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Impact of Fiscal Decentralization, Natural Resource Rents, and Institutional Quality on Environmental Quality of South Asian Economies

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ABSTRACT

This study sheds fresh light on the relationship between CO2 emissions and factors such as fiscal decentralization and natural resource rents. Data from four South Asian nations dating back from 1989 to 2019 are used in this study to measure this goal. The Westerlund and the CS-ARDL methods are used for empirical investigation. The Pesaran 2nd-GEN unit-root assessment determines the order of variable integration. The first difference integration of indicators from the second generation unit root has been brought into being. Fiscal decentralization and natural resource rents have been demonstrated to condense CO2 releases in the long span. Furthermore, when the economy grows, it fails to improve the environmental quality of South Asian economies. On the other hand, institutional quality recovers the environmental quality by mitigating CO2 emissions. It is recommended by this research that local governments should be given greater authority in order to minimize CO2 emissions and move these nations to more ecologically friendly methods of production.

Keywords: Fiscal Decentralization, Institutional Quality, Natural Resource Rents, South Asian Economies, CS-ARDL

INTRODUCTION

Fiscal decentralization has been seen all around the world throughout time. It's a system under which municipal and regional administrations are given control or power over certain economic undertakings in their jurisdiction (Zhang et al., 2011; Hanif et al., 2017; Hanif et al., 2020; Hao et al., 2020; Li et al., 2020; Wen and Lee, 2020). During a long period of time, fiscal decentralization will lead to more significant economic expansion and quality of life because of the greater skill and local knowledge of province and local governments (Zhang et al., 2011; Hanif et al., 2017). However, according to Eller and Breuss (2004), decentralization in several developing countries has resulted in insufficient services and

development under centralized structures. Structures like this foster a culture of failure and rentiers in order to meet the needs of the broader population (Huang et al., 2020; Ji et al., 2020). Fiscal decentralization is primarily intended to improve environmental sustainability, despite the many competing interests at play—political skirmishes, racial and regional conflicts, global recession, market economy transition, and democratic reform (Hanif et al., 2019; Su et al., 2020).

One of the finest policy choices that developing nations have available to them to improve the environmental sustainability of their economies is to reorganize the public sector in order to make it more accessible to the public interest (Khan et al., 2021; Hanif et al., 2020). However, Wang et al. (2021) discussed the negative liaison flanked by fiscal decentralization and carbon gas secretions. Numerous studies came to the conclusion that fiscal reorganization lowers the eminence of the environment (Chen and Liu, 2020; Hanif et al., 2017; Kim, 2011). On the other hand, in some shreds of evidence, fiscal decentralization recovers environmental quality (Cheng et al., 2020; Hanif et al., 2018; Bowman et al., 2007). Consequently, a lack of clarity suggests the link flanked by fiscal decentralization and environmental-related indicators may need more investigation. In the most recent few decades, local and state governments, rather than national governments, have been the primary actors in formulating environmental policy. However, the subordinate regulatory organizations only follow the norms set down by the central government and not by the sub-national government (Hao et al., 2020; Hanif et al., 2018a).

Environmental deterioration and fiscal decentralization came into being as the heated subject of various research in the existences (Li et al., 2022; Chi et al., 2021; Elhedad et al., 2020; Hanif et al., 2019; Zhang et al., 2017). Their conclusions, on the other hand, are inconclusive due to the fact that the countries/provinces studied, the time period, and the methodology used was all different. The prime purpose of this piece of work is to investigate the outcome of fiscal decentralization on CO_2 emissions for Pakistan, India, Bangladesh, and Sri lanka. As a result, our research has the potential to enlighten this relationship. In the shred light of our acquaintance, fiscal decentralization and natural resource rent have never been studied together to reduce carbon dioxide emissions. Consequently, this study closes the gap that was found in the previous research. In addition, the research investigates whether or not there is a causality between the following variables: GDP, natural resource rent, fiscal decentralization, and carbon gas secretions. The findings of this research have a significant amount of meaning and application in the real world. In recent years, the globe has been confronted with formidable environmental difficulties; as a result, the environmentalists and policymakers of the world are searching for solutions that are connected to persistent environmental issues. Certain localities are making it difficult for polluting practices to continue by instituting stringent environmental rules and carrying out a "beggar-thy-neighbor" program in which they export their polluting operations to areas that are located nearby. At the same time, some nations have very lax environmental policies and are actively working to grow their environmentally-focused industries while simultaneously increasing their environmental footprint. In such circumstances, fiscal decentralization, implemented through a "race to the top strategy," can limit environmental contamination. This strategy also involves the local government in environmental protection efforts. In addition, there is a lack of consensus among scholars and policymakers on the best way to manage environmental standards, whether it be via a centralized or decentralized structure. Therefore, it is of the utmost importance to

