Asian Social Science; Vol. 17, No. 10; 2021
ISSN 1911-2017 E-ISSN 1911-2025
Published by Canadian Center of Science and Education

Institutional Impact on Achieving the Sustainable Development Goal of Ending Poverty

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Received: August 17, 2021 Accepted: September 2, 2021 Online Published: September 19, 2021

doi:10.5539/ass.v17n10p25 URL: https://doi.org/10.5539/ass.v17n10p25

Abstract

The role of institutions is increasingly emphasised as a cornerstone of achieving the Sustainable Development Goals (SDGs). However, previous studies have not sufficiently considered the relationship between institutions and SDGs using cross-country empirical analysis. Therefore, this study examined the effects of institutions on SDG1 (end poverty) performance using a panel data set covering 111 countries for the period 2010–2019. Instrumental variable (IV) estimation (2SLS) and the three-stage least squares (3SLS) method were used to explore the direct and indirect impacts, respectively, of institutions on SDG1 performance. The institutional impact was captured using a composite index developed from individual worldwide governance indicators and SDG1 performance was evaluated with an index constructed using the SDG index database. The results showed that institutions have a highly significant direct positive relationship with SDG1 performance. Regulatory quality has the strongest influence on SDG1 performance while political stability has the lowest. Furthermore, institutions affect SDG1 indirectly via mediating factors – state policy, economic growth, and SDG2 (end hunger) performance. This study provides robust empirical evidence for enhanced regulatory quality and control of corruption creating a conducive environment for facilitating the achievement of the SDG of ending poverty, suggesting that policies aimed at fulfilling this goal should include the prerequisite of upgrading the country's institutions.

Keywords: ending poverty, institutions, sustainable development goals, 3SLS, 2SLS

1. Introduction

The United Nations' Sustainable Development Goals (SDGs) are an essential framework that sets the global vision for action up to 2030. It is not just a replacement for the unfinished elements of the Millennium Development Goals (MDGs), but goes far beyond the battle against the indignity of poverty. Adopted by 193 UN member states, the SDGs are a significant international step towards sustainable development.

Recent global research is increasingly geared towards addressing issues related to the implementation of SDGs, while the devastating impacts and consequences of the COVID-19 pandemic of 2020–2021 have provided further impetus to the scholarly interest in SDGs. With their deadline now only a decade away, attaining many of the SDG targets is even more challenging (United Nations, 2020). Although the SDGs have received much scholarly attention, the underlying mechanisms that explain the effects of institutional and governance factors on achieving SDGs are yet to be fully understood. The significance of governance in attaining SDGs has been emphasised by the SDG framework itself [SDG16 (promote peaceful and inclusive societies)] and by many scholars (Biermann, Kanie, & Kim, 2017; Fukuda-Parr, 2013; Glass & Newig, 2019). Thus, the insights generated by analysing the institutional and governance factors that influence the achievement of SDGs can ultimately lead to their effective implementation.

The significance of governance for sustainable development has consistently been emphasised; the need for effective policies, good governance, and active institutions for attaining the global development goals has been acknowledged (Omona, 2010; Roy & Tisdell, 1998). Weak institutions are suggested as the leading reason for the limited success of the MDGs (Miyazawa & Zusman, 2015). The evidence implies that developing countries that began implementing MDGs with solid policies and institutions surpassed others in meeting the goals (Go & Quijada, 2015). Since substantial governance aspects are integrated into the SDGs, it is anticipated that they have

more opportunities to go beyond the MDGs (Biermann et al., 2014).

Although a few studies have attempted to elucidate the influence of institutional and governance factors on achieving the SDGs, the lack of comprehensive and concrete empirical evidence supporting the link hinders evidence-based policymaking to upgrade state institutional mechanisms. The literature (Bowen et al., 2017; Kanie & Biermann, 2017; Meuleman & Niestroy, 2015; Monkelbaan, 2019; Vijge et al., 2020) has predominantly focused on conceptual and normative perspectives of the role of governance in SDGs. Glass and Newig (2019) used cross-sectional data, drawn only from a sample of countries with a high- and upper-middle-income, and simultaneously focused on all SDGs and their overall achievement to contribute to the discourse on governance in SDG implementation. The study used four governance indicators (participation, policy coherence, reflexivity and adaptation, and democratic institutions) drawn from Sustainable Governance Indicators (SGI) to measure diverse aspects of governance. Democratic institutions and participation have explained the achievement of SDGs in accordance with its findings. Furthermore, the authors highlighted the usefulness of longitudinal analysis for verification of their findings. However, since they used multiple linear regression as the analytical tool for their analysis, they did not address the potential endogeneity of the explanatory variables.

A cross-country empirical analysis using a large panel of data can provide strong support for predicting the level of influence of institutional and governance factors in achieving the SDGs. Instead of concurrently scrutinising a large number of goals, consideration of each goal separately will provide more scope for in-depth analysis and identification of all potential relationships. The prioritisation of poverty eradication in both the MDGs and SDGs makes it clear that the international community regards poverty as a primary global challenge and its elimination as indispensable to sustainable development. Moreover, the criticality of concentrating on achieving SDG1 (end poverty in all its forms) was endorsed by the recent findings of the synergetic relations of SDG1 with most of the other SDGs (Fonseca, Domingues, & Dima, 2020; Kroll, Warchold, & Pradhan, 2019). Therefore, this study attempts to explicitly demonstrate the importance of institutional aspects in achieving SDG1.

The role of institutions in poverty alleviation has received considerable academic interest (Chong & Calderón, 2000; Fagbemi, Oladejo, & Adeosun, 2020; Rizk & Slimane, 2018; Tebaldi & Mohan, 2010). Although many empirical investigations have examined the direct relationships of institutions to poverty, only a few have posited indirect impacts (Brady, Blome, & Kleider, 2017; Deolalikar et al., 2002; Enders & Hoover, 2003). Hardly any studies have explored the indirect effects of institutions on achievement of SDG1.

