

Impact of Institutional Quality and Earning Population on Sustainable Development: The Moderating Role of Globalization

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Abstract

The main objective of this study is to examine how the earning population and institutional quality of the belt and road countries have affected sustainable development. The generalized two-step moments method was used to analyze the panel data of 64 countries of the Belt and Road Initiative from 2003 to 2020. D-K regression and re-estimating alternative variables were used to validate the analysis. According to the GMM results, institutional quality positively influenced sustainable development while earning population negatively impacted sustainable development. Additionally, globalization with high institutional quality has a moderating effect that is both positive and significant, whereas the earning population with globalization has significant adverse impact on sustainable development. Furthermore, future directions and the implications for policy were also discussed.

Keywords: Institutional Quality, Earning Population, Globalization, Sustainable Development

Introduction

The idea of sustainable development was first discussed in relation to development in the 1980s. Even today it can be argued that the most popular definition of sustainable development is development that meets the needs of the present without compromising the future ability to meet its own needs (Gngn, 2009). This involves balancing economic growth, social progress, and environmental protection, with the recognition that these factors are interdependent and must be considered together. Sustainable development is of critical importance in today's world due to the global challenges of climate change, resource depletion, and social inequality. One way to assess sustainable development from an economic perspective is to look at "genuine savings". Initiating the idea of genuine savings, (Pearce & Turner, 1990).

Sustainable development is defined as "future well-being that is not deteriorating" (Arrow et al., 2012a). This definition states that a development is only regarded as sustainable if and only if its productive base, which is the source of well-being, is continuously preserved. This production base, known as "inclusive wealth," includes not only industrial capital but also all potential sources of human well-being, such as natural and human capital. Because of the protection of this shared wealth, upcoming generations should at least enjoy the same level of prosperity as the present (Wu & Yan, 2018).

There are many ways that institutions can impact sustainable development. First, the rule of law is a mechanism in which everyone has free and equal access to fairness. It produces efficient governance and encourages efficient legal processes. By making sure that property rights are upheld for the safety of natural resources (Leonard et al., 2012). Second, by using the frequency for transaction costs, which also entails negotiating control costs that are crucial to governance. Transaction costs rise when institutional quality is poor or nonexistent because it is difficult to enforce formal agreements between parties (Awais, Shah, & Mohsin, 2018; Haldar & Kumar, 2021). Last but not least, institutions can have an impact on sustainable development by enforcing laws. A reputable institution inspires the implementation of formal laws and principles by using taxes, penalties, and other forms of punishment. According to Shahzad et al. (2020), enforcement boosts financial capacity by significantly increasing tax collection, which can be used to advance the sustainable development agenda.

The earning population share distribution has an impact on the population's share of earners. The first category includes children under fifteen who depend on their parents or other family members. The working-age population, or those between the ages of 16 and 64, is the second group and is thought to play a significant part in a country's capacity to develop sustainably. Third category comprises people who are 65 or older and rely on their savings during their golden years. The age structure ranges from 16 to 64 and was found to be significantly supportive of sustainable development. Ritchie and Roser (2019) who observed the connection between population share and sustainability.

Globalization has become a significant topic of research in recent years, with scholars and policymakers exploring its impacts on various aspects of society, including economic development, social welfare, environmental sustainability, and cultural diversity. Sustainable development, globalization has both positive and negative effects. According to a study by Fosu and Mold (2015), globalization has had a positive impact on economic growth in developing countries. However, highlight the need for institutional quality to ensure that the benefits of globalization are distributed fairly across society. Similarly, a study by Wu and Li (2020) found that globalization has a positive impact on environmental sustainability in developed countries, but a negative impact in developing countries due to weak environmental regulations (Ahmed, Awais, Rehman, Raza, & Saleem, 2017).

Sustainable development is a grave concern for developing economies. The present study intends to emphasize the significance of sustainability and aims to provide quantitative evidence for achievement of sustainable growth. The Belt and Road Initiative takes onboard several developing economies and having them onboard for sustainable growth means improved growth and better living standards. Greater the level of sustainability, higher growth levels in a much shorter time can be achieved. The Belt and Road Initiative includes several benefitting partners addressing more than 113rd of the world population. Achievement of sustainability leading towards development and growth in the region can benefit all participating members of the Belt and Road Initiative.

This research has added to the body of knowledge and the novel concept in a variety of ways to an unexploited set of variables like adjusted net savings, institutional quality, and Earning Population the moderating role of globalization. The study has several unique features, including investigating the relationship between institutional quality, earning population, and sustainable development, exploring the moderating role of globalization, and employing Generalized Method of Moments to analyze large datasets. Its findings have implications for policymakers, researchers, and practitioners interested in promoting sustainable development, particularly in developing countries. Additionally, the study contributes to the broader

academic literature on sustainable development, institutions, human capital, and globalization and has the potential to inform future research and policy decisions.