investigate the part fiscal decentralization plays in reducing carbon dioxide emissions. The findings of this research are especially significant for Pakistan, India, Bangladesh, and Sri Lanka, which served as the nation of investigation. As a result, all these countries are prosperous while also being extraordinarily decentralized and polluted simultaneously. The most important issue is whether or not fiscal decentralization effectively limits the amount of carbon dioxide emissions produced by increased economic activity. Using these countries as a model, it is essential to do research on the relationship between carbon dioxide emissions and fiscal decentralization because of the importance of this topic.

The next section will provide a summary of the relevant research. In the third section, we will discuss the data and the methodologies used. The conclusions based on the methodologies used are discussed in the fourth section. Finally, the conclusion and the proposed course of action are covered in the fifth section.

Review of Past Studies

The environmental repercussions of decentralizing political and secretarial power have recently emerged as a hot issue of discussion in academic circles as well as in the realm of government. On different effects, fiscal decentralization provides public goods to favor environmental efficiency, as verified by Chunyu et al. (2021) and Cheng et al. (2020). The existing segment of the discussion analyzes the pertinent literature with the goal of producing projections on the ways in which decentralization might affect the standard of the environment. According to the findings of a number of studies, there seems to be a substantial connection in the middle of the extent of decentralization of fiscal and the level of emanations among areas within an economy (Batool et al., 2022; Hao et al., 2020). For the reason that it enables the ruling classes to observe their own radiation, having a framework assumes that the disparity in authority that exists between the various jurisdictions will become more pronounced (Chen and Liu, 2020; Ali et al., 2018). There is a possibility that the impacts of fiscal decentralization will be impacted in various ways by frameworks that include interest groups and political allocation (Huang and Zhou, 2020). However, a lack of clarity on the impacts of fiscal decentralization provides an opportunity to investigate the links between a wide range of problems (Jiang et al., 2022; Huang and Zhou, 2020).

Since fiscal decentralization has an effect on the mechanism that drives economic growth, it is possible that fiscal decentralization will also have an indirect impact on the quality of the environment. This is because researchers have found a correlation between the economy's growth and the environment's quality (Sigman, 2014). Fiscal decentralization plays a part in the expansion of the existing economy. Therefore, decentralization in the fiscal circle can indirectly control the preservation of the natural environment. According to the findings of various researchers, there is a connection between the growth of the economy and the deterioration of the natural environment (Raza et al., 2022; Adebayo and Akinsola, 2021; Lorente et al., 2018). According to the EKC theory, there is a U-formed liaison amongst environmental contamination and income at the per capita level, and this connection is shadowed by Adebayo and Kirikkaleli (2021). However, the inverted U formed of EKC with the same indicators was demonstrated by Grossman and Krueger (1995). Environmental pollution rises in the early stages of economic expansion but then declines after the economy reaches a certain level, according to their research. Ji et al. (2020) elaborated that economic growth has the potential to influence the state of the

environment; hence, fiscal decentralization will indirectly impact environmental conditions as a result of the impacts it has on economic growth.

In addition to this, fiscal decentralization will unquestionably affect the excellence of the environment. A greater degree of decentralization in the fiscal system may improve environmental quality if it enables local governments operating under a decentralized system to have improved access to financial capital and increased leeway in their efforts to preserve the quality of the environment (Wang et al., 2022; Huang and Zhou, 2020). Compared to the central administration, local administrations have a greater understanding of environmental sustainability, enabling them to make more effective investments in refining the eminence of the environment in their respective areas. In contrast, more fiscal decentralization may result in a decline in the overall sustainability of the environment. The main reason for the push for fiscal decentralization is to encourage a process of economic development (Chen et al., 2018). This is due to the fact that local governments stand to gain significant benefits from greater rates of GDP growth in their respective areas. Because of this, the current leaders of the community make every effort to increase the rate of economic development in contrast to the rate at which it was achieved by their predecessors, even if it means sacrificing the quality of the environment. According to Shi et al. (2018), a higher degree of decentralization inspires native authorities to spend more on lucrative initiatives and substructures requiring considerable energy and emitting extra greenhouse gases.