To bridge the above gaps in the literature, this study examines the institutional impact on the fulfilment of SDG1 and the pathways through which these impacts operate. Accordingly, the study first analyses the direct impact of institutions on achieving SDG1 using the instrumental variable (IV) approach (two-stage least squares [2SLS]) as a measure to overcome the endogeneity of the regressors. Then, the indirect or mediation effects of institutions on the realisation of SDG1 through state policy, economic growth, and fulfilment of SDG2 (end hunger) are estimated separately using the three-stage least squares (3SLS) method. These analyses rely on panel data for 111 countries under all income categories over a ten-year period from 2010 to 2019. This investigation contributes in two ways to the literature on the institutions–SDG nexus: methodologically, it uses more robust estimation techniques and a large panel of data compared to the existing literature for analysing the direct effect of institutions; and empirically, it analyses hitherto unexplored mediation effects of institutions on fulfilment of SDG1.

2. Literature Review

2.1 Institutions

The term ‘institution’ refers to a wide variety of structures, bodies, processes, and norms that organise people's lives and societies (United Nations, 2016). North (1990, p. 3) provides the following definition: “Institutions are the rules of the game in a society or are the humanly devised constraints that shape human interaction”. In general, political institutions – the primary determinant of long-term growth – establish economic institutions. Political and economic institutions are both categorised as inclusive or extractive. Inclusive political institutions tend to establish inclusive economic institutions and enable equal distribution of resources, thereby providing a level playing field in the market and guaranteeing contracts and securing property rights (Acemoglu & Robinson, 2012). Consequently, the variability in economic institutions, which are based on the system of political power and the type of political institutions, is the essential cause of divergence in economic development (Acemoglu, Johnson, & Robinson, 2005).

2.2 Nexus of Institutions and Poverty

Theoretical investigations suggest that institutions influence poverty through market distortions and resource misallocation. According to the institutional economics literature, the quality of institutions is an appropriate factor for explaining the economic and socio-political performance of a group, society, or nation (Bardhan, 2002; Dasgupta & Serageldin, 2000; North, 1990). The capability approach explicitly focuses on profit variation between groups from the available resource endowment while simultaneously considering distribution of and access to resources (Sen, 1983). The examination of institutions as 'rules of the game' in allocating resources and working for or against distinct social groups would allow a glimpse of these issues (Bastiaensen, De herdt, & D'Exelle, 2005).

From a theoretical standpoint, weak institutions may lead to income disparities. Chong and Gradstein (2007) empirically confirmed the correlation between weak institutions and income inequality. Accordingly, the poor are not protected by an unbiased judicial system. It has also been proposed that wide income disparity makes it possible for the rich to exert stronger political dominance, thereby sabotaging institutions. As explained by Tebaldi and Mohan (2008) poor institutions result in a reduction in the efficiency of technology and productivity of labour and capital. Furthermore, weak institutions produce poverty traps that can be escaped only through improvement of institutions. Besides, Justesen and Bjørnskov (2012) explained the interaction between poverty and corruption suggesting that poor people are victims of government bureaucrats' corrupt behaviour in developing countries, particularly in African countries. Grindle (2004) highlighted good governance as an indispensable condition for combating poverty.

The crucial role played by the state in shaping poverty and inequality has been explained by the conventional approach as a mediating factor, which often has indirect implications for power resources and institutions (Brady et al., 2017). The importance of state policies to poverty is better described as the significance of a mixture of social policy and regulations that influence the distribution of economic resources and opportunities in life (Brady et al., 2017; Wilensky, 2002). According to Sindzingre (2005), institutions have significant capacity to influence poverty by mediating the effects of economic transitions and disseminating economic outcomes. In summary, institutions have a fundamental role in poverty and inequality with direct and indirect consequences.

3. Materials and Methods

3.1 Analytical Framework

Institutions have direct and indirect impacts on poverty through various mediating factors (Deolalikar et al., 2002). Figure 1 illustrates the nature of the interrelationships between poverty eradication and institutions, state policy, economic growth, and elimination of hunger. This paper considers all the linkages depicted in this diagram, and concentrates more on the direct impacts of institutions on ending poverty, which is the ultimate target of SDG1.

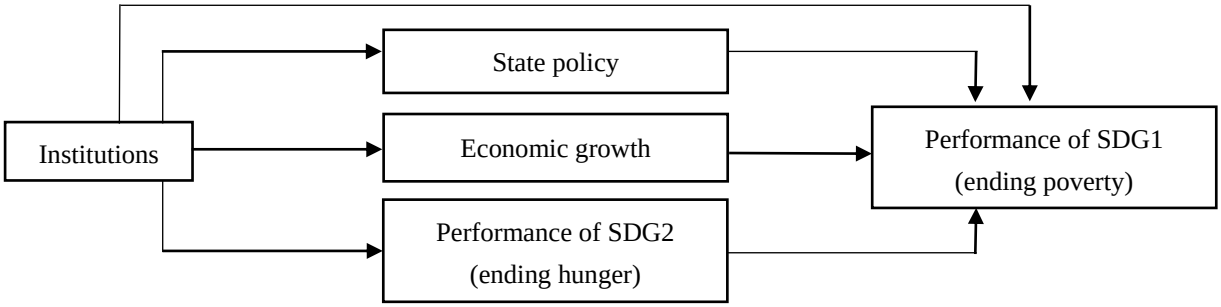

Figure 1. Direct and indirect effects of institutions on the achievement of SDG1

3.2 Data

Based on data availability, this paper analysed a panel data set covering 111 countries in the period 2010–2019. A composite index for SDG1 performance, which is the main dependent variable in this study, was constructed using raw data gathered from the SDG index database developed by the Sustainable Development Solutions Network (SDSN). In creating the composite index, indicators for SDG1 were normalised and aggregated into a goal score (SDG1 index) using the same methodology adopted to develop the SDG index by the SDSN (Sachs et al., 2020). The SDG1 index was scaled from 0 to 1, with higher values denoting better SDG1 performance.

This study used institutions as the main independent variable, which was a composite index developed using the

worldwide governance indicators (WGIs), i.e. voice and accountability (*VA*), political stability and absence of violence/terrorism (*PS*), government effectiveness (*GE*), regulatory quality (*RQ*), rule of law (*RL*), and control of corruption (*CC)* (Kaufmann, Kraay, & Zoido-Lobatón, 1999). For constructing the composite institution index (*INS*), principal component analysis (PCA) was performed for the cross-country data. The six WGIs are deemed superior to other institutional variables because they are estimated using 31 different qualitative indicators gathered from 13 reliable sources (Globerman, 2002; Kaufmann, Kraay, & Mastruzzi, 2011). For checking the robustness of the results, data on Political Risk Services (PRS) – created using 12 indicators – issued by the International Country Risk Guide (ICRG) (ICRG, 2016) were used.

