Appendices

A 1: List of countries of LICs, LMICs, UMICs, and HICs

Group of countries	Name of countries	Total countries
LICs	Central African Republic, Zambia, Malawi, Rwanda, Uganda, Gambia, Togo, Burundi, Mali, Sudan, Niger, Yemen, DR Congo	13
LMICs	Lesotho, Republic of the Congo, Cambodia, Haiti, Bolivia, Honduras, El Salvador, Cameroon, Kenya, Iran, Benin, Philippines, Papua New Guinea, Ghana, Morocco, Senegal, Sri Lanka, Tanzania, Ukraine, Algeria, Kyrgyzstan, Pakistan, Nepal, Bangladesh, Mauritania, Indonesia, Tunisia, Mongolia, India, Vietnam, Egypt	31
UMICs	Botswana, Mexico, South Africa, Peru, Brazil, Colombia, Paraguay, Guatemala, Jamaica, Dominican Republic, Thailand, Costa Rica, Iraq, Turkey, Ecuador, Jordan, Maldives, Albania, Belarus, Bulgaria, Moldova, Serbia, Azerbaijan, Armenia, China, Malaysia, Mauritius, Russia, Gabon	29
HICs	Chile, Qatar, Bahrain, Saudi Arabia, Kuwait, Panama, Trinidad and Tobago, Israel, Uruguay, USA, Japan, Estonia, Canada, Singapore, Romania, Latvia, Greece, Portugal, U.K., Lithuania, Luxembourg, Cyprus, Australia, Croatia, Germany, Poland, New Zealand, Ireland, Spain, Czech Republic, Slovakia, Norway, Hungary, Sweden, Netherlands, Slovenia, Denmark, Finland, Switzerland, Italy, France, Austria, Belgium	43
	Overall total countries	116

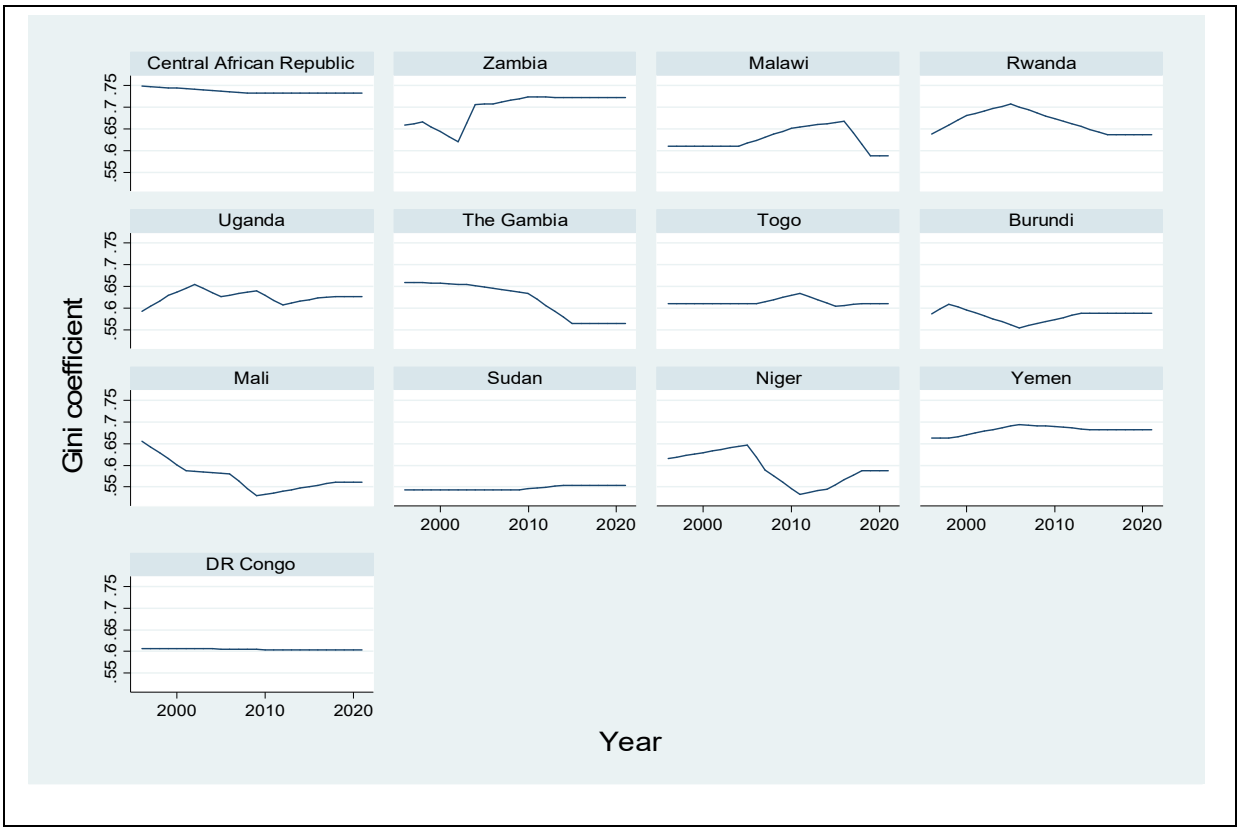
Source: Researcher's compilation based on the World Bank country classification, 2021

A 2: Average Gini coefficient (income inequality) in LICs, LMICs, UMICs, and HICs during 1996-2021

Year	LICs	LMICs	UMICs	HICs
1996	0.629698	0.600164	0.613498	0.488894
1997	0.631746	0.599196	0.612541	0.491075
1998	0.633786	0.596675	0.610324	0.495452
1999	0.633513	0.595427	0.611065	0.494597
2000	0.632955	0.595451	0.613987	0.496664
2001	0.631984	0.597714	0.617115	0.497138
2002	0.631949	0.598146	0.615417	0.498152
2003	0.634736	0.597466	0.616006	0.502124
2004	0.637344	0.600072	0.613248	0.508247
2005	0.637217	0.59991	0.612691	0.507241
2006	0.634602	0.598509	0.612065	0.509068
2007	0.63192	0.59622	0.615687	0.512177
2008	0.630384	0.593862	0.610469	0.50552
2009	0.628935	0.591001	0.605502	0.50072
2010	0.628122	0.588923	0.604575	0.501447
2011	0.625869	0.584408	0.601908	0.502008
2012	0.624066	0.582178	0.601058	0.501648
2013	0.623453	0.582502	0.597059	0.50442
2014	0.622431	0.581701	0.594984	0.503988
2015	0.621878	0.582113	0.594461	0.50389
2016	0.623182	0.581497	0.595129	0.499526
2017	0.622459	0.579554	0.597425	0.500328
2018	0.621736	0.580656	0.59604	0.50003
2019	0.619753	0.580969	0.590675	0.502682
2020	0.619753	0.583751	0.600367	0.503211
2021	0.619753	0.581656	0.608522	0.50284

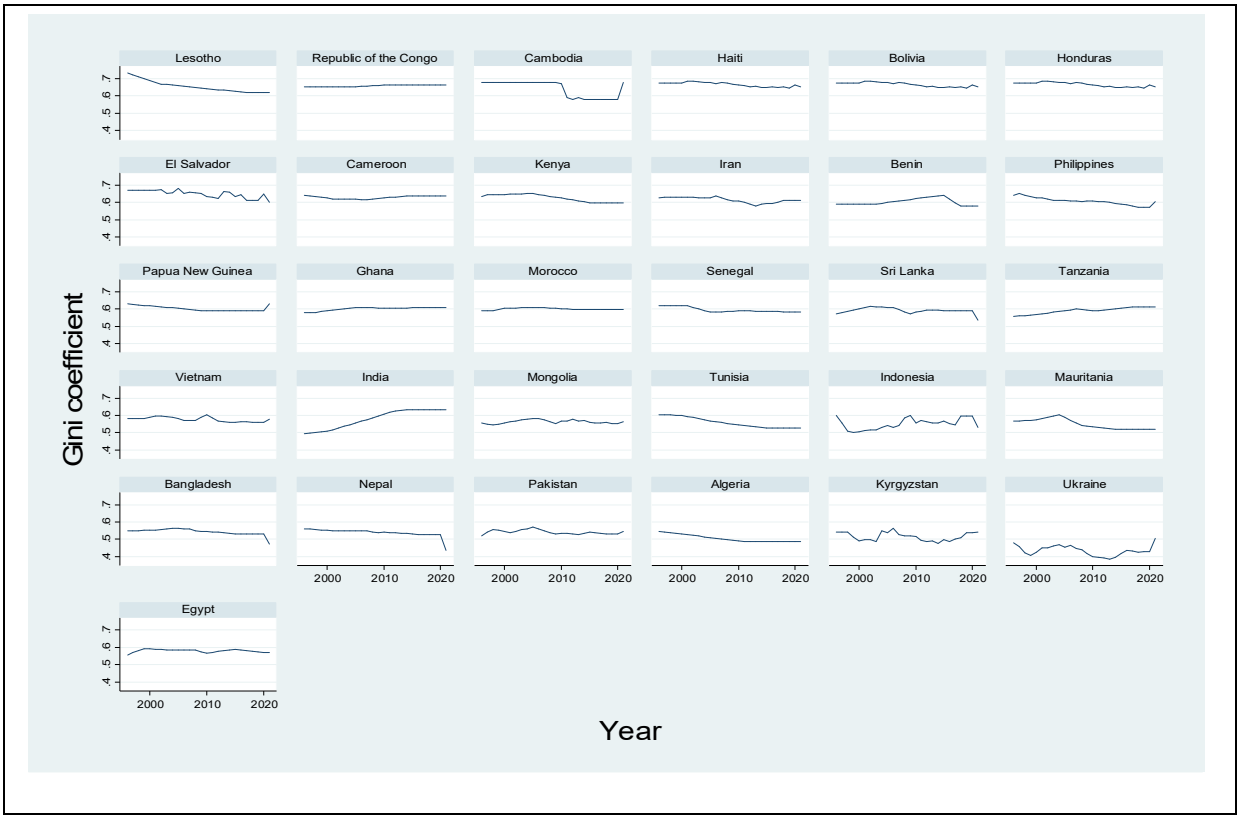
Source: Researcher's calculation based on the WID

A 3: Gini coefficient (income inequality) in LICs during 1996-2021



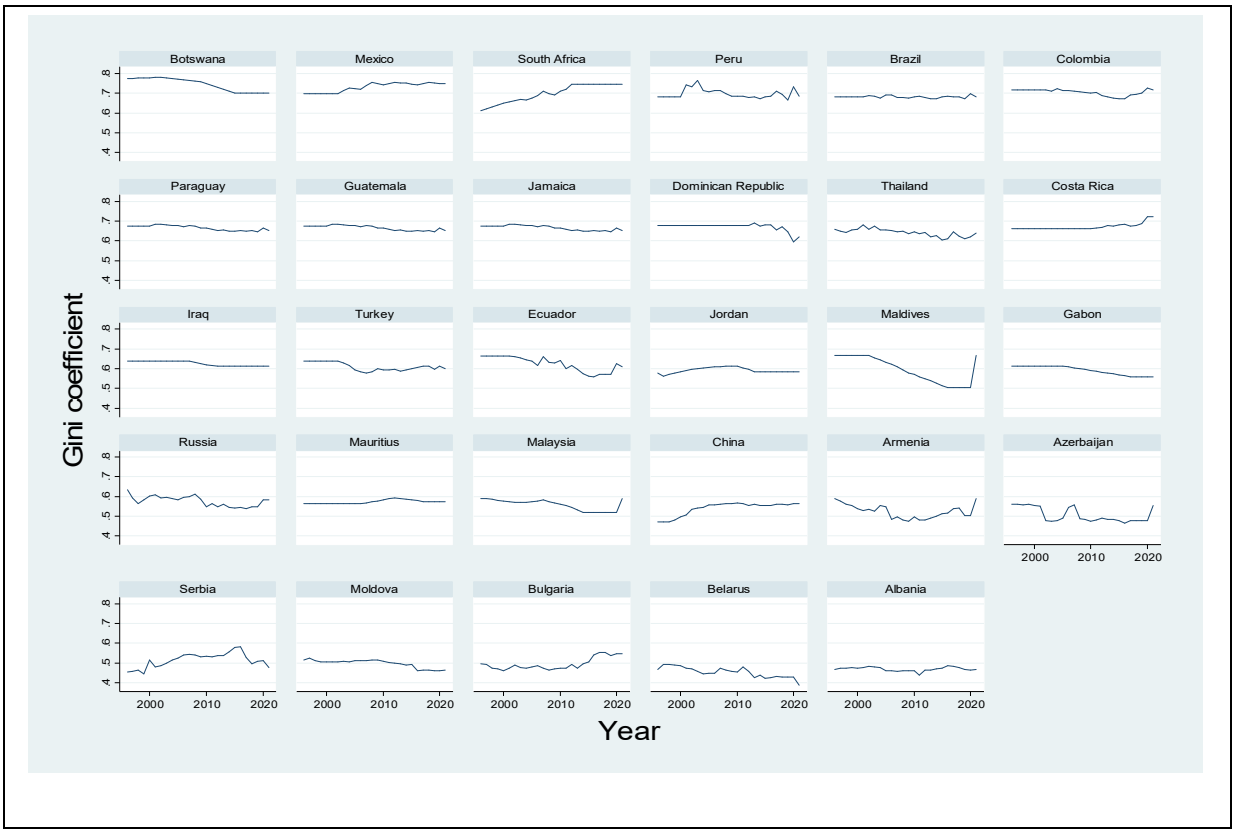
Source: Researcher's construction based on the WID