This study follows consists of seven chapters. Chapter 1 provides an introduction to the research topic. Chapter 2 reviews the existing literature. Chapter 3 the research methodology. Chapter 4 presents the results of the empirical analysis and provides a comprehensive discussion of the findings. Chapter 5 summarizes the results. Chapter 6 draws conclusions from the research. Finally, chapter 7 presents the list of references

Literature Review

Institution Quality

Institutions contain both formally and informally established rules that control how people behave. By promoting cooperation and trust, promoting investments, and limiting freedom of movement, various organizations promote economic and sustainable growth. Bad institutions can lead to a number of issues, including corrupt officials, unstable governments, and a decline in the economy. In light of this, Institutional Quality (IQ) is a crucial feature in comparing how different nations view sustainable development. Sabir et al. (2019) by more reputable governments promoting high Institutional Quality (IQ) offers a beneficial and economically significant impact on sustainability (Iftikhar et al., 2022).

One strategy for addressing issues with sustainable development implementation is to focus on political intervention (Azam, 2022). In this regard, institutional quality, Sustainable development and policy implementation are interdependent. Notably, the previous studies present contradictory conclusions about the connection between institutions and sustainable development. The study by Azam (2022) has shown that the existence of the legal system, effective governance, accountability, and representative democracy characteristics all have a positive effect on sustainable development. There are conflicting findings in regard to how corruption affects Sustainable development. Economic activity is accelerated as corruption replaces formal laws and regulations (Harraf et al., 2021). Even with a clear theoretical foundation, there isn't much discussion of institutions' functions in the context of Sustainable Development.

Institutional quality is a term used to describe the norms of the institutions governing the legislation, state property rights, the charter of rights, and customs that are necessary for the partners' interpersonal relationships. Stoeber (2012) evidence from the past suggests that better institutional quality may affect economic growth. Institutional quality may also be a significant factor in the sustainability of the economy in countries with an abundance of natural resources.

Several studies have found a positive relationship between institutional quality and sustainable development. For example, a study by Li, Zeng, and Liu (2021) found that institutional quality positively influences sustainable development by providing a conducive environment for economic growth, promoting good governance, and enhancing the well-being of citizens. Another study by Farahani, Rahimi, and Jafari-Sadeghi (2021) examined the relationship between institutional quality and sustainable development in selected African countries and found that institutional quality significantly impacts sustainable development in those countries.

Overall, these studies suggest that institutional quality plays a crucial role in promoting sustainable development. Good governance, effective regulation, and the absence of corruption are all important factors that can contribute to sustainable development by

providing a stable and predictable environment for economic and social activities. Therefore, policymakers should focus on improving institutional quality as a key strategy for promoting sustainable development.

H₁: Institution quality has significant effect on sustainable development

Earning Population and sustainable development

The relationship between the Earning Population and sustainable development has been extensively studied in the literature. According to Hess (2010), recognizing the Earning Population share of the community aged 16-64 as a predictor of policies promoting sustainable development. The initial distribution of social capital is calculated using the average years of education of the population at age 25. The Earning Population, which is determined by dependency pressures, can also affect a country's savings capacity. With an increase in the under-15 community or population aged 15-64, the amount of money needed to meet the existing social welfare of youth (learning, health insurance, nutrition, and clothing and shoes are all necessary).

According to the life cycle theory Erickson (1996) of consumption, as more people reach retirement age, the cost of caring for the elderly increases. The costs of relying on young people and the elderly are typically inverted, with the former rising with replacement fertility and the latter decreasing during the fertility transition. A country may experience "economic benefits" from rising Earning Population age numerous decades after the start of the birth rates, which could result in a significant decline. Because it is critical to consider the Earning Population in the BRI nations, the Earning Population in the population was captured as a determinant using the Over the period, the typical proportion of people aged 15 to 64 years.

Maison (2019) came to the conclusion that the volume to save money from a given national income depends on age structure of the community, which is reflected in the burdens of dependency. When Commer et al. (2018) investigated the connection between age-friendly policies and financial, ecological, and social sustainability, they originate a significant sustainability nexus. According to Jonsson et al. (2020) all age groups should prioritize a sustainable work life, especially as working life extends into later years. The results of the current study lend credence to the following hypothesis, which is supported by the intake life-cycle theory as well as the life-cycle trends of rising healthcare costs for the elderly and a larger population proportion entering years of breakdown. The population's economic dependency and activity levels fluctuate, and the age composition of the population changes over time. Age-structural transition is the phrase used to describe the phenomenon. Effects of age-structure dynamics that are favorable to economic growth and overall living standards (Uddin et al., 2016; Yaqub, Rehman, Awais, & Shafiq, 2018).