For analysing the direct effect of institutions on SDG1, annual GDP growth (GDPG), personal remittances received in percentage GDP (*REMI*), net inflows of foreign direct investment as a percentage of GDP (*FDI*), trade openness (*TO*), and urban population as a percentage of the total population or urbanisation (*URBN*) were used as structural controls. For evaluating the indirect impacts of institutions on SDG1 performance through different mediating variables in the direct 3SLS model estimation, *FDI*, *URBN*, *REMI*, *POPG* (annual population growth) or *POPD* (people per square kilometre of land area), *UNEMP* (total unemployment as a percentage of total labour force) and *EDU* (the number of years of schooling) were used as the control variables depending on the mediating variable. *URBN, POPG, REMI,* percentage of merchandised exports in manufacturing exports as a proxy for technology (*TECH*), number of scientific and technical journal articles (*SCJL*) as a proxy for new scientific discoveries, and agriculture value added as a percentage of GDP (*AGRI*) were used as the control variables in the indirect models. Based on the explanation of the link between poverty and state policy by Brady et al. (2017), general government final consumption expenditure was used as a proxy for state policy (*STPOL*) while per capita GDP was used as a proxy for economic growth (*PCGDP*).

This study employed the instrumental variables from previous studies on governance and sustainable development (Güney, 2017). The legal origin was used as an instrument for legal institutions (Acemoglu, Johnson, & Robinson, 2001; La Porta, Lopez-De-Silanes, Shleifer, & Vishny, 1997). The log of settlers' mortality (Acemoglu et al., 2001) and latitude (La Porta, Lopez-De-Silanes, Shleifer, & Vishny, 1999) were also used as instrument variables. However, this study treated data on religion from the Pew Research Centre as a proxy for the fractionalisation level, owing to the limited data for the ethnolinguistic fractionalisation index for recent years.

3.3 Estimation Techniques and Model Specification

3.3.1 Principal Component Analysis

This study employed principal component analysis (PCA) to construct the *INS* using the WGIs (Kaufmann et al., 1999). Many scholars acknowledge the superiority of composite indices constructed using WGIs to measure institutions (e.g. Globerman, 2002). PCA uses orthogonal transformation to convert a set of correlated variables ($X_1 \ldots X_P$) into a set of values for linearly uncorrelated variables ($PC_1 \ldots, PC_K$), which are called principal components. The predicted model was as follows:

$$INS_{it} = (PC_{VA} \times VA_{it}) + (PC_{PS} \times PS_{it}) + (PC_{GE} \times GE_{it}) + (PC_{RQ} \times RQ_{it}) + (PC_{RL} \times RL_{it}) + (PC_{CC} \times CC_{it}) \quad (1).$$

3.3.2 Instrumental Variable (IV) – The 2SLS Method

The 2SLS method was employed with selected instrumental variables to test the direct effect of institutions on SDG1 performance. Accordingly, the model used was as follows:

$$SDG1_{it} = \beta_1 INS_{it} + \beta_2 FDI_{it} + \beta_3 TO_{it} + \beta_4 REMI_{it} + \beta_5 GDPG_{it} + \beta_6 URBN_{it} + \varepsilon_{it} \quad (2),$$

where the subscripts i and t were cross-section unit and period, respectively, $SDG1$ was the composite index for SDG1, INS was the composite index which captured the effect of institutions, FDI, $TO, REMI, GDPG$ and $URBN$ were the structural controls denoting foreign direct investment, trade openness, foreign remittance, GDP growth, and urbanisation, respectively, β_1, β_2, β_3, β_4, β_5, and β_6 were the respective coefficients for estimation and ε_{it} was the error term. The use of instrumental variables and the 2SLS method for estimating the above model helped to conquer the potential endogeneity between SDG1 and institutions.

A number of diagnostic tests were performed to determine whether the model adequately explained the associations between the variables. For testing endogeneity in the model, the Durbin chi-squared test and the Wu–Hausman test were applied, and the null hypothesis was tested for exogeneity of variables. A finding of significance ($p \leq .05$) led to the rejection of the null hypothesis and the conclusion that the regressors were endogenous. To test for a weak instrument problem in the model, the null hypothesis was tested with the Wald test at the $p \geq .01$ level. By rule of thumb, this inference is supported if the minimum eigenvalue is higher than

the 15% rejection level of the critical value. The test for validity (overidentified restrictions test) assesses whether any instrument is invalid if it is correlated with the error term of the outcome variable. The Sargan test and Basman test were employed as validity tests, and the null hypothesis was that all instrumental variables in the stage 2 regression were uncorrelated with the error term for the dependent variable. A finding of non-significance confirmed the null hypothesis.

3.3.3 Structural Equation Model

The structural equation model consisted of a cross-country SDG1 equation and three separate channel equations for state policy, economic growth, and SDG2 performance. The 3SLS model, which was introduced by Zellner and Theil (1962), was used to capture the endogeneity in the structural equation. *lnSTPOL*, *lnPCGDP*, and *SDG2* index were the mediating variables in the three models. Here, the coefficients of the parameters of interest described the effect of a marginal change in *INS* on the dependent variable. The product of the coefficient of *INS* in the channel equation and the coefficients of the mediating variables *lnSTPOL, lnPCGDP*, and *SDG2* index indicated how *INS* affected *SDG1* through the mediating variables. Some of the control variables included in the channel equation were endogenous in the system; thus, the use of instrumental variables was crucial in this case. To make this model more efficient, Tavares and Wacziarg (2001) introduced several restrictions.

lnSTPOL, *lnPCGDP*, and *SDG2* index as mediating variables (MV) in the relationship between *INS* and *SDG1* were modelled in equation (3):

$$SDG1_{it} = \beta_0^{SDG1} + \beta_1^{SDG1} INS_{it} + \beta_2^{SDG1} MV_{it} + \sum_{l=n}^{n} \beta_l^{SDG1} CV_{it}^{SDG1} + \varepsilon_{it}^{SDG1} \quad (3).$$

CV_{it}^{SDG1} denoted control variables. Equations (4), (5), and (6) were channel equations in which *lnSTPOL*, *lnPCGDP* and *SDG2* were the dependent variables, respectively, while INS_{it} was the independent variable.