A 4: Gini coefficient (income inequality) in LMICs during 1996-2021



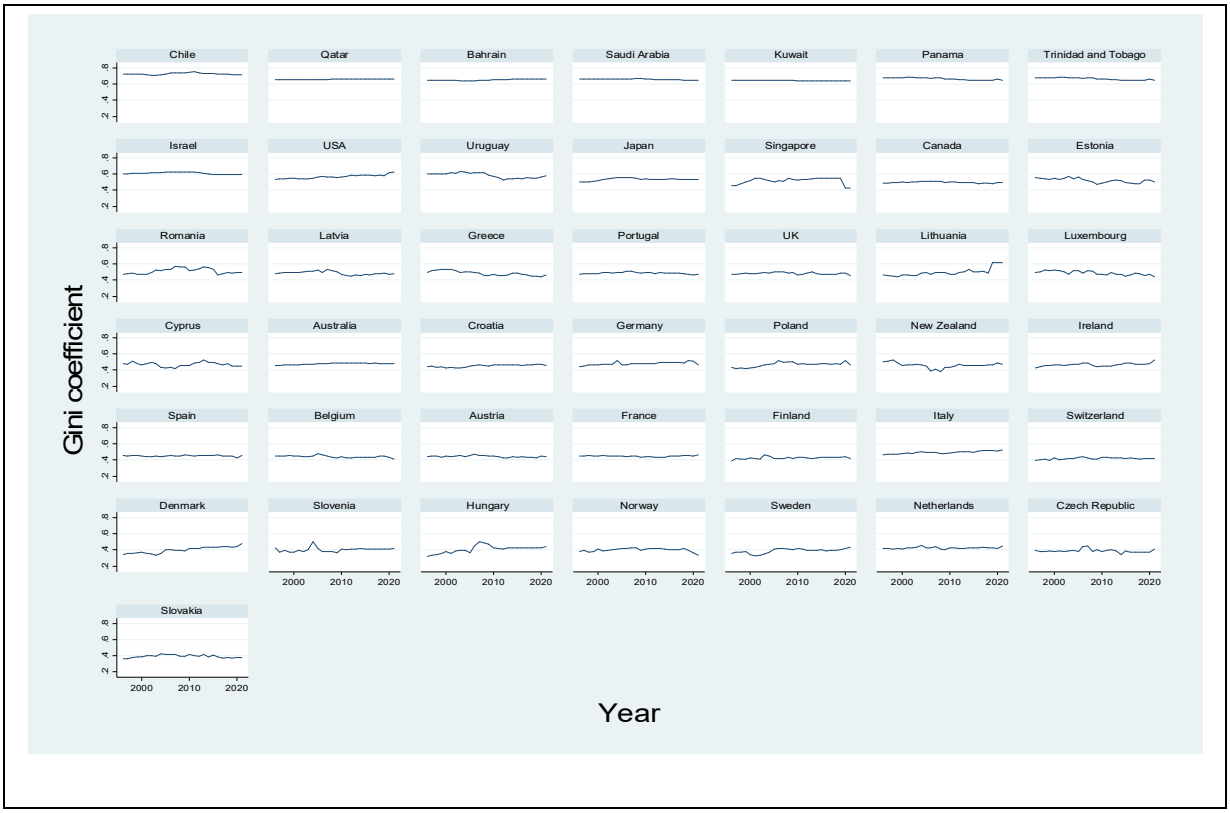
Source: Researcher's construction based on the WID

A 5: Gini coefficient (income inequality) in UMICs during 1996-2021



Source: Researcher's construction based on the WID

A 6: Gini coefficient (income inequality) in HICs during 1996-2021



Source: Researcher's construction based on the WID

A 7: List of countries of EWG and ERG countries

Group of countries	Name of countries	Total countries
EWG countries	Burundi (2.376), Yemen (2.317), Central African Republic (2.273), Sudan (1.909), Iraq (1.814), DR Congo (1.644).	6
ERG countries	Finland (8.650), Denmark (8.536), New Zealand (8.518), Switzerland (8.460), Norway (8.432), Sweden (8.419), Luxemburg (8.398), Netherlands (8.375), Canada (8.200), Australia (8.129), Austria (8.062), Singapore (8.020), Germany (7.965), Ireland (7.950), U.K. (7.907), Belgium (7.597), USA (7.546).	17

Source: Researcher's compilation. Note: average governance score from 1996 to 2021 in parentheses, calculation based on WGIs using the method used by Abbas *et al.* (2021)

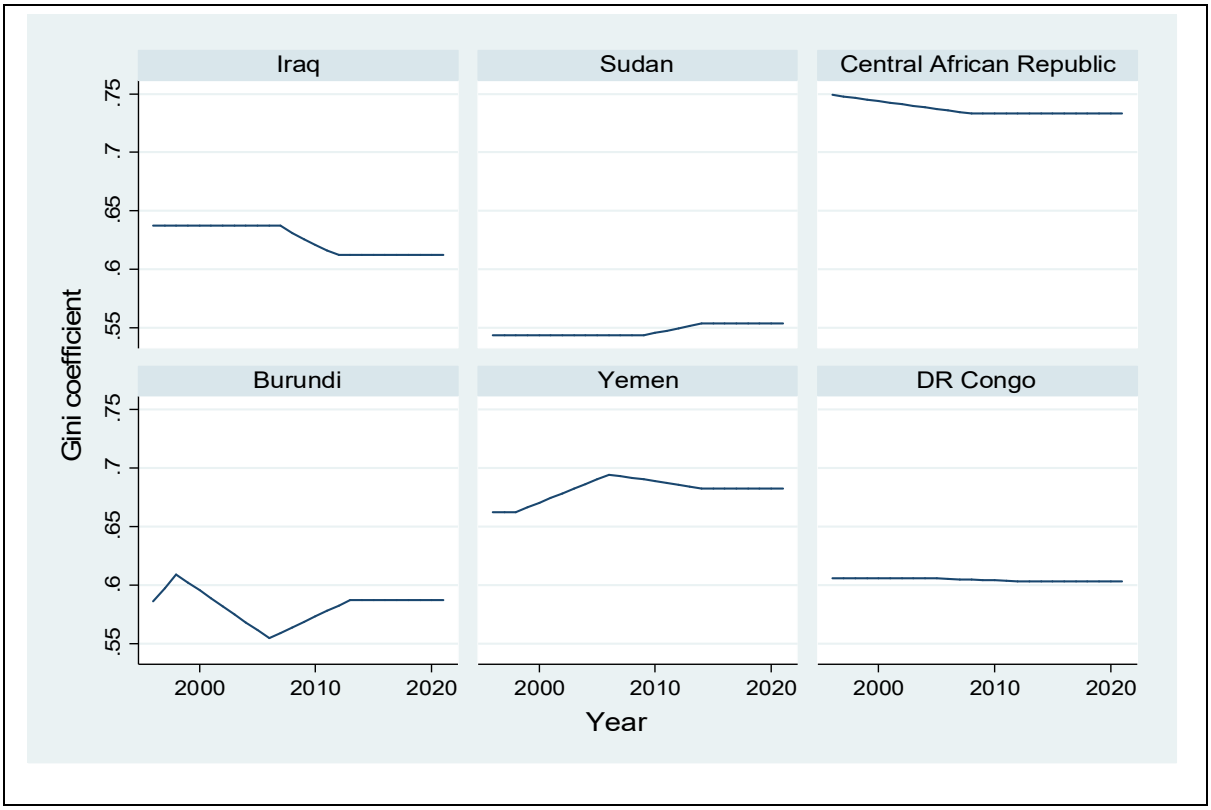
A 8: Average Gini coefficient (income inequality) in EWG and ERG countries during 1996-2021

Year	EWG countries	ERG countries
1996	0.630781	0.437821
1997	0.632475	0.445777
1998	0.634163	0.450796
1999	0.633497	0.451286
2000	0.632823	0.453785
2001	0.632142	0.45077
2002	0.631453	0.450281
2003	0.630757	0.454661
2004	0.630053	0.462569
2005	0.629289	0.464454
2006	0.628517	0.463488
2007	0.628825	0.464281
2008	0.628081	0.458028
2009	0.627665	0.45262
2010	0.627671	0.45934
2011	0.627748	0.4606
2012	0.627882	0.461132
2013	0.628723	0.46162
2014	0.628772	0.464167
2015	0.628771	0.462896
2016	0.628771	0.461764
2017	0.628771	0.463473

2018	0.628772	0.462751
2019	0.628771	0.463408
2020	0.628772	0.461618
2021	0.628771	0.457309

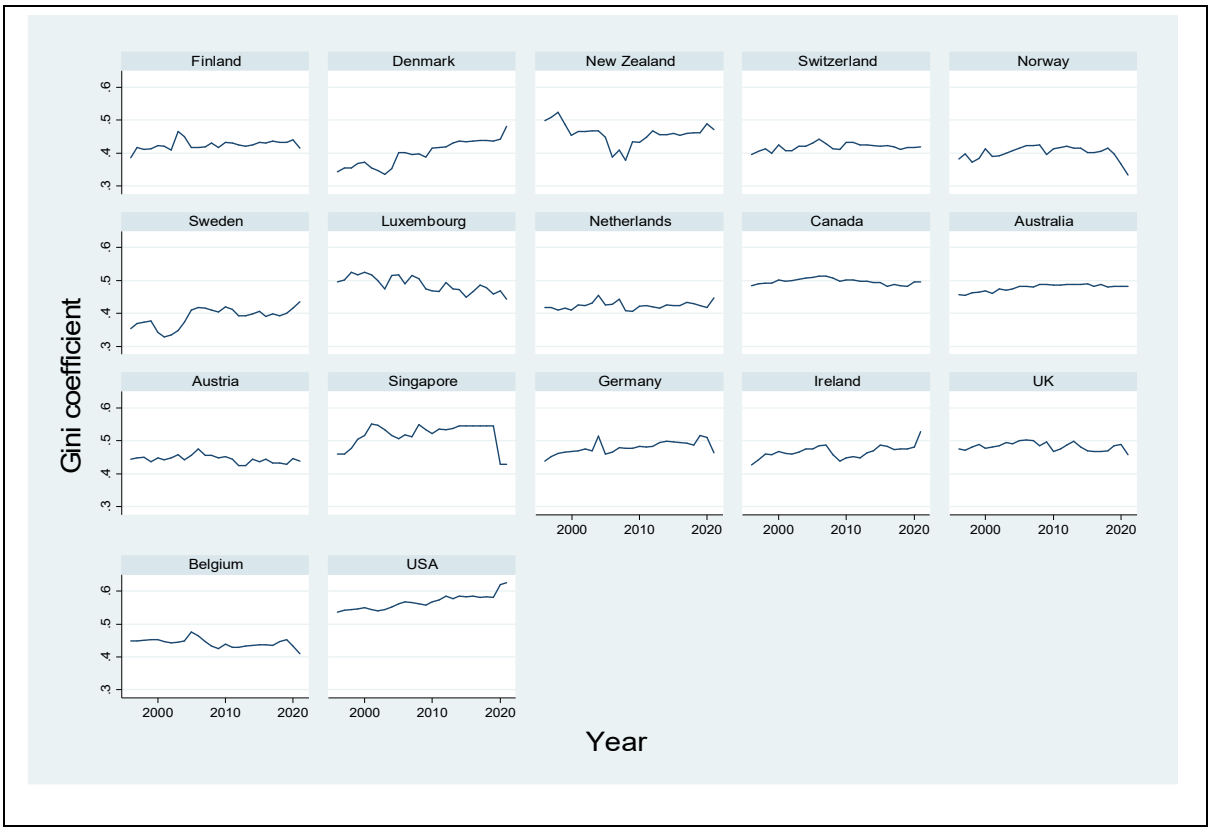
Source: Researcher's calculation based on the WID

A 9: Gini coefficient (income inequality) in EWG countries during 1996-2021



Source: Researcher's construction based on the WID

A 10: Gini coefficient (income inequality) in ERG countries during 1996-2021



Source: Researcher's construction based on the WID

References

Abbas, Q., Junqing, L., Ramzan, M., & Fatima, S. (2021). Role of governance in debt-growth relationship: Evidence from panel data estimations. *Sustainability, 13*(11)*,* 5954.