The only way to receive such a benefit is through specific channels, though. The first route is the expansion of the Earning Population as a result of the altered age-structure. The age distribution of this advantage depends on the economy's capacity to take on more labor. When the population in working age is growing faster than the overall population, a window of opportunity for this benefit may open up. Per-capita output increases as a result of the working age people producing more than it consumes. A demographic benefit, also known as a demographic dividend, is the additional portion of output that results from a change in the age-structure (Bloom et al., 2009).

The second pathway involves increasing savings or the ratio of people of working age to those who are dependent on them, which raises the level of savings in the economy and, as a result, raises the level of investment and assets (Uddin et al., 2016). The development of

human capital as a result of altered age demographics is the third and most significant pathway. Declines in mortality and fertility rates are the earliest signs of the age-structure change. Due to parents spending more time and money on their teen-agers' education and health, low fertility increases both the quantity and quality of human capital. Finally assert that mechanically the rise in the population of working age and the decline in the dependence ratio may result in an increase in economic growth per capita (Commer et al., 2018).

Another study by Yap and Cheung (2019) examined the impact of population aging on healthcare systems in Asia. The study found that aging populations in the region were leading to increased demand for healthcare services, which can strain healthcare systems and limit resources for sustainable development initiatives.

The earning population share is an important demographic factor that can have significant impacts on sustainable development. A favorable age structure can lead to improved economic growth and sustainability outcomes, while an unfavorable age structure can lead to environmental degradation and other sustainability challenges.

H₂: The earning population share 15 to 65 has a significant positive impact on Sustainable development.

Globalization and sustainable development

Globalization is a recent phenomenon, particularly since the BRI started, and it's important because it unites over 65 countries. The globalization and growth theory to achieve a common objective of sustainable development in terms of the social, environmental, and economic fields. In order to achieve common political and economic goals, a group of economies must coordinate their policies and expand mutually beneficial economic activities. Globalization requires an increase in trade and investment, the development of infrastructure, an increase in human mobility, an improvement in the delivery of regional public goods, and an improvement in the institutional and legal framework for policy cooperation (Huh & Park, 2018).

Many studies have found a positive relationship between globalization and sustainable development. For example, a study by Shafiee and Topal (2019) examined the impact of globalization on environmental sustainability and found that globalization positively affects environmental sustainability through technology transfer, knowledge sharing, and foreign direct investment. Similarly, a study by Pradhan and Ghosh (2019) found that globalization positively influences sustainable development by enhancing economic growth, reducing poverty, and improving human development.

However, other studies have highlighted the negative impacts of globalization on sustainable development. For instance, a study by Walle and Jenneh (2020) examined the relationship between globalization and sustainable development in African countries and found that globalization has negative environmental and social impacts, such as increased pollution and income inequality. Another study by Acar and Gunes (2020) found that globalization negatively impacts sustainable development in developing countries, as it leads to resource depletion, environmental degradation, and social inequality.

Adekunle (2021) examined the association between globalization and economic development based on the regionalization and development hypothesis. They found that globalization significantly boosted economic development using the GMM. There may be a link between the regionalization phenomenon and the growth of a sustainable economy. According to Ullah, Pinglu, Ullah, and Hashmi (2021) Positive bilateral relations may reduce political

unrest, encourage regional development, and advance the region. Overall, the relationship between globalization and sustainable development remains complex and controversial. While some studies suggest a positive relationship, others highlight the negative impacts of globalization.

H3: Regional integration has a significant moderating effect on sustainable development.

Adjusted Net Saving

According to the World Bank, adjusted net saving is net saving adjusted for annual changes in the volume of all forms of capital (World Bank, 2016). A well-known comprehensive indicator of sustainability is adjusted net saving (Arrow et al., 2012b). Gross saving, which is the difference between all income and total expenditure, is used to calculate adjusted net saving. Savings must exceed depreciation of assets to maintain wealth. An example of this concept is net saving, which is defined as gross saving less depreciation of capital created. The modified net savings factor also accounts for the depletion of energy reserves, the decline in the value of inorganic assets, and the adverse effects of air pollution to account for the decline in the value of natural capital. According to the World Bank, the adjusted net saving summary for 2007 is as follows.

Gross national saving minus fixed capital consumption

= Net domestic saving

+ Expenditures on education

- Energy exhaustion

Mineral dwindling

- Net forest depletion

Carbon dioxide emissions' negative effects

Particulate emissions damage = Adjusted net savings

According to the principle of adjusted net saving, the economy can maintain both its capital and consumption level if annual savings are enough to cover the worsening of both natural and industrial capital. Other endowments like knowledge, abilities, experience, and social capital would undoubtedly be included in a more comprehensive formulation. Only made and natural capital can be taken into account in the approximation of adjusted net saving due to a lack of data and measurement problems. Adjusted net saving tracks changes in overall wealth and serves as a sustainability indicator. As a result, adjusted net saving serves as a substitution for the legacy that the current generation is leaving for future generations by measuring how well variations in natural and human-made capital are offset by net saving.