$$STPOL_{it} = \beta_0^{STPOL} + \gamma_1^{STPOL} INS_{it} + \sum_{l=n}^{n} \beta_l^{STPOL} CV_{it}^{STPOL} + \varepsilon_{it}^{STPOL} \quad (4).$$

$$lnPCGDP_{it} = \beta_0^{lnPCGDP} + \gamma_1^{lnPCGDP} INS_{it} + \sum_{l=n}^{n} \beta_l^{lnPCGDP} CV_{it}^{lnPCGDP} + \varepsilon_{it}^{lnPCGDP} \quad (5).$$

$$SDG2_{it} = \beta_0^{SDG2} + \gamma_1^{SDG2} INS_{it} + \sum_{l=n}^{n} \beta_l^{SDG2} CV_{it}^{SDG2} + \varepsilon_{it}^{SDG2} \quad (6).$$

The Sobel test was used to determine the mediation effect in a model (Sobel, 1982). Here, the coefficients of interest were those that described the effect of INS_{it} on the channel variables in the three models (γ_1^{STPOL}, $\gamma_1^{lnPCGDP}$and γ_1^{SDG2}) and the coefficients that described the effect of each channel variable on *SDG1* (β_1^{SDG1}). The respective channel effect was then provided by the product of corresponding parameters on a particular channel path. The standard error of S_{ab} was obtained using the following formula when testing the statistical significance of channel effects:

$$S_{ab} = \sqrt{b^2 S_a^2 + a^2 S_b^2 + S_a^2 S_b^2} \quad (7),$$

where S_{ab} was the standard error of $\gamma_1^m \beta_m^Y$, a and b were γ_1^m and β_m^Y, respectively, S_a^2 was the variance of the equation describing the effect of INS on the channel variable, and S_b^2 was the variance of the equation describing the effect of the channel variable on SDG1.

3.3.4 Pooled Ordinary Least Square, Fixed Effect and Random Effect Models

The pooled ordinary least square (OLS), fixed effect (FE) and random effect (RE) models were used in testing the robustness of the results. As diagnostic tests, the Lagrange Multiplier (LM) test was performed to determine whether the RE model was better than the pooled OLS estimation, while the Hausman test was employed to select the best from the FE and RE models (Eom, Sock, & Hua, 2007).

4. Results and Discussion

4.1 Principal Component Analysis

The PCA constructed a composite index using six alternative measures for institutions. The results for pairwise correlations (Table A1 on request) show that the correlations were significantly positive for the indicators. According to results (Table A2 on request), only the eigenvalue of component 1 (5.21954) was > 1, and captured 87% of the internal system's variability.

4.2 Summary Statistics

Table 1 provides summary statistics for almost all the variables used in this study. The *SDG1* index ranged between 0 and 1. An average country in the sample had achieved about 80% of SDG1. The institution index (*INS*) ranged between -4.858 and 4.603.

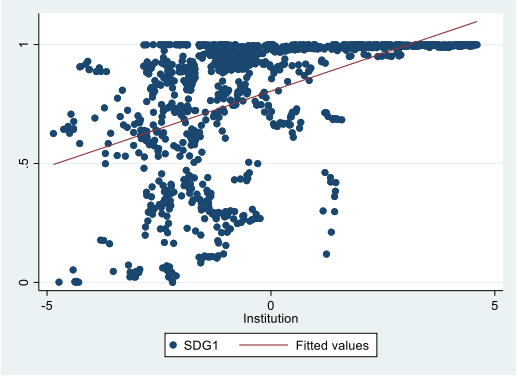

Figure 2. Scatterplot of *INS* and *SDG1*, *sourced,* Author's creation using secondary data

Table 1. Summary statistics

Variable	Number of observations	Mean	Standard deviation	Minimum	Maximum
SDG1	1110	0.804	.267	0	1
INS	1110	0	2.285	-4.858	4.603
FDI	1110	5.907	16.543	-40.414	280.132
URBN	1110	59.866	21.564	15.544	100
GDPG	1110	3.555	3.355	-36.392	25.163
TO	1110	91.325	51.65	20.275	381.785
POPG	1110	1.23	1.23	-2.258	6.568
lnPCGDP	1110	8.669	1.484	5.811	11.436
lnSTPOL	1043	23.158	2.114	18.673	28.551
EDU	782	88.461	28.462	15.039	163.935
REMI	1100	4.441	6.149	0	32.506
SCJL	1110	18 233.981	59 195.865	1.1	528 263.25
TECH	1073	46.431	28.826	0	96.239

Table 2. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) SDG1	1.000												
(2) INS	0.544*	1.000											
(3) FDI	0.005	0.093*	1.000										
(4) TO	0.146*	0.313*	0.253*	1.000									
(5) REMI	-0.084*	-0.362*	0.004	-0.009	1.000								
(6) GDPG	-0.182*	-0.225*	-0.003	0.028	0.046	1.000							
(7) POPG	-0.555*	-0.462*	0.029	-0.118*	-0.012	0.259*	1.000						
(8) URBN	0.613*	0.605*	0.052	0.216*	-0.320*	-0.285*	-0.246*	1.000					
(9) EDU	0.724*	0.717*	0.028	0.217*	-0.242*	-0.350*	-0.598*	0.691*	1.000				
(10) TECH	0.381*	0.451*	-0.023	0.212*	-0.040	-0.113*	-0.488*	0.276*	0.454*	1.000			
(11) SCJL	0.181*	0.206*	-0.060*	-0.197*	-0.193*	-0.012	-0.156*	0.175*	0.155*	0.270*	1.000		
(12) lnPCGDP	0.788*	0.861*	0.053	0.235*	-0.414*	-0.288*	-0.509*	0.769*	0.820*	0.478*	0.269*	1.000	
(13) lnSTPOL	0.495*	0.567*	-0.121*	-0.154*	-0.506*	-0.184*	-0.305*	0.544*	0.552*	0.464*	0.571*	0.720*	1.000

4.3 Pairwise Correlation

The results for pairwise correlations between variables used (Table 2) to explore the institutions–SDG1 nexus show that the correlation between SDG1 performance and *INS* was significantly positive (Figure 2). The correlation between SDG1 and *lnPCGDP* and that between SDG1 and *lnSTPOL* were also significantly positive. In the case of structural controls, except for *GDPG*, *POPG*, *REMI*, and *FDI*, all other variables showed significant positive correlations. Only *FDI* showed a non-significant positive correlation with SDG1 performance.