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The colonial origins of comparative development: An empirical investigation. *American Economic Review, 91*(5), 1369-1401.

Acemoglu, D., Naidu, S., Restrepo, P., & Robinson, J. A. (2013). Democracy, redistribution and inequality. *NBER Working Paper No. 19746*.

Acheampong, A. O., Dzator, J., Abunyewah, M., Erdiaw-Kwasie, M. O., & Opoku, E. E. O. (2023). Sub-Saharan Africa's tragedy: Resource curse, democracy and income inequality. *Social Indicators Research, 168*, 471-509.

Adams, S. (2008). Globalization and income inequality: Implications for intellectual property rights. *Journal of Policy Modeling, 30*(5), 725-735.

Adams, S., & Klobodu, E. K. M. (2019). Urbanization, economic structure, political regime, and income inequality. *Social Indicators Research, 142*, 971-995.

Adams, S., & Mengistu, B. (2008). Privatization, governance and economic development in developing countries. *Journal of Developing Societies, 24*(4), 415-438.

Adeleye, B. N. (2024). Income inequality, human capital and institutional quality in Sub-Saharan Africa. *Social Indicators Research, 171*, 133-157.

African Union Commission (AUC)/OECD. (2018). *Africa's development dynamics 2018: Growth, jobs and inequalities.* AUC, Addis Ababa/OECD Publishing, Paris.

Aggarwal, S. C. (2022). Inequality and inclusive development: Evidence from selected Indian states. *Indian Journal of Human Development, 16*(1), 55-76.

Agrawal, P. (2015). Reducing poverty in India: The role of economic growth. *IEG Working Paper No. 349* .

Agrawal, T., & Agrawal, A. (2023). Beyond consumption expenditure: Income inequality and its sources in India. *Progress in Development Studies, 23*(1), 7-27.

Ahmad, M. (2017). Economic freedom and income inequality: Does political regime matter? *Economies, 5*(2), 18.

Ahmed, N., Marriott, A., Dabi, N., Lowthers, M., Lawson, M., & Mugehera, L. (2022). *Inequality kills.* Oxfam GB for Oxfam International.

Aiyar, S., & Ebeke, C. H. (2019). Inequality of opportunity, inequality of income and economic growth. *IMF Working Paper WP/19/34*.

Akpa, A. F. (2023). Effect of natural resources rents on income inequality in sub-Saharan Africa: exploring the direct and indirect transmission mechanisms. *International Journal of Development Issues, 22*(2), 167-181.

Alesina, A., & Perotti, R. (1996). Income distribution, political instability, and investment. *European Economic Review, 40*(6), 1203-1228.

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *Quarterly Journal of Economics, 109*(2), 465-490.

Ali, I. M. A., Attiaoui, I., Khalfaoui, R., & Tiwari, A. K. (2022). The effect of urbanization and industrialization on income inequality: An analysis based on the method of moments quantile regression. *Social Indicators Research, 161*, 29-50.

Alvarado, R., Tillaguango, B., López-Sánchez, M., Ponce, P., & Işık, C. (2021). Heterogeneous impact of natural resources on income inequality: The role of the shadow economy and human capital index. *Economic Analysis and Policy, 69*, 690-704.

Amate-Fortes, I., Guarnido-Rueda, A., Martínez-Navarro, D., & Oliver-Márquez, F. J. (2021). Measuring inequality in income distribution between men and women: What causes gender inequality in Europe? *Quality & Quantity, 55*, 395-418.

Amiti, M., & Cameron, L. (2012). Trade liberalization and the wage skill premium: Evidence from Indonesia. *Journal of International Economics, 87*(2), 277-287.

Amri, P. D., & Bouvet, F. (2024). Do voters in developing and transitional democracies care about income inequality? The role of media freedom. *Economics & Politics, 36*(1), 245-274.

Anand, S., & Segal, P. (2008). What do we know about global income inequality? *Journal of Economic Literature, 46*(1), 57-94.

Andres, A. R., & Ramlogan-Dobson, C. (2011). Is corruption really bad for inequality? Evidence from Latin America. *The Journal of Development Studies, 47*(7), 959-976.

Aneja, R., Barkha, & Banday, U. J. (2021). Regional economic growth and inequality in India: A sector-wise decomposition analysis. *Arthaniti: Journal of Economic Theory and Practice, 20*(1), 95-110.

Ang, J. B. (2010). Finance and inequality: The case of India. *Southern Economic Journal, 76*(3), 738-761.

Ang, J. B. (2009). Financial liberalization and income inequality. *MPRA Paper No. 14496*.

Anyanwu, J. C. (2016). Empirical analysis of the main drivers of income inequality in Southern Africa. *Annals of Economics and Finance, 17*(2), 337-364.

Anyanwu, J. C., Erhijakpor, A. E. O., & Obi, E. (2016). Empirical analysis of the key drivers of income inequality in West Africa. *African Development Review, 28*(1), 18-38.

Arora, R. U., & Ratnasiri, S. (2015). Economic reforms, growth and well-being: Evidence from India. *Journal of Economic Policy Reform, 18*(1), 16-33.

Asad, M. A., & Ahmad, M. (2011). Growth and consumption inequality in Pakistan. *Pakistan Economic and Social Review, 49*(1), 69-89.

Asamoah, L. A. (2021). Institutional quality and income inequality in developing countries: A dynamic panel threshold analysis. *Progress in Development Studies, 21*(2), 123-143.

Asogwa, F. O., Onyeke, Q. O., Kuma, P. M., Arazue, W. O., & Nkalu, C. N. (2022). Do macroeconomic indicators determine income inequality in selected African countries? *Journal of Public Affairs, 22*(4), e2560.

Avom, D., Ntsame Ovono, N., & Ongo Nkoa, E. (2022). Revisiting the effects of natural resources on income inequality in Sub-Saharan Africa. *International Journal of Development Issues, 21*(3), 389-412.

Azam, M. (2016). Income Inequality in India 2004-2012: Role of alternative income sources. *Economics Bulletin, 36*(2), 1160-1169.

Azam, M., & Bhatt, V. (2018). Spatial income inequality in India, 1993–2011: A decomposition analysis. *Social Indicators Research, 138*, 505-522.

Bahamonde, H., & Trasberg, M. (2021). Inclusive institutions, unequal outcomes: Democracy, state capacity, and income inequality. *European Journal of Political Economy, 70,* 102048.

Bahmani-Oskooee, M., Hegerty, S. W., & Wilmeth, H. (2008). Short-run and long-run determinants of income inequality: Evidence from 16 countries. *Journal of Post Keynesian Economics, 30*(3), 463-484.

Bai, J., Choi, S. H., & Liao, Y. (2021). Feasible generalized least squares for panel data with cross-sectional and serial correlations. *Empirical Economics,* 60, 309-326.

Bajpai, N. (2002). A Decade of economic reforms in India: The unfinished agenda. *Metamorphosis: A Journal of Management Research, 1*(2), 125-154.

Balcázar, C. F. (2015). Long-Run effects of democracy on income inequality: Evidence from repeated cross-sections. *Policy Research Working Paper 7153*. World Bank Group.

Balcázar, C. F. (2016). Long-run effects of democracy on income inequality in Latin America. *The Journal of Economic Inequality, 14*, 289-307.

Baloch, A., Noor, Z. M., Habibullah, M. S., & Bani, N. Y. M. (2018). The effect of the gender equality on income inequality: A dynamic panel approach. *Jurnal Ekonomi Malaysia, 52*(2), 3-17.

Baloch, M. A., Danish, & Meng. F. (2019). Modeling the non-linear relationship between financial development and energy consumption: Statistical experience from OECD countries. *Environmental Science and Pollution Research, 26*, 8838-8846.

Baltagi, B. H. (2005). *Econometric analysis of panel data* (Third Edition ed.). John Wiley & Sons Ltd. West Sussex, England.

Banerjee, A., & Piketty, T. (2005). Top Indian incomes, 1922-2000. *The World Bank Economic Review, 19*(1), 1-20.

Banerjee, A., Dolado, J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in single-equation framework. *Journal of Time Series Analysis, 19*(3), 267-283.

Barro, R. J. (2000). Inequality and growth in a panel of countries. *Journal of Economic Growth, 5*, 5-32.

Basole, A. (2014). Dynamics of income inequality in India: Insights from World Top Incomes Database. *Economic and Political Weekly, 49*(40), 14-17.

Batuo, M. E., Kararach, G., & Malki, I. (2022). The dynamics of income inequality in Africa: An empirical investigation on the role of macroeconomic and institutional forces. *World Development, 157*, 105939.

Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review, 89*(3), 634-647.

Behrman, J. R. (1993). The economic rationale for investing in nutrition in developing countries. *World Development, 21*(11), 1749-1771.

Benabou, R. (2000). Unequal societies: Income distribution and the social contract. *The American Economic Review, 90*(1), 96-129.

Benoit, K. (2011). *Linear regression models with logarithmic transformations*. Methodology Institute, London School of Economics, 1-8. Retrieved from https://kenbenoit.net/assets/courses/ME104/logmodels2.pdf

Berisha, E., Gupta, R., & Meszaros, J. (2020). The impact of macroeconomic factors on income inequality: Evidence from the BRICS. *Economic Modelling, 91*, 559-567.

Bharti, N. K., Chancel, L., Piketty, T., & Somanchi, A. (2024). Income and wealth inequality in India, 1922-2023: The rise of the billionaire raj. *Working Paper N°2024/09*.

Björklund, A. (1991). Unemployment and income distribution: Time-series evidence from Sweden. *The Scandinavian Journal of Economics, 93*(3), 457-465.

Blancheton, B., & Chhorn, D. (2021). Government intervention, institutional quality, and income inequality: Evidence from Asia and the Pacific, 1988-2014. *Asian Development Review, 38*(1), 176-206.

Bollen, K. A., & Jackman, R. W. (1985). Political democracy and the size distribution of income. *American Sociological Review, 50*(4), 438-457.

Bourguignon, F. (1981). Pareto superiority of unegalitarian equilibria in Stiglitz' model of wealth distribution with convex saving function. *Econometrica, 49*(6), 1469-1475.

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological), 37*(2), 149-163.

Bukhari, M., & Munir, K. (2016). Impact of globalization on income inequality in selected Asian countries. *MPRA Paper No. 74248*.