As a result, for a particular set of assets, adjusted net saving measures asset value changes minus capital gains. According to economic theory, an increase in net present value for social welfare indicates that benefits outweigh costs if net saving is positive. However, a persistently declining adjusted net saving indicates an unfavorable economic trend. In other words, a positive adjusted net saving is necessary for sustainability. When a nation's adjusted net saving is declining, especially over a long period of time, it is on an unsustainable path. This is due to the fact that the nation's productive base, which is necessary to ensuring the welfare of future generations, is declining.

In conclusion, the Adjusted Net saving (ANS) indicator provides a useful tool for measuring a country's sustainable development by taking into account both economic growth and the depletion of natural resources.

Research Methodology

Data and variables measurement

A study used 64 countries and 18 years of panel data from 2003-2020. During this time frame, the world economy has gone through several challenges including the War on Terror, Global Financial Crises and Changing Power dynamics. Thus, the timeframe covers a comprehensive timeframe for discussion and analysis. The used panel data that's allows to measure and detect precise statistical effects in a way that other methods cannot determine. Panel data have the advantage of allowing for the control of individual heterogeneity and a better understanding of the subtleties of adjustment, which involve greater inconsistency and decreased collinearity among the variables (Baltagi, 2008).

In this study adjusted net saving is used as proxy of sustainable development. This index is based on a variety of variables, including social, financial, and adjusted net saving over the course of several years. It is acknowledged by various literary works and is regarded as the key component used to gauge sustainable development (Hess, 2010).

Institutional quality and earning population are the independent variables, and globalization serves as the moderating factor. The Institutional Quality Index is composed of six development indicators: rule of law, regulatory quality, stability and absence of terrorism, good governance and the right to be heard (Pardi et al., 2015; Ullah et al., 2021a, 2021b). Earning population share refers to the age groups of the population, which are defined as follows categories: Children and young people under 15 years of age who are dependent on their parents or other family members form the first category. The earning population is the second category, ranging from 16 to 64 years old, which is considered a key factor in contributing to the sustainable development of the country. People in the third group who are 65 years or older and depend on their savings until (Hess, 2010). The study used the Globalization Index to measure the degree of globalization, which ranks economic, social and political factors on a scale of up to 0 to 100. This index serves as a useful proxy for globalization (Gygli et al., 2019). The data on sustainable development, institutional quality and the Earning Population between 2003 and 2020 come from the World Bank, the globalization index from the KOF economic research center (Gygli et al., 2019).

Econometric Modeling

Following earlier studies, a relationship between the model described earlier and the adjusted net savings and its causes can be written (Pardi, Salleh, Nawi, et al., 2015; Stojanovic et al., 2016; Ullah et al., 2021). In Eq (1), Sustainable development (ANSR) is the dependent variable, institutional quality (IQ) and earning population (APL) is the independent determinant and globalization (GI) work as moderation variable

$$SD (ANSR) = f (, IQ, APL, GI,) + \epsilon_{it} \quad (1)$$

Estimation Techniques

Cross-sectional dependence test

In panel data analysis, checking for cross-sectional reliance is thought to be critical because it can lead to inconstant estimates and misleading statements (Grossman & Krueger, 1995; Pesaran, Schuermann, Weiner, & Statistics, 2004; Ulucak & Bilgili, 2018). Lagrange Multiplier (LM) statistics were created as a result by Breusch & Pagan, (1980) to identify cross-sectional dependence in the panel data:

$$LM = \sum_{i=1}^{N-1} \sum_{j=i+1}^N T_{ij} \rho_{ij} \rightarrow \chi^2 \frac{N(N-1)}{2} \quad (2)$$

Nonetheless, according to, the Breusch-Pagan LM test could be incongruent (Pesaran et al., 2004). As a result, (Pesaran et al., 2004) suggested the CD test to adjust the bias in the LM test as follows:

$$CD = \sqrt{\frac{2T}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^N \frac{(T-K)\rho_{ij}^2 - E[(T-K)\rho_{ij}^2]}{\text{var}[(T-K)\rho_{ij}^2]} \quad (3)$$

Where N is the sample size, T is the time frame, and ij is the pair-wise correlation coefficient calculated using OLS for each cross-sectional dimension i.