4.4 The Direct Effect of Institutions on SDG1 Performance

Table 3 summarises the regressions of instrumental variables for institutions against the *SDG1* index and shows the impact of institutions on SDG1 performance. Model 1 was estimated using a composite index of institutions as the independent variable to capture their overall impact on SDG1 performance. Models 2 to 7 were estimated using individual governance indicators as independent variables to explore the relative contribution of different aspects of institutions to achieving SDG1.

Diagnostic tests – Durbin chi-square and Wu–Hausman tests – confirmed that fitted models were valid since the endogeneity test indicated that there were endogenous variables (0.0000 < 0.05). The test of weak instruments, instrumental variable first-stage test, further confirmed that instruments used in the model were not weak (0.0000 < 0.05). In the case of overidentified restrictions, the Sargan and Basman tests indicated that instrumental variables were uncorrelated with the error term of the *SDG1* index (0.0000 > 0.05).

The composite index for institutions and all the individual governance indicators showed a highly significant positive direct effect on SDG1 performance, which clearly means that institutions play a crucial role in achieving SDG1 (Figure 2). An increase in the institution index by 1 unit, increased the SDG1 index by 0.1255 units. Furthermore, of the alternative measures for institutions, regulatory quality (*RQ*) showed the strongest direct influence while political stability (*PS*) showed the weakest influence on SDG1 performance. Glass and Newig (2019), showed that only participation of four key aspects of governance for sustainable development (participation, policy coherence, reflexivity and adaptation, and democratic institutions) had a significant positive relationship with SDG1 performance.

Contrary to expectations, this study found a highly significant negative correlation between FDI and SDG1 performance. While most previous studies supported the positive effects of FDI on poverty reduction, others found that FDI had a negative or insignificant effect (Magombeyi & Odhiambo, 2017) Indeed, the impact of FDI on poverty reduction can differ between countries due to differences in economic, social, and institutional conditions (Nguea, Noumba, & Noula, 2020). The indirect impact of FDI on reducing poverty is found across different states of economic growth. Some arguments to explain the negative association between FDI and economic growth are the major technological gap between investing and beneficiary economies (Li & Liu, 2005), the crowding-out effect of FDI on domestic investment (Borensztein, De Gregorio, & Lee, 1998), and constraints of 'threshold externalities' in the least developed countries, e.g. levels of education, health, infrastructure and technology, which are inadequate to optimise FDI's potential benefits (OECD, 2002).

Trade openness also had strikingly negative correlations, and except in one case, they were statistically significant. Rodrik (2001) argued that countries need to improve their human resources and restructure their institutions so that trade openness can have the preferred effect on poverty reduction and the poor can gain from the opportunities afforded by it. Both remittances (Adams & Page, 2005; Qayyum, Javid, & Arif, 2008) and GDP growth (Mulok, Kogid, Asid, & Lily, 2012; Stevans & Sessions, 2008) had the expected positive correlations. Furthermore, urbanisation showed positive correlations, and in most cases, they were statistically significant at p < 0.01. Liddle (2017) and Martinez-vazquez, Panudulkitti and Timofeev (2009) suggested a U-shaped association between urbanisation level and poverty level.

Table 3. Direct impact of institutions on SDG1 performance.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Variables	INS	CC	GE	PS	RQ	RL	VA
INS	0.1255***						
	(6.4920)						
CC		0.2700***					
		(6.1570)					
GE			0.2268***				

			(7.8193)				
PS				0.1845***			
				(3.9794)			
RQ					0.3204***		
					(6.4260)		
RL						0.2371***	
						(7.0750)	
VA							0.2155***
							(5.5610)
FDI	-0.0037***	-0.0042***	-0.0027***	-0.0034***	-0.0025**	-0.0040***	-0.0042***
	(-3.1805)	(-3.4628)	(-2.8319)	(-3.2082)	(-2.1505)	(-3.7263)	(-3.7270)
TO	-0.0008***	-0.0006*	-0.0006***	-0.0007**	-0.0009***	-0.0005**	-0.0000
	(-2.6280)	(-1.9560)	(-2.6100)	(-2.2755)	(-2.8612)	(-2.0412)	(-0.1444)
REMI	0.0156***	0.0177***	0.0151***	0.0083***	0.0116***	0.0175***	0.0088***
	(5.2504)	(5.3709)	(6.2039)	(3.4182)	(4.2344)	(6.0855)	(3.4878)
GDPG	0.0108**	0.0083	0.0042	0.0009	0.0081	0.0059	0.0074
	(1.9778)	(1.4963)	(1.0113)	(0.1963)	(1.5158)	(1.2617)	(1.4124)
URBN	0.0018	0.0029***	0.0034***	0.0047***	0.0013	0.0037***	0.0038***
	(1.6121)	(2.7574)	(4.4760)	(4.8659)	(1.0827)	(4.5847)	(4.0231)
Constant	0.6873***	0.5797***	0.5546***	0.5619***	0.6728***	0.5333***	0.5062***
	(9.2213)	(8.6739)	(10.8759)	(7.6363)	(9.1176)	(9.7080)	(8.7206)
Observations	377	377	377	377	377	377	377
R-squared	0.1726	0.0903	0.4301	0.3002	0.1508	0.2987	0.2367
Durbin chi-squared	45.13	45.66	24.04	17.67	40.4	37.80	32.10
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wu-Hausman *F*-statistic	45.19	50.66	25.14	18.15	44.21	41.13	34.35
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
IV FS statistic	35.65	33.34	63.40	19.3	31.19	55.76	21.35
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adj. *R*-squared	0.5356	0.4665	0.5642	0.5299	0.5002	0.5352	0.4579
Sargan chi-squared	0.3310	0.731	0.524	42.61	0.087	0.049	22.35
	(0.5650)	(0.392)	(0.469)	(0.000)	(0.769)	(0.825)	(0.000)
Basman chi-squared	0.3243	0.717	0.514	46.77	0.085	0.048	23.13
	(0.5690)	(0.397)	(0.473)	(0.000)	(0.771)	(0.826)	(0.000)
Instruments	Settler mortality Latitude	Settler mortality Latitude	Settler mortality Latitude	Settler mortality Latitude UK law Muslim	Settler mortality Latitude	Settler mortality Latitude	Settler mortality Latitude UK law Muslim

Note: All models were estimated using 2SLS estimation. Numbers within parentheses are *t* statistics of coefficients except in the case of Durbin chi-squared, Wu–Hausman *F*-statistic, IV FS statistic, Sargan chi-squared and Basman chi-squared for which *p*-values are given. ***, ** and * indicate significance at the 1%, 5% and 10% level, respectively.