Bulíř, A. (2001). Income inequality: Does inflation matter? *IMF Staff Papers, 48*(1), 139-159.

Busse, M., & Hefeker, C. (2007). Political risk, institutions and foreign direct investment. *European Journal of Political Economy, 23*(2), 397-415.

Butler, J., Wildermuth, G. A., Thiede, B. C., & Brown, D. L. (2020). Population change and income inequality in rural America. *Population Research and Policy Review, 39*, 889-911.

Canh, N. P., Nguyen, B., Thanh, S. D., & Kim, S. (2021). Entrepreneurship and natural resource rents: Evidence from excessive entrepreneurial activity. *Sustainable Production and Consumption, 25*, 15-26.

Caous, E. L., & Huarng, F. (2020). Economic complexity and the mediating effects of income inequality: Reaching sustainable development in developing countries. *Sustainability, 12*(5), 2089.

Cardoso, E., Barros R. P. d., & Urani, A. (1995). Inflation and unemployment as determinants of inequality in Brazil: The 1980s. In R. Dornbusch. & S. Edwards (eds.), *Reform, recovery, and growth: Latin America and the Middle East* (pp. 151-176). University of Chicago Press.

Carr-Hill, R. (2020). Inequalities in access to higher education in Africa: How large are they? Do they mirror the situation in the metropole 60 years ago? *International Journal of Educational Development, 72*, 102122.

Castells-Quintana, D., & Royuela, V. (2012). Unemployment and long-run economic growth: The role of income inequality and urbanisation. *Investigaciones Regionales, 24*, 153-173.

Çelik, S., & Basdas, U. (2010). How does globalization affect income inequality? A panel data analysis. *International Advances in Economic Research, 16*, 358-370.

Chancel, L., & Piketty, T. (2019). Indian income inequality, 1922-2015: From british raj to billionaire raj? *Review of Income and Wealth, 65*(S1), S33-S62.

Chancel, L., Cogneau, D., Gethin, A., & Myczkowski, A. (2019). Income inequality in Africa, 1990-2017. *WID.world Issue Brief 2019/6*.

Chaudhuri, S., & Ravallion, M. (2006). Partially awakened giants : Uneven growth in China and India. *Policy Research Working Paper Series 4069, The World Bank*.

Checchi, D., & García-Peñalosa, C. (2008). Labour market institutions and income inequality. *Economic Policy, 23*(56), 602-649.

Chekouri, S. M. (2023). Natural resource abundance and income inequality: A case study of Algeria. *International Journal of Development Issues, 22*(3), 325-344.

Chong, A., & Calderón, C. (2000). Institutional quality and income distribution. *Economic Development and Cultural Change, 48*(4), 761-786.

CMIE. (2023). Retrieved from https://www.cmie.com/kommon/bin/sr.php?kall=warticle&dt=20230501182648&msec=936

Coccia, M. (2021). How a good governance of institutions can reduce poverty and inequality in society? In N. Faghih, & A. H. Samadi (eds.), *Legal-Economic Institutions, Entrepreneurship, and Management* (pp. 65-94). Springer, Cham.

Collier, P., & Hoeffler, A. (2002). Military expenditure: Threats, aid and arms races. *World Bank Policy Research Working Paper No. 2927*. World Bank Group, Washington, D.C.

Cooray, A. (2009). Government Expenditure, Governance and Economic Growth. *Comparative Economic Studies, 51*, 401-418.

Cowell, F. (2011). *Measuring Inequality* (Third ed.). London School of Economics Perspectives in Economic Analysis.

Dabla-Norris, E., Kochhar, K., Suphaphiphat, N., Ricka, F., & Tsounta, E. (2015). *Causes and consequences of income inequality: A global perspective.* IMF Staff Discussion Note SDN/15/13.

Danish, Baloch, M. A., & Wang, B. (2019). Analyzing the role of governance in CO2 emissions mitigation: The BRICS experience. *Structural Change and Economic Dynamics, 51*, 119-125.

Darvas, Z. (2019). Global interpersonal income inequality decline: The role of China and India. *World Development, 121*, 16-32.

Davis, T. J. (2016). Good governance as a foundation for sustainable human development in sub-Saharan Africa. *Third World Quarterly, 38*(3), 636-654.

Decreuse, B., & Maarek, P. (2015). FDI and the labor share in developing countries: A theory and some evidence. *Annals of Economics and Statistics* (119/120), 289-319.

DeVerteuil, G. (2009). Inequality. *International Encyclopedia of Human Geography,* 433-445.

Derviş, K., & Qureshi, Z. (2016). Income distribution within countries: Rising inequality. *Global Economy and Development at Brookings*. Retrieved from https://www.brookings.edu/wp-content/uploads/2016/08/income-inequality-within-countries_august-2016-003.pdf

Deyshappriya, N. P. R. (2017). Impact of macroeconomic factors on income inequality and income distribution in Asian countries. *ADBI Working Paper 696. Tokyo: Asian Devlopment Bank Institute*. Retrieved from https://www.adb.org/publications/impact-macroeconomic-factors-income-inequality-distribution

Dhas, R. A. C. (2009). Agricultural crisis in India: The root cause and consequences. *MPRA Paper No. 18930*.

Diagne, M. (2021). *Tackling corruption is our collective responsibility.* The World Bank. Retrieved from https://blogs.worldbank.org/en/governance/tackling-corruption-our-collective-responsibility

Diamond, L., & Morlino, L. (2005). *Assessing the quality of democracy.* Baltimore: Johns Hopkins University Press.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*(366), 427-431.

Dobson, S., & Ramlogan-Dobson, C. (2012). Why is corruption less harmful to income inequality in Latin America? *World Development, 40*(8), 1534-1545.

Doessel, D. P., & Valadkhani, A. (1998). Economic development and institutional factors affecting income distribution: The case of Iran, 1967-1993. *International Journal of Social Economics, 25*(2/3/4), 410-423.

Dorsch, M. T., & Maarek, P. (2019). Democratization and the conditional dynamics of income distribution. *American Political Science Review, 113*(2), 385-404.

Dossou, T. A. M. (2023). Income inequality in Africa: Exploring the interaction between urbanization and governance quality. *Social Indicators Research, 167*, 421-450.

Dossou, T. A. M., Ndomandji Kambaye, E., Bekun, F. V., & Eoulam, A. O. (2023a). Exploring the linkage between tourism, governance quality, and poverty reduction in Latin America. *Tourism Economics*, *29*(1), 210-234.

Dossou, T. A. M., Kambaye, E. N., Berhe, M. W., & Alinsato, A. S. (2023b). Toward efforts to lessen income inequality in Asia: Exploring synergies between tourism and governance quality. *Tourism Management Perspectives, 46*, 101086.

Dossou, T. A. M., Kambaye, E. N., Berhe, M. W., & Asongu, S. A. (2023c). Moderating effect of ICT on the relationship between governance quality and income inequality in sub-Saharan Africa. *Information Development*.

Dossou, T. A. M., Kambaye, E. N., Berhe, M. W., & Asongu, S. A. (2022). Does E-governance reduce income inequality in sub-Saharan Africa? Evidence from a dynamic panel. *African Governance and Development Institute Working Paper No. WP/22/066*, 1-37.

Dreher, A., & Gaston, N. (2008). Has globalization increased inequality? *Review of International Economics, 16*(3), 516-536.

Driscoll, J. C., & Kraay, A. C. (1998). Consistent covariance matrix estimation with spatially dependent panel data. *The Review of Economics and Statistics, 80*(4), 549-560.

ElGindi, T. (2017). Natural resource dependency, neoliberal globalization, and income inequality: Are they related? A longitudinal study of developing countries (1980–2010). *Current Sociology, 65*(1), 21-53.

Esarey, J., Salmon, T. C., & Barrilleaux, C. (2012). What motivates political preferences? Self-interest, ideology, and fairness in a laboratory democracy. *Economic Inquiry, 50*(3), 604-624.

ESCAP, UN. (2018). Inequality of outcomes in Asia and the Pacific: Trends, drivers and costs. In *Inequality in Asia and the Pacific in the Era of the 2030 Agenda for Sustainable development.* United Nations. Retrieved from https://hdl.handle.net/20.500.12870/1551

Facchini, F. (2008). *Inequalities and growth: Are there good and bad inequalities?* Public Choice Spciety, 2007, San Antonio (USA), United States, hal-00270483.

Ferreira, I. A., Gisselquist, R. M., & Tarp, F. (2022). On the impact of inequality on growth, human development, and governance. *International Studies Review, 24*(1).

Florida, R., & Mellander, C. (2016). The geography of inequality: Difference and determinants of wage and income inequality across US metros. *Regional Studies, 50*(1), 79-92.

Friderichs, T. J., Keeton, G., & Rogan, M. (2023). Decomposing the impact of human capital on household income inequality in South Africa: Is education a useful measure? *Development Southern Africa, 40*(5), 997-1013.

Froehlich, W. (1948). The role of income determination in reinvestment and investment. *The American Economic Review, 38*(1), 78-91.

Fukuda, T. (2017). The relationship between financial development and income inequality in India: Evidence from VARX and ARDL assessments. *Asian Economic and Financial Review, 7*(10), 1014-1027.

Fum, R. M., & Hodler, R. (2010). Natural resources and income inequality: The role of ethnic divisions. *Economics Letters, 107*(3), 360-363.

Furceri, D., & Ostry, J. D. (2019). Robust determinants of income inequality. *Oxford Review of Economic Policy, 35*(3), 490-517.

Ganaie, A. A., Bhat, S. a., & Kamaiah, B. (2018). Macro-determinants of income inequality: An empirical analysis in case of India. *Economics Bulletin, 38*(1), 309-325.

Gaston, N., & Rajaguru, G. (2009). The long-run determinants of Australian income inequality. *Economic Record, 85*(270), 260-275.

Geneva Academy (n.d). *Today's armed conflicts.* Geneva, Switzerland: Geneva Academy of International Humanitarian Law and Human Rights. Retrieved from https://geneva-academy.ch/galleries/today-s-armed-conflicts

Ghosh, S., Doğan, B., Can, M., Shah, M. I., & Apergis, N. (2023). Does economic structure matter for income inequality? *Quality & Quantity, 57*, 2507-2527.

Gimba, O. J., Seraj, M., & Ozdeser, H. (2021). What drives income inequality in sub-Saharan Africa and its sub-regions? An examination of long-run and short-run effects. *African Development Review, 33*(4), 729-741.

Gini, C. (1912). *Variabilità e mutabilità: contributo allo studio delle distribuzioni e delle relazioni statistiche.* Tipografia di Paolo Cuppini, Bologna.

Gossel, S. (2024). FDI and inequality in Sub-Saharan Africa: does democracy matter? *International Journal of Emerging Markets, 19*(1), 33-55.

Gradín, C., Tarp, F., & Leibbrandt, M. (2021). Global inequality may be falling, but the gap between haves and have-nots is growing. *United Nations University World Institute for Development*, *Economics Research, Finland*. Retrieved from https://www.wider.unu.edu/publication/global-inequality-may-be-falling-gap-between-haves-and-have-nots-%C2%A0growing

Green, D. (2020). *Which developing countries have managed to reduce income inequality and why?* Oxfam. Retrieved from https://frompoverty.oxfam.org.uk/which-developing-countries-have-managed-to-reduce-income-inequality-and-why/

Greene, W.H. (2000). *Econometric analysis.* NJ: Prentice Hall.

Grimm, M., Harttgen, K., Klasen, S., & Misselhorn, M. (2008). A human development index by income groups. *World Development, 36*(12), 2527-2546.

Grossman, G. M., & Helpman, E. (1996). Electoral competition and special interest politics. *The Review of Economic Studies, 63*(2), 265-286.

Grotti, R., & Scherer, S. (2016). Does gender equality increase economic inequality? Evidence from five countries. *Research in Social Stratification and Mobility, 45*, 13-26.

Gupta, S., Davoodi, H., & Alonso-Terme, R. (2002). Does corruption affect income inequality and poverty? *Economics of Governanance, 3*, 23-45.