The competition between "race to the bottom" and "race to the top" is discussed in more detail in a separate section of the empirical research on the effect of fiscal decentralization on environmental pollution (Hao et al., 2020). Race to the bottom refers to situations when countries have lower environmental regulations to make up for capital, and "race to the top" refers to situations where local governments raise standards to shift environmental harm to other places (Cheng et al., 2020). According to traditional federalism, local governments might choose to release large quantities of toxins across boundaries due to the transregional spillover effects of environmental pollution (Huang and Zhou, 2020). Fiscal decentralization critically influences deteriorating environmental quality (Wang and Lei, 2016). However, the results of the link between fiscal decentralization and environmental sustainability are questionable. Furthermore, there is no consensus on how to govern environmental standards in either a centralized or decentralized structure. In this regard, numerous research has been done to investigate the relationship between the decentralized system and environmental sustainability.

Data, Variables Description, and Methodology

Data and Variables

In this section, fiscal decentralization, institutional quality, and economic growth are measured for environmental quality in South Asian countries. The selected four South Asian countries are Bangladesh, India, Pakistan, and Sriland. For the purpose of analysis, the data has been taken from 1989 to 2019 through the WDI of the World Bank. In discussing the measurement units of selected variables, the environmental quality is measured through CO_2 emissions (metric ton per capita). Fiscal decentralization is taken as the ratio of revenues to general government revenues. Economic growth is measured in the unit of GDP per capita annual % growth and natural resource rents as total natural

resource rents % of GDP. Furthermore, institutional quality is the government regulation and services, individual rights, and quality of law, calculated as principle component analysis from World governance indicators.

Model and Methodology

The econometric model is established to examine the reaction of fiscal decentralization, institutional quality, and economic growth toward environmental quality in South Asian countries. The econometric model is as follows:

$$ENQ_{it} = \alpha_0 + \alpha_1 FSD_{it} + \alpha_2 EGP_{it} + \alpha_3 TRR_{it} + \alpha_4 INQ_{it} + \mu_{it} \quad (1)$$

In the above linear equation (1), variables are taken as ENQ (environmental quality), FSD (financial quality), EGP (Economic Growth), TRR (Natural Resource Rents), and INQ (institutional quality). α_0…….. α_4 are intercept and slope of the model and coefficients to describe the model's variables. However, it indicates the countries concerning time, and u_{it} shows the terms of the error in the model.

In discussing the methodology, the first step is the cross-section dependency of the variables. Then, it measures whether the variables of interest are cross-section dependent or independent. The cross-section dependence test is monitored by Pesaran (2004) and is centered on the null hypothesis against the alternative hypothesis. Further, the 2nd-Gen unit-root assessment named cross-sectionally augmented IPS (CIPS) is smeared on the study variables to integrate their orders of stationarity.

$$CIPS = N^{-1} \sum_{i=1}^{n} CADF_i \quad (2)$$

In the above equation of CIPS, CADF consists of null and alternative hypotheses for possible outcomes of stationarity and non-stationarity in the variables.

In the next step, cointegration is necessarily to measure to establish the interaction in the middle of dependent and independent indicators. The panel cointegration test follows Westerlund (2007), which contains Gt, and Ga, with Pt, and Pa test statistics. The equation of the cointegration test is modeled below:

$$\Delta ENQ_{it} = \eta_i D_t + \gamma_i (ENQ_{it-1} - \delta_i X_{it-1}) + \sum_{j=1}^{Pi} \gamma ij \Delta ENQ_{it-1} + \sum_{j=-qi}^{Pi} \theta ij \Delta X_{it-1} + \mu_{it} \quad (3)$$

In the above equation of Westerlund (2007), *it* indicates the panel countries under the time period. However, D_t is the deterministic component, while γ_i is the adjustment in ENQ_{it-1}-$\delta_i X_{it-1}$ by reflecting constant and time trend for independence in the midst of ΔX_{it} and μ_{it}.