In this study, a further effort was made to determine whether the impact of institutions on SDG1 performance varied according to the level of development of a country by splitting the sample into two categories of developed and developing countries. Table 4 shows the results of the 2SLS estimation for developed and developing countries separately.

Table 4. Direct impact of institutions on SDG1 performance: developed countries versus developing countries

Variable	Developed countries[1]	Developing countries[1]
INS	0.0455***	-0.4993**
	(3.6930)	(-2.2576)

FDI	0.0004	-0.0136***
	(0.4059)	(-2.8282)
TO	-0.0004**	0.0009
	(-1.9945)	(0.4757)
REMI	0.0097**	0.0330***
	(2.5234)	(3.0659)
GDPG	0.0084	0.0227
	(1.5877)	(1.3415)
URBN	0.0005	0.0102***
	(0.6959)	(3.1107)
Constant	0.8244***	-1.1056*
	(15.2423)	(-1.6968)
Observations	184	193
Durbin chi-squared	6.09	37.44
	(0.0135)	(0.000)
Wu-Hausman *F*-statistic	6.03	44.53
	(0.0150)	(0.000)
IV FS statistic	23.26	3.46
	(0.000)	(0.033)
Adj. *R*-squared	0.4378	0.1011
Sargan chi-squared	1.779	2.002
	(0.182)	(0.157)
Basman chi-squared	1.718	1.939
	(0.189)	(0.164)
Instruments	Settler mortality	Settler mortality
	Latitude	Latitude

Note: All models were estimated using 2SLS estimation. Numbers within parentheses are *t* statistics of coefficients except in the case of Durbin chi-squared, Wu–Hausman *F*-statistic, IV FS statistic, Sargan chi-squared, and Basman chi-squared, for which *p*-values are given. ***, ** and * indicate significance at 1%, 5% and 10% level, respectively.

[1]Based on the country classification of the World Bank, high- and upper-middle-income countries are considered developed countries, whereas low- and lower-middle-income countries are considered developing countries.

Diagnostic tests confirmed the validity of the models and the instrumental variables used. The impact of institutions on SDG1 performance was significantly positive in developed countries and significantly negative in developing countries. This result corroborates the findings in previous studies of the negative effect of institutions on poverty reduction in developing countries (e.g. Siddique, Shehzadi, Shaheen, & Manzoor, 2016). They described poor governance and weak institutions as a persistent challenge for economic development and poverty reduction in developing countries. Corruption and ineffective implementation of government programmes in developing countries misdirect the target of poverty eradication.

4.5 The Indirect Effect of Institutions on SDG1 Performance

The coefficient estimates of the structural models are summarised in Table 5. In model (8) of 3SLS, on average, a 1% increase in state policy increased SDG1 performance by 0.0003 units, and a 1 unit increase in institutions increased state policy by 30.33%. Similarly, according to model (9), on average, a 1% increase in economic growth increased SDG1 performance by 0.001 units, while a 1 unit increase in institutions increased economic growth by 45.0%. Model (10) indicated that a 1 unit increase in the SDG2 index increased SDG1 performance by 0.28 units, whereas a 1 unit increase in institutions increased SDG2 by 0.0152 units.

The results for the Sobel test showed that the indirect effects of INS on SDG1 performance were significantly positive for all three channel variables independently. This implies that institutions accelerate SDG1 performance through state policy, economic growth, and SDG2 performance. The results showed that state policy had a 0.96% mediation impact on SDG1 when the institution index increased by one unit. This appears to corroborate the conceptual exposition of the behaviour of state policy as a critical mediating variable for the institutions–poverty nexus (Brady et al., 2017; Deolalikar et al., 2002).

Table 5. Indirect impact of institutions on SDG1 performance through state policy, economic growth, and SDG2 performance

Variable	Model (8)		Model (9)		Model (10)	
	State policy as mediating variable		Economic growth as mediating variable		SGD2 performance as mediating variable[2]	
	SDG1	lnSTPOL	SDG1	lnPCGDP	SDG1	SDG2
lnSTPOL	0.0317***					
	(3.375)					
lnPCGDP			0.0966***			
			(3.9580)			
SDG2					2.7506***	
					(12.3167)	
INS	0.0564***	0.3033***	-0.0235***	0.4502***	-0.0305***	0.0152***
	(8.431)	(6.999)	(-2.7798)	(20.1678)	(-3.5990)	(7.2949)
FDI			0.0008		-0.0006	
			(1.0607)		(-0.5057)	
URBN			0.0013*		0.0031***	0.0009***
			(1.9595)		(4.4667)	(3.9708)
POPG			-0.0897***			-0.0404***
			(-7.5821)			(-9.3626)
EDU			0.0000			
			(0.0028)			
REMI	0.0147***			-0.0408***	0.0099***	
	(5.926)			(-5.1535)	(5.1512)	
UNEMP	0.0067***					
	(2.706)					
TECH		0.0181***		0.0080***		0.0001
		(5.544)		(5.0574)		(0.5098)
SCJL		0.0000 ***		0.0000**		
		(10.25)		(2.4865)		
POPD					0.00001	
					(0.2625)	
AGRI						0.0003
						(0.6864)
Constant	-0.0517	22.2123***	0.0050	8.3812***	-1.0721***	0.5891***
	(-0.232)	(137.7)	(0.0289)	(105.6685)	(-8.6324)	(28.8022)
Observations	335	335	268	268	322	322
R-squared	0.413	0.511	0.7261	0.7528	0.4829	0.6677
Sobel test	0.0096***		0.0435***		0.0418***	
	(3.04)		(3.884)		(6.276)	

Note: All models were estimated using 3SLS estimation proposed by Zellner and Theil (1962). Numbers within parentheses are *t*-statistics of coefficients. ***, ** and * indicate significance at 1%, 5% and 10% level, respectively.

[2] Based on the compatibility of the available data for SDG1 and SDG2, the analysis of the indirect effect of institutions through SDG2 performance was limited to a panel of 95 countries.