Gustafsson, B., & Johansson, M. (1999). In search of smoking guns: What makes income inequality vary over time in different countries? *American Sociological Review, 64*(4), 585-605.

Gyimah-Brempong, K. (2002). Corruption, economic growth, and income inequality in Africa. *Economics of Governance, 3*, 183-209.

Ha, N. M., Le, N. D., & Trung-Kien, P. (2019). The impact of urbanization on income inequality: A study in Vietnam. *Journal of Risk and Financial Management, 12*(3), 146.

Hamadeh, N., Rompaey, C. V., & Metreau, E. (2021). *New World Bank country classifications by income level: 2021-2022.* Retrieved from https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2021-2022

Han, J., Liu, R., & Zhang, J. (2012). Globalization and wage inequality: Evidence from urban China. *Journal of International Economics, 87*(2), 288-297.

Harris, R., & Sollis, R. (2003). *Applied time series modelling and forecasting.* West Sussex, John Wiley & Sons Ltd.

Hartwell, C. A., Horvath, R., Horvathova, E., & Popova, O. (2019). Democratic institutions, natural resources, and income inequality. *Comparative Economic Studies, 61*, 531-550.

Hartwell, C., Horvath, R., Horvathova, E., & Popova, O. (2022). Natural resources and income inequality in developed countries: Synthetic control method evidence. *Empirical Economics, 62*, 297-338.

Hasell, J. (2018). Is income inequality rising around the world? *Our World in Data.* Retrieved from https://ourworldindata.org/income-inequality-since-1990

Hasell, J. (2023). Measuring inequality: What is the Gini coefficient? *Our World in Data*. Retrieved from https://ourworldindata.org/what-is-the-gini-coefficient

Hassan, M. S., Mahmood, H., Saeed, M. I., Alkhateeb, T. T. Y., Arshed, N., & Mahmoud, D. H. I. (2021). Investment portfolio, democratic accountability, poverty and income inequality nexus in Pakistan: A Way to Social Sustainability. *Sustainability, 13*(11), 6411.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251-1271.

Hewett, W. W. (1925). The definition of income. *The American Economic Review, 15*(2), 239-246.

Hicks, J. R. (1946). *Value and capital: An inquiry into some fundamental principles of economic theory.* Oxford, Clarendon Press.

Hirschman, A. O., & Rothschild, M. (1973). The changing tolerance for income inequality in the course of economic development: With a mathematical appendix. *The Quarterly Journal of Economics, 87*(4), 544-566.

Huang, B., Morgan, P. J., & Yoshino, N. (2019). Demystifying rising inequality in Asia. *Asian Development Bank Institute*. Retrieved from https://www.adb.org/sites/default/files/publication/485186/adbi-demystifying-rising-inequality-asia.pdf

Hung, N. T., Yen, N. T. H., Duc, L. D. M., Thuy, V. H. N., & Vu, N. T. (2020). Relationship between government quality, economic growth and income inequality: Evidence from Vietnam. *Cogent Business & Management, 7*(1).

Huynh, C. M., & Nguyen, T. L. (2019). Shadow economy and income inequality: New empirical evidence from Asian developing countries. *Journal of the Asia Pacific Economy, 25*(1), 175-192.

Huynh, C. M., Le, Q. N., & Huynh, G. L. (2023). A multidimensional free market and income inequality in developing Asia: How does the quality of governance matter? *International Social Science Journal, 73*(250), 1079-1097.

International Labour Conference. (2021). *Inequalities and the world of work.* Geneva: International Labour Office. Retrieved from https://www.ilo.org/resource/conference-paper/ilc/109/inequalities-and-world-work

International Labour Organization (ILO). (2018). *More than 60 per cent of the world's employed population are in the informal economy*. International Labour Organization.

Retrieved from https://www.ilo.org/resource/news/more-60-cent-world%E2%80%99s-employed-population-are-informal-economy

International Monetary Fund (IMF). (2017). *India: Selected issues*. Country Report No. 2017/055. International Monetary Fund. Retrieved from https://www.imf.org/en/Publications/CR/Issues/2017/02/22/India-Selected-Issues-44671

International Monetary Fund (IMF). (2018). *Pursuing women's economic empowerment.* IMF. Retrieved from https://www.imf.org/en/Publications/Policy-Papers/Issues/2018/05/31/pp053118pursuing-womens-economic-empowerment.

International Monetary Fund (IMF). (2023). *The Sahel, Central African Republic face complex challenges to sustainable development.* IMF. Retrieved from https://www.imf.org/en/News/Articles/2023/11/16/cf-the-sahel-car-face-complex-challenges-to-sustainable-development

Islam, M. N. (2016). Does democracy reduce income inequality? *Empirical Economics, 51*, 1299-1318.

Jaikumar, S., & Sarin, A. (2015). Conspicuous consumption and income inequality in an emerging economy: Evidence from India. *Marketing Letters, 26*, 279-292.

Jamil, A. R. M., Law, S. H., Khair-Afham, M. S., & Trinugroho, I. (2024). Financial inclusion and income inequality in developing countries: The role of aging populations. *Research in International Business and Finance, 67*(A), 102110.

Jäntti, M., & Jenkins, S. P. (2010). The impact of macroeconomic conditions on income inequality. *The Journal of Economic Inequality, 8*, 221-240.

Johansson, A. C., & Wang, X. (2014). Financial sector policies and income inequality. *China Economic Review, 31*, 367-378.

Kanbur, R. (2021). Sustainable development goals and the study of economic inequality. *The Journal of Economic Inequality, 19*, 3-11.

Kanbur, R., & Zhuang, J. (2013). Urbanization and inequality in Asia. *Asian Development Review, 30*(1), 131-147.

Kang, H. (2022). Impacts of income inequality and economic growth on CO_2 emissions: Comparing the Gini coefficient and the top income share in OECD countries. *Energies, 15*(19), 6954.

Karataş, A. (2021). Evaluation of the relationship of democracy and governance: An empirical analysis. *Croatian and Comparative Public Administration, 21*(4), 623-651.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2006). Governance matters V: Aggregate and individual governance indicators for 1996–2005. *World Bank Policy Research Working Paper No. 4012, World Bank, Washington*. Retrieved from https://documents1.worldbank.org/curated/en/265051468322155295/pdf/wps4012.pdf

Kaufmann, D., Kraay, A., & Zoido-Lobatón, P. (2000). Governance matters: From measurement to action. *Finance & Development,* 37(2). Retrieved from https://www.imf.org/external/pubs/ft/fandd/2000/06/kauf.htm

Kentor, J. (2001). The long term effects of globalization on income inequality, population growth, and economic development. *Social Problems, 48*(4), 435-455.

Kim, J.-H. (2015). A study on the effect of financial inclusion on the relationship between income inequality and economic growth. *Emerging Markets Finance and Trade, 52*(2), 498-512.

Knowles, S. (2005). Inequality and economic growth: The empirical relationship reconsidered in the light of comparable data. *The Journal of Development Studies, 41*(1), 135-159.

KOF Swiss Economic Institute. Data. Retrieved from https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html.

Koh, S. Y. (2020). Inequality. *International Encyclopedia of Human Geography (Second Edition),* 269-277.

Kotwal, A., Ramaswami, B., & Wadhwa, W. (2011). Economic liberalization and Indian economic growth: What's the evidence? *Journal of Economic Literature, 49*(4), 1152-1199.

Kousar, S., Ahmed, F., López García, M. d. l. N., & Ashraf, N. (2020). Renewable energy consumption, water crises, and environmental degradation with moderating role of

governance: Dynamic panel analysis under cross-sectional dependence. *Sustainability, 12*(24), 10308.

Kremer, M., & Maskin, E. (2006). Globalization and inequality. Retrieved from https://www.hse.ru/data/624/768/1238/Maskin.pdf

Kunawotor, M. E., Bokpin, G. A., & Barnor, C. (2020). Drivers of income inequality in Africa: Does institutional quality matter? *African Development Review, 32*(4), 718-729.

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, *45*(1), 1-28.

Law, C.-H., & Soon, S.-V. (2020). The impact of inflation on income inequality: The role of institutional quality. *Applied Economics Letters, 27*(21), 1735-1738.

Lee, D. J., & Son, J. C. (2016). Economic growth and income inequality: Evidence from dynamic panel investigation. *Global Economic Review, 45*(4), 331-358.

Lee, J.-W., & Lee, H. (2018). Human capital and income inequality. *ADBI Working Paper Series 810*. Tokyo: Asian Development Bank Institute. Retrieved from https://www.adb.org/publications/human-capital-and-income-inequality

Levin, A., Lin, C.-F., & Chu, C.-S. J. (2002). Unit root tests in panel data: Asymptotic and fnite-sample properties. *Journal of Econometrics, 108*(1), 1-24.

Li, H., & Zou, H.-f. (1998). Income inequality is not harmful for growth: Theory and evidence. *Review of Development Economics, 2*(3), 318-334.

Li, H., & Zou, H.-f. (2002). Inflation, growth, and income distribution: A cross-country study. *Annals of Economics and Finance, 3*, 85-101.

Licht, A. N., Goldschmidt, C., & Schwartz, S. H. (2007). Culture rules: The foundations of the rule of law and other norms of governance. *Journal of Comparative Economics, 35*(4), 659-688.

Liddle, B. (2017). Urbanization and inequality/poverty. *Urban Science, 1*(4), 35.

Litchfield, J. A. (1999). *Inequality: Methods and tools*. Text for World Bank's web site on inequality, poverty, and socio-economic performance.

Lorenz, M. O. (1905). Methods of measuring the concentration of wealth. *Publications of the American Statistical Association, 9*(70), 209-219.

Lous, B., & Graafland, J. (2022). Who becomes unhappy when income inequality increases? *Applied Research in Quality of Life, 17*, 299-316.

Makhlouf, Y. (2023). Trends in income inequality: Evidence from developing and developed countries. *Social Indicators Research, 165*, 213-243.

Mallick, H., Mahalik, M. K., & Padhan, H. (2020). Does globalization exacerbate income inequality in two largest emerging economies? The role of FDI and remittances inflows. *International Review of Economics, 67*, 443-480.

Marsh, R. M. (2015). Determinants of income inequality in the early twenty-first century: A cross-national study. *Comparative Sociology, 14*(2), 219-251.

Martínez, R., Ayala, L., & Ruiz-Huerta, J. (2001). The impact of unemployment on inequality and poverty in OECD countries. *Economics of Transition, 9*(2), 417-447.

Maxwell, N. L. (1990). Changing female labor force participation: Influences on income inequality and distribution. *Social Forces, 68*(4), 1251-1266.

Mdingi, K., & Ho, S.-Y. (2021). Literature review on income inequality and economic growth. *MethodsX , 8,* 101402.

Meltzer, A. H., & Richard, S. F. (1981). A rational theory of the size of government. *Journal of Political Economy, 89*(5), 914-927.

Memon, S., & Qureshi, I. A. (2021). Income inequality and macroeconomic instability. *Review of Development Economics, 25*(2), 758-789.

Milanovic, B. (2005). Can we discern the effect of globalization on income distribution? Evidence from household surveys. *The World Bank Economic Review, 19*(1), 21-44.

Milanovic, B. (2000). Determinants of cross-country income inequality: An 'Augmented' Kuznets hypothesis. In V. Franičević and M. Uvalić (eds.). *Equality, Participation, Transition*, (pp. 48-79). Palgrave Macmillan, London.

Milanovic, B. (2006). Global income inequality: A review. *World Economics, 7*(1), 131-157.

Milanovic, B. (2021). Notes on global income inequality: A non-technical summary. *Global Policy*. Retrieved from https://www.globalpolicyjournal.com/blog/20/05/2021/notes-global-income-inequality-non-technical-summary

Ministry of Finance, Department of Economic Affairs. (2020). *Monthly economic report.* Ministry of Finance, Department of Economic Affairs. Retrieved from https://dea.gov.in/monthly-economic-report-table

Ministry of Finance, Goverment of India. (2019). State of the economy in 2018-19: A macro view. *Press Information Bureau.* Retrieved from https://pib.gov.in/Pressreleaseshare.aspx?PRID=1577069

Mirrlees, J. A. (1971). An exploration in the theory of optimum income taxation. *The Review of Economic Studies, 38*(2), 175-208.