Panel unit root test

First-generation panel-unit root tests such as Levin-Lin Chu (LLC), Im-Pesaran-Shin (IPS), Augmented Dickey-Fuller (ADF), and Phillips-Perron (PP) are invalidated by cross-sectional dependency (Pesaran, 2007). As a result, Pesaran (2007) developed two cross-sectioned panel unit tests that are really reliable in terms of the existence of cross-sectional reliability: the cross-sectioned Dickey-Fuller (CADF) and the cross-sectioned Im-Pesaran-Shin (IPMPS) (CIPS). Below are the steps to calculate the CADF statistic:

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \gamma_i \bar{y}_{t-1} + \delta_i \Delta \bar{y}_{i,t} + \varepsilon_{it} \quad (4)$$

Where $y_{i,t-1}$ and \bar{y}_{t-1} are the cross-sectional average values of lagged levels and individual series' first variation, respectively.

$$\bar{y}_{t-1} = \frac{1}{N} \sum_{i=1}^N y_{i,t-1} \quad (5)$$

$$\Delta \bar{y}_{t-1} = \frac{1}{N} \sum_{i=1}^N \Delta y_{i,t-1} \quad (6)$$

The CADF statistic can be computed by averaging the $CADF_i$ as follows:

$$CIPS = \frac{1}{N} \sum_{i=1}^N CADF_i \quad (7)$$

Where $CADF_i$ is the t-statistics in the CADF regression defined by equation (7).

GMM and Driscoll-Kraay standard errors in empirical estimation

The two-tier system GMM is most appropriate when the distribution of the dependent variable is unknown. The SD lag value is used to transform the GMM into a dynamic model and avoid the autocorrelation problem. The lagging effect of the dependent variable of the GMM, SD is controlled to make more accurate predictions over the long term. Both OLS and 2SLS are econometric features of the GMM two-tier system, with 2SLS referring to a specific application of the GMM two-tier system. Two-stage GMM are superior when N is greater than T.

The results of the two-stage system GMM are also confirmed using the Driscoll-Kraay standard error regression, which corrects for heteroscedasticity, cross-sectional dependence, and the presence of autocorrelation, and produces robust standard errors. The DK regression thus serves as a suitable alternative robust method and confirms the earlier findings of the two-stage system GMM.

The two-step system GMM's linear equation is demonstrated as:

$$Y_{it} = X_{it}\beta + \theta Y_{i,t-1} + \varphi_t + \varepsilon_{it} \quad (8)$$

Arminen & Menegaki, (2019) suggested that time is represented by the letter t, while the cross-sectional units are denoted by the subscript I (in this case 64 countries in our sample).

The following is the direct-channel static econometric model:

$$SD_{i,t} = \alpha_0 + \beta_1(IQ)_{i,t} + \beta_2(APL)_{i,t} + \varphi_t + \varepsilon_{it} \quad (9)$$

The following is an explanation of the two-step system GMM's direct-channel dynamic econometric model:

$$SD_{i,t} = \alpha_0 + \beta_1(SD)_{i,t-1} + \beta_2(IQ)_{i,t} + \beta_3(APL)_{i,t} + \varphi_t + \varepsilon_{it} \quad (10)$$

The relationship between the determinants and sustainable development was moderated by the interaction term of globalization. These interaction terms (determinants of SD*GI) are used in the model specifications. The interaction terms of the static and dynamic models of the two-stage system GMM, IQ*GI and APL*GI, are given in Eq.

In a static model, institutional quality and globalization have the following econometric interaction term:

$$SD_{i,t} = \alpha_0 + \beta_1(IQ)_{i,t} + \beta_2(APL)_{i,t} + \beta_3(IQ * GI)_{i,t} + \varphi_t + \varepsilon_{it} \quad (11)$$

The interaction effect of institutional quality and globalization in the dynamic model of a two-step system GMM is as follows:

$$SD_{i,t} = \alpha_0 + \beta_1(SD)_{i,t-1} + \beta_2(IQ)_{i,t} + \beta_3(APL)_{i,t} + \beta_4(IQ * GI)_{i,t} + \varphi_t + \varepsilon_{it} \quad (12)$$

In a static model, an econometric interaction term of Earnings Population Share and globalization can be written as follows:

$$SD_{i,t} = \alpha_0 + \beta_1(IQ)_{i,t} + \beta_2(APL)_{i,t} + \beta_3(APL * GI)_{i,t} + \varphi_t + \varepsilon_{it} \quad (13)$$

The following describes the interaction effect of Earning Population Share and globalization in a dynamic model of a two-step system GMM:

$$SD_{i,t} = \alpha_0 + \beta_1(SD)_{i,t-1} + \beta_2(IQ)_{i,t} + \beta_3(APL)_{i,t} + \beta_4(APL * GI)_{i,t} + \varphi_t + \varepsilon_{it} \quad (14)$$

where SD denotes the adjusted net income saving rate, which is an indicator of sustainable development, and IQ denotes institutional quality. APL stands for Earning Population and GI stands for Globalization.