Similarly, economic growth had a 4.3% mediation effect on SDG1 performance when the institution index increased by one unit. This finding confirms the argument of Deolalikar et al. (2002) that the institutional impact on economic growth influences the pace of poverty reduction. Similarly, the results shown in Table 5 indicate that when the institution index increased by one unit, SDG2 performance had a mediation impact of 4.2% on SDG1 performance. Consequently, this finding provides empirical support for the idea of a synergetic relationship between SDG1 and SDG2 suggested by several recent studies (Barbier & Burgess, 2019; Fonseca et al., 2020; Yang, Zhao, Liu, Cherubini, Fu, & Pereira, 2020).

The results of 3SLS reveal that although direct impact of institutions on SDG1 performance is negative in models (9) and (10), indirect impact of institutions on SDG1 performance through all 3 mediators are positive and highly significant. Thus, focussing on the mediation effect of institutions carried by state policy, economic growth and SDG2 performance will provide the direction for policies aimed at fulfilling SDG1.

5. Robustness Check

The robustness of the model fitted for the direct impact of institutions on SDG1 performance using a composite index for institutions (Model 1) was checked using both alternative estimation techniques (OLS, FE, and RE) and alternative measurement of institutions (ICRG Index; Tables A3 and A4 on request). The findings of the robustness check confirm a similar institutional impact on SDG1 performance. Similarly, the composite index developed using ICRG data was used as an alternative institution index to test the robustness of the models for the indirect impact of institutions (Table A5 on request). The results corroborate the existence of a mediation impact of institutions on SDG1 performance through state policy, economic growth, and SDG2 performance. However, in the robustness check, the sign of the mediation impact only through SDG2 performance was different from that expected.

6. Conclusion

Given the scanty literature on institutions-SDG nexus, this study aimed to show the likely impacts of institutions on achieving SDG1 together with their specific aspects and paths of influence. This paper contributes to the literature by providing cross-country empirical evidence for the theoretical perspectives on both direct and indirect effects of institutions on achieving SDG of ending poverty, suggesting evidence-based policy implications. Another contribution is capturing the institutional impact by composite index developed using six governance indicators – voice and accountability, political stability, government effectiveness, regulatory quality, the rule of law, and control of corruption – to see the overall impact of institutions along with six individual governance indicators to explore the relative contribution of different aspects of institutions, in achieving SDG1. A further unique feature of this study is employing the instrumental variable (2SLS) method using longitudinal data to enhance the robustness of the estimates.

The results of the analysis of a panel of 111 countries showed that institutions positively affect SDG1 performance at $p < 0.01$ level. Regulatory quality showed the strongest influence while political stability showed the weakest influence on SDG1 performance. This study also finds that the fulfilment of SDG1 is more likely with enhanced regulatory quality and control of corruption compared to other governance aspects. This finding is precisely consistent with the conclusion of Doumbia (2019) that, in comparison with the other governance indicators, regulatory quality and control of corruption have a more significant effect on the earnings of the poor. Indirect impact analysis of institutions using 3SLS revealed that the mediation effects of institutions on SDG1 performance through state policy, economic growth, and SDG2 performance affect the pace of achieving SDG1.

Based on the findings, the main policy recommendation of this study is that all countries need to strengthen their institutional framework so that the achievement of SDG1 is expedited. The results also suggest that a mechanism that ensures minimal abuse of public power for private benefits with a more efficient regulatory system will furnish a substantially conducive environment for the achievement of SDG1. Furthermore, focussing on the mediation effect of institutions carried by three mediators – state policy, economic growth, and SDG2 performance– will provide the direction for formulating desirable policies aimed at fulfilling SDG1. The policies to attain strengthened governance through a solid institutional framework can facilitate social development (e.g., education, health, and infrastructure), economic growth, and food security, thereby contributing to SDG of ending global poverty.

Data availability statement

The data that support the findings of this study are available from the author, upon reasonable request.

Disclosure statement

No potential conflict of interest was reported by the author.

Acknowledgement

The author would like to thank the anonymous reviewers and Prof. N.S. Cooray, Prof. M.A. Myoe and Prof. K. Yamada from International University of Japan for their insightful comments on the earlier version of this paper and gratefully acknowledge the financial support received from the Japan International Cooperation Agency (JICA) for this paper and the research behind.

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Appendix

Table A1. Pairwise correlations for the governance indicators

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) CC	1.000					
(2) GE	0.931*	1.000				
(3) PS	0.759*	0.743*	1.000			
(4) RQ	0.883*	0.940*	0.714*	1.000		
(5) RL	0.956*	0.961*	0.768*	0.932*	1.000	
(6) VA	0.815*	0.806*	0.729*	0.839*	0.841*	1.000

* *p<0.1*

Table A2. Principal Components

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	5.21954	4.86071	0.8699	0.8699
Comp2	.358824	.123381	0.0598	0.9297
Comp3	.235442	.121835	0.0392	0.9690
Comp4	.113608	.0715349	0.0189	0.9879
Comp5	.0420728	.0115573	0.0070	0.9949
Comp6	.0305155		0.0051	1.0000

	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6
CC	0.4192	-0.1368	-0.2472	-0.6674	0.4228	0.3469
GE	0.4226	-0.2477	-0.2664	0.1684	-0.7116	0.3929
PS	0.3662	0.8948	-0.2075	0.1459	0.0251	0.0126
RQ	0.4166	-0.2894	0.0304	0.6764	0.5298	0.0597
RL	0.4283	-0.1731	-0.1666	-0.1554	-0.1278	-0.8476
VA	0.3932	0.0738	0.8923	-0.1527	-0.1314	0.0561

Table A3. Direct impact of institutions on the performance of SDG1 (Robustness check using alternative estimation techniques)

Variables	2SLS	OLS	FE	RE
INS	0.1255***	0.1832	2.3965*	1.1721*
	(6.4920)	(0.6349)	(1.7980)	(1.8805)
FDI	-0.0037***			
	(-3.1805)			
TO	-0.0008***	0.0798***	-0.0428	0.0244