Mishchuk, H., Samoliuk, N., Bilan, Y., & Streimikiene, D. (2018). Income inequality and its consequences within the framework of social justice. *Problemy Ekorozwoju– Problems of Sustainable Development, 13*(2), 131-138.

Mocan, H. N. (1999). Structural unemployment, cyclical unemployment, and income inequality. *The Review of Economics and Statistics, 81*(1), 122-134.

Monnin, P. (2014). Inflation and income inequality in developed economies. *CEP Working Paper 2014/1*. Retrieved from https://www.cepweb.org/wp-content/uploads/2014/05/CEP_WP_Inflation_and_Income_Inequality.pdf

Morris, M., & Western, B. (1999). Inequality in earnings at the close of the twentieth century. *Annual Review of Sociology, 25*, 623-657.

Muduli, D. K., Rout, S. K., & Khan, N. A. (2022). Nexus between tax structure and income inequality in India. *Asian Development Policy Review, 10*(2), 88-105.

Müller, K., Wagner, G. G., Frick, J., & Hauser, R. (1994). How unemployment and income inequality changed in East and West Germany following reunification. *Vierteljahrshefte zur Wirtschaftsforschung, 63*(1/2), 48-52.

Munir, K., & Bukhari, M. (2020). Impact of globalization on income inequality in Asian emerging economies. *International Journal of Sociology and Social Policy, 40*(1/2), 44-57.

Munir, K., & Sultan, M. (2017). Macroeconomic determinants of income inequality in India and Pakistan. *Theoretical and Applied Economics, 24*(4(613)), 109-120.

Muryani, Esquivias, M. A., Sethi, N., & Iswanti, H. (2021). Dynamics of income inequality, investment, and unemployment in Indonesia. *Journal of Population and Social Studies, 29*, 660-678.

Narayan, P. K., & Smyth, R. (2006). What determines migration flows from low-income to high-income countries? An empirical investigation of Fiji–U.S. migration 1972-2001. *Contemporary Economic Policy, 24*(2), 332-342.

Nguyen, C. P., Schinckus, C., Su, T. D., & Chong, F. H. L. (2021). The influence of tourism on income inequality. *Journal of Travel Research*. *60*(7), 1426-1444.

Nguyen, C. V., Giang, L. T., Tran, A. N., & Do, H. T. (2019). Do good governance and public administration improve economic growth and poverty reduction? The case of Vietnam. *International Public Management Journal, 24*(1), 131-161.

Nguyen, V. B. (2021). The difference in the FDI inflows – Income inequality relationship between developed and developing countries. *The Journal of International Trade & Economic Development, 30*(8), 1123-1137.

Odedokun, M. O., & Round, J. I. (2004). Determinants of income inequality and its effects on economic growth: Evidence from African countries. *African Development Review, 16*(2), 287-327.

OECD. (2015). *In it together: Why less inequality benefits all.* OECD Publishing, Paris. https://doi.org/10.1787/9789264235120-en

OECD. (2023). *Income inequality.* OECD. Retrieved from https://www.oecd.org/en/data/indicators/income-inequality.html

OECD. (2006). *Annual report on the OECD guidelines for multinational enterprises 2006: Conducting business in weak governance zones,* Organisation for Economic Co-operation and Development publishing, Paris. https://doi.org/10.1787/mne-2006-en

Ofori, I. K., Dossou, T. A. M., & Akadiri, S. S. (2022). Towards the quest to reduce income inequality in Africa: Is there a synergy between tourism development and governance? *Current Issues in Tourism, 26*(3), 429-449.

Ongo Nkoa, B. E., & Song, J. S. (2022). Does institutional quality increase inequalities in Africa? *Journal of the Knowledge Economy, 13*, 1896-1927.

Oxfam India. (2023). *Survival of the richest: The India story.* Oxfam India, New Delhi. Retrived from https://www.oxfamindia.org/knowledgehub/workingpaper/survival-richest-india-story#:~:text=%E2%80%9CSurvival%20of%20the%20Richest%E2%80%9D%20is,the%20world%20in%2025%20years.

Padhan, H., Haouas, I., Hammoudeh, S., & Tiwari, A. K. (2022). Nonlinear analysis of government expenditure and tax rate on income inequality in India. *Journal of Public Affairs, 22*(3), e2518.

Panagariya, A. (2004). India in the 1980s and 1990s: A triumph of reforms. *IMF Working Paper WP/04/43*.

Park, K. H. (2017). Education, globalization, and income inequality in Asia. *ADBI Working Paper 732*. Retrieved from https://www.adb.org/publications/education-globalization-and-income-inequality-asia

Parks, R. W. (1967). Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated. *Journal of the American Statistical Association, 62*(318), 500–509.

Perera, L. D. H., & Lee, G. H. Y. (2013). Have economic growth and institutional quality contributed to poverty and inequality reduction in Asia? *Journal of Asian Economics,* 27, 71-86.

Perotti, R. (1996). Growth, income distribution, and democracy: What the data say. *Journal of Economic Growth, 1*, 149-187.

Persson, T., & Tabellini, G. (1994). Is inequality harmful for growth? *The American Economic Review, 84*(3), 600-621.

Perugini, C., & Tekin, İ. (2022). Financial development, income inequality and governance institutions. *Panoeconomicus, 69*(3), 353-379.

Pesaran, M. H. (2021). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics, 60*, 13-50.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*(2), 335-346.

Piketty, T. (2015). About Capital in the twenty-first century. *American Economic Review, 105*(5), 48-53.

Policardo, L., & Carrera, E. J. S. (2018). Corruption causes inequality, or is it the other way around? An empirical investigation for a panel of countries. *Economic Analysis and Policy, 59*, 92-102.

Ponce, P., Yunga, F., Larrea-Silva, J., & Aguirre, N. (2023). Spatial determinants of income inequality at the global level: The role of natural resources. *Resources Policy, 84,* 103783.

Prawoto, N., & Cahyani, R. D. (2020). Analysis of unequal distribution of population income in Indonesia. *The Journal of Asian Finance, Economics and Business, 7*(7), 489-495.

Qureshi, Z. (2023). Rising inequality: A major issue of our time. *The Brookings Institution,* Washington DC: Brookings Institution. Retrieved from https://www.brookings.edu/articles/rising-inequality-a-major-issue-of-our-time/

Radhakrishna, R. (2014). Performance of Indian economy in the post-reform period. *Indian Journal of Human Development, 8*(1), 5-27.

Radhakrishna, R., & Mishra, B. (2020). Growth, poverty, inequality and well-being: Regional contrast in India. *Indian Journal of Human Development, 14*(3), 372-393.

Ram, R. (1984). Population increase, economic growth, educational inequality, and income distribution: Some recent evidence. *Journal of Development Economics, 14*(3), 419-428.

Ravallion, M. (2007). *Economic growth and poverty reduction: Do poor countries need to worry about inequality?* 2020 focus brief on the world's poor and hungry people. IFPRI, Washington, DC.

Ravallion, M. (2014). Income inequality in the developing world. *Science, 344*(6186), 851-855.

Reed, W. R., & Ye, H. (2009). Which panel data estimator should I use? *Applied Economics, 43*(8), 985-1000.

Regional Economic Outlook, Asia and Pacific. (2016). *Building on Asia's strengths during turbulent times.* Washington, D.C: International Monetary Fund. Retrieved from https://www.imf.org/en/Publications/REO/APAC/Issues/2017/03/06/Building-on-Asia-s-Strengths-during-Turbulent-Times

Reuveny, R., & Li, Q. (2003). Economic openness, democracy, and income inequality: An empirical analysis. *Comparative Political Studies, 36*(5), 575-601.

Rice, G. R., & Lozada, G. A. (1983). The effects of unemployment and inflation on the income distribution: A regional view. *Atlantic Economic Journal, 11*, 12-21.

Ridhwan, M. M. (2021). Spatial wage differentials and agglomeration externalities: Evidence from Indonesian microdata. *Economic Analysis and Policy, 71*, 573-591.

Rivera-Batiz, F. L. (2002). Democracy, governance, and economic growth: Theory and evidence. *Review of Development Economics, 6*(2), 225-247.

Rodrik, D. (2008). Second-best institutions. *American Economic Review, 98*(2), 100-104.

Rodrik, D. (1999). Where did all the growth go? External shocks, social conflict, and growth collapses. *Journal of Economic Growth, 4*, 385-412.

Roser, M., & Ortiz-Ospina, E. (2013). Income inequality. *Our World in Data.* Retrieved from https://ourworldindata.org/income-inequality

Ross, M. L. (2007). How mineral-rich states can reduce inequality. In M. Humphreys, J. D. Sachs, J. E. Stiglitz (eds.), *Escaping the Resource Curse* (pp. 237-255). Columbia University Press.

Rowley, J., & Slack, F. (2004). Conducting a literature review. *Management Research News, 27*(6), 31-39.

Roy-Mukherjee, S., & Udeogu, E. (2020). Neo-liberal globalization and income inequality: Panel data evidence from OECD and Western Balkan countries. *Journal of Balkan and Near Eastern Studies, 23*(1), 15-39.

Sağlam, B. B. (2021). Educational inequality versus income inequality: An empirical investigation. *The Economic and Social Review, 52*(3), 269-299.

Saha, S., Beladi, H., & Kar, S. (2021). Corruption control, shadow economy and income inequality: Evidence from Asia. *Economic Systems, 45*(2), 100774.

Sala-i-Martin, X. (2002). The disturbing "Rise" of global income inequality. *NBER Working Paper 8904*.

Sarkar, S., & Mehta, B. S. (2010). Income inequality in India: Pre- and post-reform periods. *Economic and Political weekly, 45*(37), 45-55.

Sarkodie, S. A., & Adams, S. (2020). Electricity access, human development index, governance and income inequality in Sub-Saharan Africa. *Energy Reports, 6*, 455-466.

Sarkodie, S. A., & Strezov, V. (2019). Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. *Science of The Total Environment, 646*, 862-871.

Sawadogo, R., & Ouoba, Y. (2024). Do natural resources rents reduce income inequality? A finite mixture of regressions approach. *Resources Policy, 91,* 104870.

Schutz, R. R. (1951). On the measurement of income inequality. *The American Economic Review, 41*(1), 107-122.

Sebri, M., & Dachraoui, H. (2021). Natural resources and income inequality: A meta-analytic review. *Resources Policy, 74*, 102315.

Sefton, J. A., & Weale, M. R. (2006). The concept of income in a general equilibrium. *The Review of Economic Studies, 73*(1), 219-249.

Sehrawat, M., & Giri, A. K. (2015). Financial development and income inequality in India: An application of ARDL approach. *International Journal of Social Economics, 42*(1), 64-81.

Sehrawat, M., & Singh, S. K. (2019). Human capital and income inequality in India: Is there a non-linear and asymmetric relationship? *Applied Economics, 51*(39), 4325-4336.

Sehrawat, M., & Singh, S. K. (2021). Do corruption and income inequality play spoilsport in the energy efficiency-growth relationship in BRICS countries? *Journal of Quantitative Economics, 19*, 727-746.

Sen, A. K. (1997). From income inequality to economic inequality. *Southern Economic Journal, 64*(2), 384-401.

Sethi, P., Bhattacharjee, S., Chakrabarti, D., & Tiwari, C. (2021). The impact of globalization and financial development on India's income inequality. *Journal of Policy Modeling, 43*(3), 639-656.

Shahabadi, A., Nemati, M., & Hosseinidoust, S. E. (2017). The effect of knowledge economy factors on income inequality in the selected Islamic countries. *Journal of the Knowledge Economy, 8*, 1174-1188.