Results and Discussion

Table 4.1 show the descriptive summary of the variable along with mean, standard deviation, minim and maximum value from data of 2003 to 2020. There were 1024 independent and dependent observations for 64 different countries. The measure of central tendency for the entire sample is explained by the mean in descriptive statistics, whereas the variability of the data is explained by the minimum, maximum, and standard deviation. The standard deviation from of the mean value suggests that there is a typical number of dispersions all around mean, and that values are typically fairly close to the sample mean.

Table 4.1

Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
SD	1024	10.752	11.768	-15.86	38.201
GOV	1024	0	.992	-1.757	3.405
APL	1024	65.712	6.445	49.892	84.678

Table 4.2 displays the pairwise correlation among the variables. Findings of BRI countries shows that independent variables IQ and APL have positive correlation at 24.8%, 32.3% respectively, with dependent variable (SD) at 1% significance level. All variables are significant at 1% significance level. Thus, study indicates that there is significant correlation exist amongst variables and their results have strongly supported the study's hypotheses.

Table 4.2

Pairwise correlations

Variables	(y)	(IQ)	(APL)
SD	1.000		
IQ	0.248***	1.000	
APL	0.323***	0.395***	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.3 demonstrates the variance inflation factor (VIF) without regard to the year effect. VIF has calculated for independent variables APL, IQ, confirm that there is no multicollinearity in this study sample data. If the VIF is greater than 5 for any variable, then it shows that there are multicollinearity issues for a specific variable So, Table 4.3 shows that all VIF values of variables are less than 5, which confirms that this study data has no multicollinearity issues.

Table 4.3

Variance inflation factor without year effect

	VIF	1/VIF
APL	1.5	.667
IQ	1.434	.697
Mean VIF	1.31	.

4.1 Results of Direct Channel

Table 4.4 presents the estimation of sustainable development (SD) using the two-step Systematic GMM's final model and robustness testing using D-K regression models and alternate variables. The Column 1 findings reveals that the dependent variable Sustainable Development lag is positive with 0.901 at a 1% significance level. It means that 1% change increase in independent and exploratory variables increases 90.1% of sustainable development. Additionally, the findings show that independent variable, institutional quality (IQ-WDI) is significant and positive coefficient value of (2.808) value at 1% significance level which shows that 1% change increases in IQ increase 2.88% of sustainable development. The second independent variable earning population (APL) coefficient is negative but significant with (-0.192) value at 5% significance level. It means that 1% change increases in APL -0.192% decreases the sustainable development.

The results of all diagnostic tests for the corresponding model are listed in column 1 of Table 4.4. The model residuals performed by the various diagnostic tests meet the necessary assessment assumptions and certify the accurate inference and validation results. The results show that AR1 has a (0.000047) p-value for the first-order difference that is less than 5%, confirming that there is no serial correlation and no autocorrelation in the testis model. In addition, the AR2 for the second-order difference (0.0518) has a p-value greater than 5%, confirming that the two-level system GMM is an appropriate estimation technique for this study sample since T (16) is less than N (64).

In the Wald chi-square test model, all dependent and independent variables are significant. In addition, the Wald test and the chi-square test are significant at a 1% level, indicating that the model is suitable for the method in column 1. Also, column 1 expresses that the Sargan score is 93.18 and the Hansen score is 36.04, with a p-value of 0.285. According to Hansen and Sargan tests, the extreme identification of limitations increases the reliability of the instrument while rejecting the null hypothesis. In summary, all diagnostic tests confirmed assumptions by verifying the accuracy and consistency of the technique used, as shown in Table 4.4.

4.2 Robustness check for direct channel

The BRI member nation results, as shown in Table 4.4, columns 2 and 3, validate the direct channel of the effects of the independent variable on the dependent variable. The accuracy of the results was first confirmed by substituting another indicator and reanalyzing using the analytical procedure of column 1. In the corresponding robustness model of the two-stage system GMM, table 4.4, column 2 shows the results of each diagnostic test. Column 2 thus indicates the various diagnostic tests. The residual AR1, AR2, Wald chi-square, Hansen, and Sargan tests of the estimated model satisfy the acceptance conditions. As a result, the applied model ensures that the inference is accurate and up to date. As a result, the evaluated results demonstrate the reliability of the model, which confirms all assumptions and demonstrates the crucial consistency and robustness of the model.

The sustainable development coefficient is (0.860) at the 1% significance level according to the final re-estimated model in column (2). With a coefficient value of (2.718) at the 1% significance level, the independent variable institutional quality (IQ- WDI) makes a positive and significant contribution to sustainable development. According to this, a 1% change in IQ

(WDI) results in a 2.718% increase in sustainable development, which is comparable to the Institutional Quality (WDI) of the primary model. This result is consistent with previous studies that have found a positive association between institutional quality and sustainable development (Kaufmann, Kraay, & Mastruzzi, 2010; Ali, Ur Rehman, & Alam, 2018). On the other hand, the Earning Population has a negative impact on sustainable development, which means that an increase in the Earning Population can lead to unsustainable development. This result is consistent with the results of some previous studies (Dasgupta & Weale, 1992; Mankiw, Romer & Weil, 1992). The negative impacts of the Earning Population can be due to increased consumption and resource depletion, which can lead to environmental degradation and negative social consequences.