In the end, the study requires the interaction of fiscal decentralization, natural resource rents, institutional quality, and economic growth with environmental quality in the short and long run in selected South Asian countries. Keeping in mind this, the study smears a cross-section augmented autoregressive distributed lag-model. Furthermore, CS-ARDL technique has been shadowed by Chudik et al. (2016), allowing feeble exogenous regressors to keep back the dynamic behavior and filter the effect of neglected factors. The equation of CS-ARDL for long and short periods is modeled below:

$$\Delta ENQ_{it} = \eta_i + \gamma_i (ENQ_{it-1} - \delta_i X_{it-1} - \gamma_{1i} ENQ_{t-1} - \gamma_{2i} X_{t-1}) + \sum_{j=1}^{P-1} \gamma ij \Delta ENQ_{it-j} + \sum_{j=0}^{q-1} \theta ij \Delta X_{it-j} + \eta_{1i} \Delta ENQ_t + \eta_{2i} \Delta X_t + \mu_{it} \quad (4)$$

The above equation is used for the interaction of fiscal decentralization, natural resource-rents, institutional quality, and economic growth with environmental quality in the short and long run in selected South Asian countries. In the overhead equation (4) of CS-ARDL, ΔENQ_{it} indicates the dependent, while X_{it} refers to the independent variables of the model. However, ENQ_{it-1} *and* X_{it-1} specify the means of variables over long periods, correspondingly. Further, the means of indicators over short periods are ΔENQ_{it-j} and ΔX_{it-j}.

Results and Discussion

This section starts with the descriptive summary and correlation matrix to observe the statistical worth of the variables. A descriptive statistics summary in table 1 shows a respectable statistical approach to variables and that all the variables have some distinctions from their mean points. Further, their directions and peakedness are also observed. Finally, in the continuing statistical examination, the correlation matrix in table 2 shows a moderate relation of FSD with ENQ and INQ with ENQ. However, EGP has a weak association with ENQ, while TRR has a meaningful connection with ENQ but opposes others.

Table 1:Descriptive Summary

	ENQ	**FSD**	**EGP**	**TRR**	**INQ**
Mean	2.081	0.798	1.305	1.522	2.016
Median	2.248	0.566	1.448	1.809	2.148
Std. Dev.	1.479	0.799	0.987	1.901	0.202
Skewness	0.480	-0.192	-2.800	-2.583	-0.605
Kurtosis	2.818	2.033	16.090	12.821	2.778

Table 2:Correlation Matrix

	ENQ	**FSD**	**EGP**	**TRR**	**INQ**
ENQ	1				
FSD	0.451	1			
EGP	0.234	0.182	1		
TRR	-0.334	-0.117	0.719	1	
INQ	0.506	0.379	0.223	0.301	1

In table 3, cross-sectional independence has been checked, and it has been seen that all variables such as ENQ, FSD, EGP, TRR, and INQ are statistically significant and cross-sectional dependent. The significance of all variables clearly indicates that the assumption of cross-sectional independence has been forbidden; it concludes that the variables are cross-sectional dependent. After this, table 4 includes the findings of the unit root test at the level and first-order difference with no trend and constant with trend values. CIPS unit root test indicates that all the variables such as ENQ, FSD, EGP, TRR, and INQ are

statistically significant at I (1) and further put forward to propose cointegration technique and CS-ARDL for short and long run estimation.

Table 3:Cross-sectional Independence

Null Hypothesis: Cross-sectional Independence		
variables	**cross-sectional dependence statistics**	**probability values**
ENQ	3.827 ***	0.000
FSD	4.348 ***	0.000
EGP	16.562 ***	0.000
TRR	6.319 ***	0.000
INQ	3.637 ***	0.000
Note: *** denotes 1% significance level		

Table 4:CIPS Panel Unit Root Test

	levels		**1st-difference**		
variables	**without trend**	**constant-trend**	**without trend**	**constant-trend**	**decision**
ENQ	-1.535	-1.755	-6.096 ***	-6.350 ***	First Difference I (1)
FSD	-1.794	-1.390	-6.420 ***	-6.604 ***	
EGP	-1.884	-1.604	-5.315 ***	-5.805 ***	
TRR	-1.489	-1.698	-3.885 ***	-4.050 ***	
INQ	-1.088	-1.466	-3.097 ***	-3.610 ***	
Note: *** denotes 1% significance level					

In table 5, Westerlund (2007) cointegration technique is applied for the purpose of measuring the cointegration among variables. This cointegration test consists of four statistics such as Gt, Ga, Pt, and Pa, and all four statistical values are significant. Furthermore, these statistic have shown the cointegration among variables, indicating that the variables can have long-run existence. However, after accessing the cointegration among variables, the next step is CS-ARDL to inspect the variables' association in the long and short term.