Shahbaz, M., Bhattacharya, M., & Mahalik, M. K. (2017). Finance and income inequality in Kazakhstan: Evidence since transition with policy suggestions. *Applied Economics, 49*(52), 5337-5351.

Shahpari, G., & Davoudi, P. (2014). Studying effects of human capital on income inequality in Iran. *Procedia - Social and Behavioral Sciences, 109*, 1386-1389.

Shao, L. F. (2021). Robust determinants of income distribution across and within countries. *PLoS One, 16*(7), e0253291.

Shen, Y., & Yao, Y. (2008). Does grassroots democracy reduce income inequality in China? *Journal of Public Economics, 92*(10-11), 2182-2198.

Sheng, Y. (2011). Unemployment and income inequality: A puzzling finding from the US in 1941-2010. Retrieved from http://dx.doi.org/10.2139/ssrn.2020744

Shi, Y., Paul, S., & Paramati, S. R. (2022). The impact of financial deepening on income inequality: Empirical evidence from Australia. *International Journal of Finance & Economics, 27*(3), 3564-3579.

Siami-Namini, S., & Hudson, D. (2019). Inflation and income inequality in developed and developing countries. *Journal of Economic Studies, 46*(3), 611-632.

Siddique, M. A. B., Wibowo, H., & Wu, Y. (2014). Fiscal decentralisation and inequality in Indonesia: 1999-2008. *Discussion Paper 14.22, The University of Western Australia*.

Signor, D., Kim, J., & Tebaldi, E. (2019). Persistence and determinants of income inequality: The Brazilian case. *Review of Development Economics, 23*(4), 1748-1767.

Singh, A. (2023). Income inequality and intergenerational mobility in India. *The Indian Economic Journal, 71*(3), 495-507.

Sintos, A., Chletsos, M., & Kontos, K. (2024). The political process in nations: Civil society participation and income inequality. *Kyklos, 77*(3), 471-495.

Sitthiyot, T., & Holasut, K. (2020). A simple method for measuring inequality. *Palgrave Communications, 6*(112).

Stewart, F., Brown, G., & Cobham, A. (2009). The Implications of horizontal and vertical inequalities for tax and expenditure policies. *CRISE Working Paper No. 65*, Centre for Research on Inequality, Human Security and Ethnicity.

Sulemana, I., Nketiah-Amponsah, E., Codjoe, E. A., & Andoh, J. A. N. (2019). Urbanization and income inequality in Sub-Saharan Africa. *Sustainable Cities and Society, 48,* 101544.

Sylwester, K. (2002). Democracy and changes in income inequality. *International Journal of Business and Economics, 1*(2), 167-178.

Taresh, A. A., Sari, D. W., & Purwono, R. (2021). Analysis of the relationship between income inequality and social variables: Evidence from Indonesia. *Economics and Sociology, 14*(1), 103-119.

Teng, W., Mamman, S. O., Xiao, C., & Abbas, S. (2024). Impact of natural resources on income equality in Gulf Cooperation Council: Evidence from machine learning approach. *Resources Policy, 88,* 104427.

Thalassinos, E., Uğurlu, E., & Muratoğlu, Y. (2012). Income inequality and inflation in the EU. *European Research Studies, 15*(1), 127-140.

The United Nations. (2023). *The sustainable development goals report.* Retrieved from https://unstats.un.org/sdgs/report/2023/

The World Bank. Data. Retrieved from https://data.worldbank.org/

The World Bank. Data. Retrieved from https://tcdata360.worldbank.org/indicators/h20daa762?country=BRA&indicator=41794&viz=line_chart&years=1975,2021

The World Bank, Worldwide Governance Indicators. Data. Retrieved from https://databank.worldbank.org/source/worldwide-governance-indicators.

Theyson, K. C., & Heller, L. R. (2015). Development and income inequality: A new specification of the Kuznets hypothesis. *The Journal of Developing Areas, 49*(3), 103-118.

Tiwari, A. K., Shahbaz, M., & Islam, F. (2013). Does financial development increase rural-urban income inequality? Cointegration analysis in the case of Indian economy. *International Journal of Social Economics, 40*(2), 151-168.

Tridico, P. (2018). The determinants of income inequality in OECD countries. *Cambridge Journal of Economics, 42*(4), 1009-1042.

Trinugroho, I., Achsanta, A. F., Pamungkas, P., Saputro, N., & Yuniarti, S. (2023). Democracy, economic growth, and income inequality: Evidence from province level data. *Cogent Economics & Finance, 11*(1).

Tselios, V. (2022). Does political decentralization affect income inequality? The role of governance quality. *Regional Studies, 57*(5), 829-843.

Tsui, A. S., Enderle, G., & Jiang, K. (2018). Income Inequality in the United States: Reflections on the role of corporations. *Academy of Management Review, 43*(1), 156-168.

Ullah, A., Kui, Z., Ullah, S., Pinglu, C., & Khan, S. (2021). Sustainable utilization of financial and institutional resources in reducing income inequality and poverty. *Sustainability, 13*(3), 1038.

UNDP. Data. Retrieved from https://hdr.undp.org/data-center/human-development-index#/indicies/HDI.

UNDP. (2023). *165 million people fell into poverty between 2020 to 2023 as debt servicing crowded out social protection, health and education expenditures.* Retrieved from https://www.undp.org/press-releases/165-million-people-fell-poverty-between-2020-2023-debt-servicing-crowded-out-social-protection-health-and-education-expenditures

UNDP. (1997). *Governance for sustainable human development.* United Nations Development Programme, New York.

United Nations (UN). (2015). *Concepts of inequality: Development issues no. 1.* Retrieved from https://www.un.org/development/desa/dpad/publication/no-1-concepts-of-inequality/

United Nations (UN). (2024). Rich countries use six times more resources, generate 10 times the climate impacts than low-income ones. *United Nations Environment Programme*. Retrieved from https://www.unep.org/news-and-stories/press-release/rich-countries-use-six-times-more-resources-generate-10-times

United Nations (UN). (2020). World social report (2020): Inequality in a rapidly changing world. *United Nations, Department of Economics and Social Affairs*. Retrieved from https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/02/World-Social-Report2020-FullReport.pdf

Uzar, U. (2023). Income inequality, institutions, and freedom of the press: Potential mechanisms and evidence. *Sustainability, 15*(17), 12927.

Varieties of Democracy (V-Dem). (n.d.). Retrieved from https://www.v-dem.net/.

Varieties of Democracy (V-Dem). Data. Retrieved from https://v-dem.net/data/the-v-dem-dataset/country-year-v-dem-core-v13/

Varieties of Democracy (V-Dem). (2024). *Democracy report 2024.* The Varieties of Democracy (V-Dem). Retrieved from https://www.v-dem.net/publications/democracy-reports/

Vo, D. H., Nguyen, T. C., Tran, N. P., & Vo, A. T. (2019). What factors affect income inequality and economic growth in middle-income countries? *Journal of Risk and Financial Management, 12*(1), 40.

Vyas, M. (2020). Impact of lockdown on labour in India. *The Indian Journal of Labour Economics, 63*, 73-77.

Wagle, U. R. (2009). Inclusive democracy and economic inequality in South Asia: Any discernible link? *Review of Social Economy, 67*(3), 329-357.

Walter, B. F. (2015). Why bad governance leads to repeat civil war. *Journal of Conflict Resolution, 59*(7), 1242-1272.

Walujadi, D., Indupurnahayu, I., & Endri, E. (2022). Determinants of income inequality among provinces: Panel data evidence from Indonesia. *Quality - Access to Success, 23*(190), 243-250.

Wicaksono, E., Amir, H., & Nugroho, A. (2017). The sources of income inequality in Indonesia: A regression-based inequality decomposition. *ADBI Working Paper 667,* Tokyo: *Asian Development Bank Institute*. Retrieved from https://www.adb.org/publications/sources-income-inequality-indonesia

Wolde, M., Sera, L., & Merra, T. M. (2022). Causal relationship between income inequality and economic growth in Ethiopia. *Cogent Economics & Finance, 10*(1).

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data.* The MIT Press.

World Bank. (1992). *Governance and development.* The World Bank, Washington, DC. Retrieved from https://documents1.worldbank.org/curated/en/604951468739447676/pdf/multi-page.pdf

World Bank. (1989). *Sub-Saharan Africa—from crisis to sustainable growth: A long-term perspective study.* The World Bank, Washington, DC. Retrieved from https://documents1.worldbank.org/curated/en/498241468742846138/pdf/multi0page.pdf

World Inequality Database. Data. Retrieved from https://wid.world/.

World Inequality Database. WID.WORLD. Retrieved from https://wid.world/wid-world/.

World Inequality Report. (2022). Retrieved from https://wir2022.wid.world/

Wu, W.-C., & Chang, Y.-T. (2019). Income inequality, distributive unfairness, and support for democracy: Evidence from East Asia and Latin America. *Democratization, 26*(8), 1475-1492.

Xu, C., Han, M., Dossou, T. A. M., & Bekun, F. V. (2021). Trade openness, FDI, and income inequality: Evidence from sub-Saharan Africa. *African Development Review*, *33*(1), 193-203.

Zandi, G., Rehan, R., Hye, Q. M. A., Mubeen, S., & Abbas, S. (2022). Do corruption, inflation and unemployment influence the income inequality of developing Asian countries? *International Journal of Applied Economics, Finance and Accounting, 14*(2), 118-128.

Zhang, C., & Zhao, W. (2014). Panel estimation for income inequality and CO_2 emissions: A regional analysis in China. *Applied Energy, 136*, 382-392.

Zhou, L., Biswas, B., Bowles, T., & Saunders, P. J. (2011). Impact of globalization on income distribution inequality in 60 countries. *Global Economy Journal, 11*(1).

Zhuang, J., Dios, E. d., & Lagman-Martin, A. (2010). Governance and institutional quality and the links with economic growth and income inequality: With special reference to developing Asia. *ADB Economics Working Paper Series No. 193*.

List of Publications

1. **Basumatary, I. R.**, Das, M., Basumatary, S., Mwchahary, S., & Basumatary, R. (2024). Income inequality, governance quality, and environmental degradation in Asian countries: Does interaction of governance quality matter? Evidence from panel data. *Journal of Infrastructure, Policy and Development, 8*(7), 4317. https://doi.org/10.24294/jipd.v8i7.4317.
2. **Basumatary, I. R.**, & Das, M. (2024). Investigating the Effect of Democracy and Governance Quality on Income Inequality: Evidence from BRICS. *The Economic Research Guardian, 14*(1), 16-31.
3. **Basumatary, I. R.**, Das, M., Basumatary, S., & Basumatary, K. (2024). Macroeconomic determinants of income inequality among different income group countries: Evidence from panel data. *Journal of Social Economics Research, 11*(1), 111-125. https://doi.org/10.18488/35.v11i1.3614

Seminars Attended

1. Presented paper at the International Seminar on ***'Sustainable Development: Socio-Economic, Political and Technological Aspects'*** organized by the Department of Economics, Computer Science and Political Science in collaboration with IQAC, Kokrajhar Govt. College, Kokrajhar, Assam, India on the paper titled **'Nexus between Sustainable Development, Income Inequality and Corruption in South Asian Countries: An Empirical Analysis'.** May 25th, 2024.
2. Presented paper at the **58th Annual Conference of The Indian Econometric Society (TIES)** organized by the Tripura University (A Central University) on the paper titled **'Income Inequality, Governance Quality, and Environmental Degradation in Asian Countries: Does Interaction of Governance Quality Matter? Evidence from Panel Data.'** February 22nd-24th, 2024.
3. Presented paper (online) in the International Conference on ***'Managing Sustainable Growth and Development: Issues and Challenges of the Global Economy'*** jointly organized by the Faculty of Management & Commerce, The ICFAI University Tripura, and Kettering University, USA on the paper titled **'Income Inequality, Democracy, and Governance in BRICS Countries: FGLS and PCSE Regression.'** October 5th-6th, 2023.