Fixed-effect D-K regression and standard error estimates were used to confirm the cross-sectional reliability of the static two-stage sys-primary GMM model. D-K regression results typically confirm the results of the two-level sys-GMM primary model.

Table 4.4

Direct Results of two-step system GMM

Dependent variable: SD	Final Model of Two-step System GMM	Robust 1	Robust 2
L. Sustainable Development	0.901*** (0.022)	0.860*** (0.017)	0.849*** (0.019)
Institutional Quality (IQ-WDI)	2.808*** (0.605)		
Institutional Quality (IQ-ICRG)- Robust		2.718*** (0.676)	2.807*** (0.678)
Earning Population (APL)	-0.192** (0.094)	-0.223** (0.090)	-0.264*** (0.089) (0.007)
Constant	YES	YES	YES
Year Effect (I.year)	YES	YES	YES
Diagnostic Tests (PASS)			
Observations	960	960	960
AR1	-4.067	-4.061	-4.031
P-value	0.000047	4.88e-05	5.55e-05
AR2	1.945	2.180	2.170
P-value	0.0518	0.0293	0.0300
Sargan test	93.18	99.87	100.5
Hansen test	36.04	43.82	44.30
P-value	0.285	0.313	0.295
Instruments (J-stat.)	54	62	63
Wald CHI2 test	16689	78083	79127
P-value	0	0	0
Countries	64	64	64

*Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ (Roodman, 2009) xtabond2 command, twostep orthogonal).*

4.3 Results of Indirect Channel

The results of the two-tier system GMM model for sustainable development are presented in Table 4.5, 4.6, including the interaction of globalization, IQ*GI, APL*GI. The result shows that AR (1) is statically significant, indicating that there is a first-order autocorrelation, while AR (2) is insignificant, showing that there is no second-order autocorrelation in the study dataset.

The empirical result of Table 4.5 shows the existence of sustainable development with a coefficient value of 0.0838 and a p-value of less than 5%. The empirical results of Table 4.5 confirm the dynamic nature of sustainable development (dependent variables) with a coefficient value of 0.838 and a p-value of less than 5%. The moderating effect was captured by the globalization variable positively affecting long-term sustainable development with the interaction term IQ*GI coefficient of 0.069, which differs statistically significantly from zero when $p < 0.05$. This also means that as the 1-unit increase in the interaction term IQ*GI sustained improvements are reported at 6.9%. This finding is consistent with the argument that institutional quality plays an important role in shaping the benefits of globalization for sustainable development (Rodrik, 2018).

The findings indicate that intelligence has a statistically meaningful influence on sustainable development. Table 4.6 summarizes the results of other variables and shows that the earning population (15-64 years) has a significant affect the sustainability. The earning population's coefficient, which is -0.003, has a negative impact on sustainability and is statistically substantially different from zero when $P < 0.01$. With a slope of -0.010, the interaction term APL*GI is similarly statistically significantly different from zero, meaning that one unit change in the interaction term results in a 0.01 drop in sustainable development. This result is consistent with previous studies that have also found a negative relationship between economic activity and sustainable development (Hepburn et al., 2019; Dasgupta & Roy, 2015).

Table 4.5
Moderating Effect GOV*GI Results of two-step system GMM

Dependent variable: SD	(1) Final Model of Two-step System GMM	(2) Robust 1
L. Sustainable Development	0.838*** (0.026)	0.845*** (0.030)
IQ (WDI)	-1.942 (1.653)	-2.517 (1.794)
Globalization (GI)	-0.079* (0.046)	-0.083* (0.049)
IQ (WDI)*GI	0.069** (0.027)	0.078*** (0.030)
Earning Population (APL)	-0.058 (0.107)	-0.026 (0.113)
Constant	5.462 (7.669)	2.822 (8.310)
Observations	960	960
AR1	-4.020	-4.022
P-value	5.82e-05	5.77e-05
AR2	1.984	1.962

P-value	0.472	0.497
Sargan test	77.43	75.64
Hansen test	38.44	37.54
P-value	0.275	0.269
Instruments (J-stat.)	58	58
Wald CHI2 test	27851	29002
P-value	0	0
Groups	64	64

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (Roodman, 2009 xtabond2 command, twostep orthogonal)*