Table 5 Cointegration Method of Westerlund (2007)

statistic	values	p-values
Gt	-5.889 ***	0.000
Ga	-21.275 ***	0.000
Pt	-16.750 ***	0.000
Pa	-28.558 ***	0.000
Null Hypothesis : no cointegration *** denotes 1% significance level		

Table 6 CS-ARDL

Short-Run			
variables	**coefficient**	**standard-error**	**z-statistic**
FSD	-0.102 ***	0.056	-3.877
EGP	0.099 ***	0.029	5.012
TRR	0.083 ***	0.009	6.011
INQ	-0.069 ***	0.042	-3.487
ECM (-1)	-0.802 ***	0.191	-4.085
Long-Run			
variables	**coefficient**	**standard-error**	**z-statistic**
FSD	-0.313 ***	0.102	-3.028
EGP	0.164 ***	0.058	3.870
TRR	-0.149 **	0.032	-2.286
INQ	-0.108 **	0.068	-2.392
Note: ***, and ** denotes 1% and 5% significance, respectively			

In table 6, the findings of CS-ARDL point toward fiscal decentralization (FSD) -0.102*** and -0.313*** in the short and long periods, correspondingly. FSD ominously reduces carbon secretions and improves the environmental quality in short-long periods in South Asia. On the other hand, the economic growth (EGP) value in the short period is 0.099*** and 0.164*** in the long period, indicating the deterioration in environmental quality just because of increased EGP. At the same time, natural resource rents (TRR) failed to promote environmental quality in a short period. However, its long-term impression is favorable in enhancing environmental quality in South Asian economies. TRR 0.083 *** indicates that the inspiring change in natural resource rents has deterred the environmental quality of South Asian nations for a short period. However, TRR -0.149 ** is considerably mitigating carbon secretions and is pretty ornamental in environmental quality in South Asia for an

extended period. Furthermore, institutional quality (INQ) values are -0.069 *** and -0.108 ** in that order for short and long periods. These values of INQ illustrate the negative influence on carbon dioxide discharges and move towards to betterment of the environmental quality of selected South Asian nations. Last but not least, the error correction term (ECM (-1)) value is -0.802 ***, indicating the 80 percent adjustment in error ascends from short to long term.

Conclusion

This research targets to inspect the influence of financial decentralization, economic growth, institutional quality, and natural resource rents on environmental quality in four South Asian countries. For this instance, cross section dependency and unit root testing has gone through in initial stages. Then, the cross-sectional dependency and first-order integration confirm to move on to cointegration estimation. The Westerlund technique's findings manifest that each variable significantly points to cointegration and long run survival. However, the results of CS-ARDL indicate that fiscal decentralization and institutional quality have maintained the environmental quality in South Asian countries for short and long periods. Although, the environmental situation worsened when it came to economic progress over short and long periods. At the same time, rents from total natural resources are not environmentally friendly in the short period, while upheld to sustain the environmental quality in the long period. Moreover, the error-adjusted term has done a remarkable undertaking by reducing the error from short to long periods, which is about 80 percent in selected South Asian economies. In the end, the findings suggest that fiscal decentralization is an encouraging indicator for local governments. However, it is recommended to accomplish the renewable energy consuming-saving projects and goals through fiscal decentralization to make it more effective for local governments. Further, these selected South Asian nations should be more vigilant while adopting natural resources to make their use operative, and it is suggested to adopt environmentally friendly resources. However, it is also recommended that the governments should improve their institutional quality, and stakeholders should come forward to make decisions on issues related to environmental deterioration. Regarding this, the stakeholders should mark policies to implement modern low-carbon technologies in production sectors to improve environmental quality.

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