	(-2.6280)	(7.9528)	(-1.5017)	(1.2797)
REMI	0.0156***	0.0269	0.3837	0.1628
	(5.2504)	(0.3108)	(1.3532)	(0.9380)
GDPG	0.0108**	-0.0583	0.1032	0.1075
	(1.9778)	(-0.3519)	(0.7636)	(0.8151)
URBN	0.0018	-0.0136	-0.5466**	-0.0511
	(1.6121)	(-0.4639)	(-2.1528)	(-0.7499)
Constant	0.6873***	-0.4661	40.5335***	5.6291
	(9.2213)	(-0.2111)	(2.6409)	(1.2096)
Observations	377	1,100	1,100	1,100
Number of codes			110	110
F-Test			323.25	
			(0.000)	
LM-Test				4626.67
				(0.000)
Hausman Test				10.90
				(0.0915)
Durbin chi^2	45.13			
	(0.000)			
Wu-Hausman F-st	45.19			
	(0.000)			
IV FS stat	35.65			
	(0.000)			
Adj.R-square	0.5356			
Sargan chi^2	0.3310			
	(0.5650)			
Durbin chi^2	45.13			
Basman chi^2	0.3243			
	(0.5690)			
Instruments	Settlers Mortality			
	Latitude			

Note: All models were estimated using 2SLS estimation, OLS method, fixed effect and random effect models. Numbers within parentheses are t statistics of coefficients except random effect model, Durbin chi^2, Wu-Hausman F-stat, IV FS stat, Sargan chi^2 and Basman chi^2. Numbers in parentheses of Durbin chi^2, Wu-Hausman F-stat, IV FS stat, Sargan chi^2 and Basman chi^2 are *p*-values except random effect model, which are z-statistics. ***, ** and * indicate significance at 1%, 5% and 10% level, respectively.

Table A4. Direct impact of institutions on the performance of SDG1 (Robustness check using alternative measurement for institution index)

Variables	2SLS	OLS	FE	RE
POLRISK	0.0158***	0.0053***	0.0005	0.0010**
	(6.3292)	(8.2978)	(1.2642)	(2.3341)
FDI	-0.0050***	-0.0005	0.0000	0.0000
	(-3.5445)	(-1.2373)	(0.0805)	(0.1516)
TO	-0.0002	0.0000	-0.0001	-0.0001
	(-0.6387)	(0.2044)	(-1.3648)	(-1.2529)
REMI	0.0000***	0.0000***	0.0000***	0.0000***
	(2.8683)	(6.1686)	(8.3283)	(8.1407)
GDPG	-0.0007	-0.0006	-0.0001	-0.0001
	(-0.1945)	(-0.2980)	(-0.2827)	(-0.3615)
URBN	0.0029***	0.0065***	0.0050***	0.0066***

	(2.8668)	(17.8175)	(6.1343)	(10.9371)
Constant	-0.3821***	0.0499	0.4512***	0.3236***
	(-3.7140)	(1.4524)	(7.5393)	(6.6837)
Observations	408	1,055	1,055	1,055
R-squared	0.4040	0.4833	0.1370	
Number of codes			110	110
F-Test			346.77	
			(0.000)	
LM-Test				4408.18
				(0.000)
Hausman Test			13.80	
			(0.0170)	
Durbin chi^2	28.98			
	(0.000)			
Wu-Hausman F-st	30.59			
	(0.000)			
IV FS stat	31.94			
	(0.000)			
Adj.R-square	0.6160			
Sargan chi^2	18.62			
	(0.000)			
Basman chi^2	19.03			
	(0.000)			
Instruments	Settlers Mortality			
	Latitude			
	UK Law			
	French Law			

Note: All models were estimated using 2SLS estimation, OLS method, fixed effect and random effect models. Numbers within parentheses are t statistics of coefficients except random effect model, Durbin chi^2, Wu-Hausman F-stat, IV FS stat, Sargan chi^2 and Basman chi^2. Numbers within parentheses of Durbin chi^2, Wu-Hausman F-stat, IV FS stat, Sargan chi^2 and Basman chi^2 are *p*-values except random effect model, which are z-statistics. ***, ** and * indicate significance at 1%, 5% and 10% level, respectively.

Table A5. Indirect impact of institutions on the performance of SDG1 through state policy, economic growth and performance of SDG2 (Robustness check using alternative measurement for institution index)

Variables	State policy as mediator variable		Economic growth as mediator variable		Performance of SGD2 as mediator variable[2]	
	Direct Model	Indirect Model	Direct Model	Indirect Model	Direct Model	Indirect Model
	SDG1	lnSTPOL	SDG1	lnPCGDP	SDG1	SDG2
lnSTPOL	0.0272**					
	(2.370)					
lnPCGDP			0.0628**			
			(2.3981)			
SDG2					-0.1914	
					(-0.6554)	
POLRISK	0.0106***	0.0409***	-0.0027*	0.0956***	-0.0002	0.0053***
	(8.318)	(5.155)	(-1.6878)	(21.1161)	(-0.1566)	(12.7179)
FDI			-0.0005		-0.0007	
			(-0.5261)		(-0.7125)	
URBN			0.0031***		0.0044***	
			(4.1027)		(5.3667)	

POPG			-0.1232***		-0.1372***	
			(-10.1617)		(-8.6072)	
EDU			-0.0000		0.0013**	
			(-0.0370)		(2.0248)	
REMI	-0.0000			0.0000		-0.0000*
	(-0.485)			(1.3100)		(-1.7171)
UNEMP	0.0091***					
	(4.206)					
TECH		0.0188**		0.0023		0.0008*
		(2.539)		(0.5702)		(1.8308)
SCJL		-0.0000***		0.0000***		0.0000***
		(11.88)		(2.9390)		(3.0188)
Constant	-0.5956***	20.1449***	0.4099***	2.2962***	0.7350***	0.2351***
	(-2.894)	(43.29)	(3.6035)	(8.1213)	(5.6435)	(9.0331)
Observations	398	398	273	273	248	248
R-squared	0.4372	0.4264	0.7585	0.7256	0.7154	0.5731
Sobel Test		0.001		0.006		-0.00102
		(2.15)		(2.38)		(-0.652)

Note: All models were estimated using 3SLS estimation proposed by Zellner & Theil (1962). Numbers within parentheses are t-statistics of coefficients. ***, ** and * indicate significance at 1%, 5% and 10% level, respectively.

[2] Based on the compatibility of the available data for SDG1 and SDG2, the analysis of the mediation effect of institutions through SDG2 performance was limited to a panel of 95 countries.