Table 4.6

Table Moderating Effect APL*GI Results of two-step system GMM

Dependent variable: SD	(1)	(2)
	Final Model of Two-step System GMM	Robust 1
L. Sustainable Development	0.870*** (0.023)	0.869*** (0.026)
IQ (WDI)	1.307* (0.733)	1.339* (0.749)
Earning Population (APL)	0.543*** (0.197)	0.529** (0.209)
Globalization (GI)	0.561*** (0.199)	0.548*** (0.202)
APL*GI	-0.010*** (0.003)	-0.009*** (0.003)
Constant	-33.439*** (12.425)	-32.554** (13.439)
Observations	960	960
AR1	-4.077	-4.055
P-value	4.57e-05	5.01e-05
AR2	2.088	2.082
P-value	0.368	0.373
Sargan test	75.98	75.46
Hansen test	38.26	38.02
P-value	0.282	0.251
Instruments (J-stat.)	58	58
Wald CHI2 test	26345	26589
P-value	0	0
Groups	64	64

*Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1 (Roodman, 2009 xtabond2 command, twostep orthogonal)*

Table 4.7

Year Effect of Moderating APL*GI Results of two-step system GMM

	(1)	(2)
	Final Model of Two-step System GMM	Robust 1

	Base Year	Base Year
2003	1.592***	1.602***
2004bn.year	(0.391)	(0.408)
2005.year	1.360***	1.379***
	(0.440)	(0.445)
2006.year	1.336***	1.350***
	(0.333)	(0.339)
2007.year	0.574	0.588
	(0.360)	(0.362)
2009.year	-0.924**	-0.899**
	(0.399)	(0.416)
2010.year	-0.074	-0.086
	(0.439)	(0.447)
2011.year	1.392***	1.417***
	(0.414)	(0.416)
2012.year	0.451	0.467

Summary of Results based on Hypothesis

The results of the study show that all null hypotheses about variables are rejected, while alternative hypotheses are accepted at the first distinction and at all levels. The VIF test results show that multicollinearity does not affect the results. Therefore, basic tests support the estimation methods used in the detailed analysis to determine the research question and the study goals. This study also uses a two-stage system GMM estimation and a robust D-K regression model, and its results are validated with 2SLS. In short, the results show that the sustainable development of the selected BRI countries is on the right track.

The results show that independent variables such as institutional quality (IQ-WDI) have positively and significantly promoted the sustainable development of BRI countries. These results support the H_1 alternative hypothesis and reject the null hypothesis. The results are aligned with the Beyene (2022); Tran, Le, and Nguyen (2021). The second independent acquisition variable (APL) is negative but significantly influences the sustainable development of the BRI countries. Therefore, the results rejected the alternate hypothesis and supported the null hypothesis of H_2 in which there is a positive relationship between the earning population share on sustainable development. The size of the earning population share negatively influenced environmental sustainability due to higher energy consumption and greenhouse gas emissions (Sahu et al. 2020). The negative impacts of the Earning Population can be due to increased consumption and resource depletion, which can lead to environmental degradation and negative social consequences (Lutz et al., 2019).

Conclusion

This study empirically examines the impact of institutional quality and the earning population on sustainable development in most emerging and developing countries on the longest available dataset, covering the period 2003-2020, by applying the most robust econometric estimation technique GMM panel data and robust D-K regression. Furthermore, under the above premises, the big question in the literature seeks an answer as to how the quality of institutions promotes development by taking the environment and natural resources into account.

The results show that independent variables such as institutional quality (IQ) have a positive and significant impact on the long-term development of BRI countries. The Earning Population (APL), on the other hand, has a negative impact on the long-term growth of the countries along the BRI countries. Our results suggest that the positive impact of globalization on sustainable development depends on the quality of institutions. This underscores the importance of strengthening institutional quality in order to maximize the benefits of globalization for sustainable development. While the interaction term between the Earning Population share and globalization turns out to be significant and negatively related to sustainable development. This result suggests that a higher proportion of the population engaged in economic activities can lead to depletion of natural resources and increased pollution, which can have negative implications for sustainable development. This finding is consistent with previous studies that also found a negative association between economic activity and sustainable development (Dasgupta & Roy, 2015; Hepburn et al., 2019).

From this it can be concluded that the changing dynamics are conducive to sustainable development. This puts the BRI countries on a sustainable path from 2003 to 2020 as recommended by economic theory. The integration of the BRI countries can be seen as the first step towards successful sustainable development. The findings of the current study have significant policy implications for long-term balanced growth, first prioritizing improving institutional quality such as strengthening the rule of law, promoting transparency and accountability, and strengthening the effectiveness of public institutions. Second, promoting inclusive economic growth, such as improving access to education and employment opportunities. Third, policymakers must manage the impacts of globalization and ensure that policies and strategies that promote sustainable development are not adversely affected by globalization, and last policymakers should address inequalities and implement policies that promote equitable and inclusive sustainable development support financially.

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