Modern literature affirms that Islamic banks are less exposed by macro uncertainty (e.g. Al Shboul, Maghyereh, Hassan, & Molyneux, 2020; Belkhir, Grira, Hassan, & Soumaré, 2019). Therefore, by deploying micro-level data, a comparison study between Islamic and conventional banks could reveal interesting insights. Furthermore, expanding the span of the study and conducting a comparative research between emerging economies and their developed peers could be another outlet for investigating the impact of geopolitical risk on banking performance in the future.

The importance of control variables in research must never be undermined. While studying the impact of financial development and geopolitical risk on renewable energy consumption, we have used three most important control variables, namely, GDP per capita, consumer price index (CPI), and foreign direct investment (FDI). Although the use of these control variables finds enough support from existing literature on renewable energy consumption (e.g. Anton & Nucu, 2020; Best, 2017; Çoban & Topcu, 2013; Sadorsky, 2010) yet future researcher might add some more relevant control variables to enhance the validity of the results. Another potential extension of the current study is to incorporate more recent data at availability, and including the direct and indirect impact of the ongoing pandemic, Covid-19, through technology transformation, R&D, investments, etc.

Based on the notable findings existing in our third chapter, forthcoming empirical research should consider asymmetries in the analysis of corruption-financial development nexus for other countries in various political regimes. Future empirical works may also address the issue of governance

in highly corrupted economies concerning corruption. Future research should consider financial sector activity and banking sector efficiency, or different kinds of financial sector development, as that dissect might augment the policy implications. Finally, following our thesis, future researchers may enhance the study context and conduct a similar for other economies which will enrich the generalizability of our findings.

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