4. Presented paper (online) at the International Seminar on ***'Indigenous Knowledge and Intellectual Property Rights: Evidence from Developing Economies'*** held at the Department of Management, North-Eastern University, Tura Campus, Tura, Meghalaya (India) on the paper titled **'Factors Affecting Income Inequality in India: Evidence from Autoregressive Distributed Lag (ARDL) Bounds Testing Approach.'** August 11th-12th, 2023.
5. Presented paper at the Bodoland International Knowledge Festival under the theme ***'Good Governance'*** on the paper titled **'Nexus between Income Inequality and Governance'** held by the Bodoland University, Kokrajhar. February 27th – March 2nd, 2023.
6. Presented paper (online) at the International e-Conference on ***'Changing Perspectives of Language, Literature, Science and Social Science'*** jointly organized by the College of Arts, Bhigwan, Maharashtra and Rangapara College, Amaribari, Assam on the paper titled **'Reducing Income Inequality in India and Sustainable Development Goals (SDGs): A Theoretical Approach.'** June 25th, 2021.

*Journal of Infrastructure, Policy and Development*2024, 8(7), 4317.
https://doi.org/10.24294/jipd.v8i7.4317

Article

Income inequality, governance quality, and environmental degradation in Asian countries: Does interaction of governance quality matter? Evidence from panel data

Iragdao Raja Basumatary*, Manjit Das, Sijousa Basumatary, Sanswrang Mwchahary, Ringcher Basumatary

Department of Economics, Bodoland University, Kokrajhar 783370, India
*** Corresponding author:** Iragdao Raja Basumatary, rajairagdao@gmail.com

CITATION

Basumatary IR, Das M, Basumatary S, et al. (2024). Income inequality, governance quality, and environmental degradation in Asian countries: Does interaction of governance quality matter? Evidence from panel data. Journal of Infrastructure, Policy and Development. 8(7): 4317. https://doi.org/10.24294/jipd.v8i7.4317

ARTICLE INFO

Received: 19 January 2024
Accepted: 6 March 2024
Available online: 16 July 2024

Abstract: The objective of this research is to examine the effects of income inequality, governance quality, and their interaction on environmental quality in Asian countries. Time series data are obtained from 45 Asian countries for the period 1996–2020 for this empirical analysis. The research has performed various econometric tests to ensure the robustness and reliability of the results. We have addressed different econometric issues, such as autocorrelation, heteroskedasticity, and cross-sectional dependence, using the Driscoll-Kraay (DK) standard error estimation and endogeneity issues by the system generalized method of moments (S-GMM). The results of the study revealed that income inequality and governance quality have a positive impact on environmental degradation, while the interaction of governance quality with income inequality has a negative effect on it. In addition, economic growth, population growth, urbanization, and natural resource dependency are found to deteriorate the quality of the environment. The findings of the study offer insightful policies to reduce environmental degradation in Asian countries.

Keywords: income inequality; governance quality; environmental degradation; Asian countries; panel data

1. Introduction

Environmental degradation[1] has proven be the most fascinating and contentious issue in recent years among environmentalists, economists, and policymakers. With numerous and growing threats to the environment and society as a whole, the world has consented that climate change is a consequence of prolonged past and present greenhouse gas emissions (United Nations, 2019). At the backdrop of this, mitigating environmental damage and alleviating income inequality are essential objectives of the Sustainable Development Agenda, 2030. Environmental degradation is the consequence of the degradation of the natural environment by human activities such as deforestation, industrialization, pollution, and so on, which have a significant effect on climate, human health, biodiversity, and economic development (Hassan et al., 2015; Karimi Alavijeh et al., 2022). At present, human activities are more to blame than natural occurrences for the current environmental issues (Shrinkhal, 2019). Carbon dioxide (CO_2) is identified as a major cause of environmental degradation by many research scientists and scholars (Baloch et al., 2017; Pao et al., 2011; Uzar, 2020; Dehdar et al., 2022). So, in the contemporary industrialized era, environmental protection reducing environmental degradation is a major policy concern for environmental sustainability, particularly in rising economies (Farooq, 2021; Karimi Alavijeh et al., 2023). Asia is indeed the largest emitter of greenhouse gases,

accounting for 53% of global emissions, and within Asia, China stands out as the world's largest emitter, emitting more than one-fourth of global emissions (Ritchie, 2019). According to the International Energy Agency (IEA) report (2023), with the exception of China, emerging markets and developing economies in Asia saw the largest increase in emissions in 2022, rising by 4.2%, or 206 Mt CO_2. **Figure 1** shows that average CO_2 emissions data from the World Bank in the Asian region is increasing over the period 1996–2020. During 1990, total CO_2 emissions were 169,831.74 kilotons and increased to 434,042.57 kilotons in 2020, i.e., about 2.5 times higher.

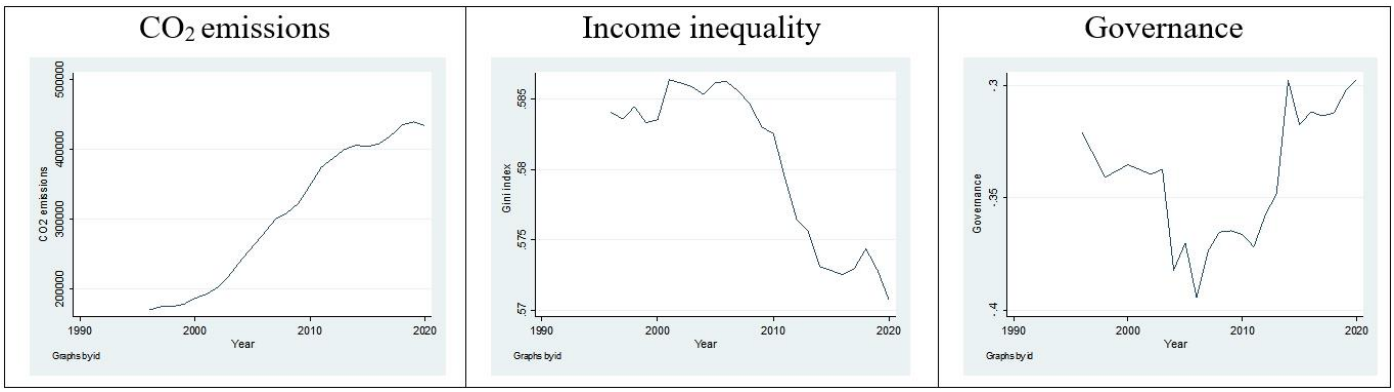


Figure 1. Trends of average CO_2 emissions, income inequality and governance.
Source: Authors' construction based on secondary data.

Asia is one of the fastest-growing emerging economies in the world. Such a rapid increase in economic growth sometimes brought social problems, exacerbating inequality in income among the rich and the poor (Hao et al., 2016). According to the World Inequality Database (2023), income inequality in many Asian countries is high, reflecting that the richest 10% in India, Thailand, and the Maldives earn more than half of the country's income; in Bangladesh, Singapore, and Nepal, the richest 10% earn 35% of the national income; and other Asian countries, such as Vietnam, Indonesia, and Pakistan, the richest 10% hold 40–50% of the country's income. It is argued that income inequality raises CO_2 emissions as it obstructs the implementation of environmental protection and can result in less environmental protection and ultimately be the cause of increased emissions (Baloch et al., 2020).

A global ethical dilemma concerning social justice affects the most vulnerable populations; addressing this dilemma requires a sustainability-oriented approach (Masud et al., 2018). These challenges hinder the achievement of the sustainable development goals (SDGs) in many nations across the world. Therefore, it is crucial for the leaders of these countries to improve governance quality, especially regarding policy design and implementation that foster socioeconomic development and sustainable resource management by ensuring universal access to clean, reliable, and affordable energy (Jarrett, 2017; Samimi et al., 2012). Effective governance, particularly environmental agencies that enforce environmental norms and regulations, contributes to environmental conservation (Liu et al., 2020). The United Nations recognizes the importance of good environmental governance at every level-global, national, regional, provincial, corporate, and civil society (United Nations, 2019). **Figure 1** shows the trends in the average governance quality of sample countries since

1996. Average governance quality is based on the six indicators of governance from the Worldwide Governance Indicators: government effectiveness, rule of law, control of corruption, no violence and political stability, regulatory quality, and voice and accountability. **Figure 1** shows that the average governance score during the study period lies between −0.39 to −0.30, indicating a low quality of governance[2]. But it is also true that some of the advanced Asian nations, such as Singapore, Japan, the Republic of Korea, Israel, etc., have high governance quality.

Therefore, this study has the motivation to investigate the effects of income inequality, governance quality, and their interaction on environmental quality in Asian countries.

The structure of this paper is as follows: section 2 provides a theoretical framework and empirical literature; section 3 describes the data and methodology employed; section 4 reports the empirical results; and chapter 5 is the conclusion with some policy recommendations.

2. Theoretical framework and empirical literature

Theoretical framework

This section summarizes the main theoretical contributions on how income inequality and governance quality influence the quality of the environment.

Various researchers and environmentalists have explored the determinants of environmental degradation across different countries or groups of countries or regions. A significant strand of literature has examined the effects of income inequality on environmental degradation (Baloch et al., 2017; Boyce, 1994; Ching et al., 2022; Hao et al., 2016; Ravallion et al., 2000; Wang et al., 2021) and the effects of governance on environmental degradation (Danish et al., 2019; Haseeb et al., 2018; Jamil et al., 2021; Korkut Pata et al., 2022; Samimi et al., 2012; Yang et al., 2022). However, the empirical evidence on this relationship is still inconclusive and requires further investigation. A review of the existing literature reveals conflicting evidence on the relationship between income inequality and CO_2 emissions. Some studies have reported a negative effect of income inequality (Ching et al., 2022; Hailemariam et al., 2019; Ravallion et al., 2000; Wang et al., 2021), while others found a positive impact of income inequality (Baloch et al., 2017; Baloch et al., 2020; Hao et al., 2016) on CO_2. Previous studies provided various mechanisms through which these relationships hold. Demir et al. (2018) explored the short-run and long-run dynamics of income inequality and environmental degradation. They argued that in the short-run, income inequality exacerbates environmental degradation by increasing the profits and outdated investments of the capitalists, which harm the environment. However, in the long-run, income inequality reduces environmental degradation by decreasing the aggregate consumption level in the economy, as richer households have a lower emission propensity (Demir et al., 2018). Another potential mechanism is that income inequality increases the rate of illiteracy and impedes the ability of people to acquire energy-efficient and low-emitting products due to low purchasing power and higher energy consumption, leading to an increase in CO_2 emissions (Baloch et al., 2020; Khan et al., 2022). Therefore, a more equitable distribution of income can reduce CO_2 emissions by enhancing renewable energy consumption, because a decrease in income

inequality alleviates individuals' economic worries and raises demand for a better quality of environment (Uzar, 2020). In an unequal society, environmental degradation may be influenced by the disparity of power and income between the agents who benefit from environmental pollution and the agents who bear the environmental costs (Boyce, 1994). It can be asserted from Boyce's (1994) statement that beneficiaries with high bargaining power would influence the government to weaken environmental regulations, leading to ecological deterioration (Yang et al., 2022). Likewise, when inequality increases, the impoverished may exploit the environment to fulfill their needs, such as generating income by degrading the ecosystem, to sustain their livelihoods (Boyce, 1994). Hence, affluent losers may leverage their economic power to influence poor winners and lobby policymakers to impose stringent environmental regulations (Yang et al., 2022). Furthermore, the inconclusive relationship observed in studies between income inequality and CO_2 emissions also hinges on the methods employed to measure income inequality (Safar, 2022). Safar (2022) demonstrated that market income inequality does not affect CO_2 emissions but net income inequality has a negative impact on CO_2 emissions.

Several studies have examined the relationship between governance and environmental degradation, finding both positive effects (Kinda, 2011; Haseeb et al., 2018; Yang et al., 2022) and negative impacts (Farooq, 2021; Jamil et al., 2021; Korkut Pata et al., 2022; Samimi et al., 2012). Governance is a crucial factor for achieving sustainable development, as it influences both institutional performance and specific outcomes (Jamil et al., 2021). Regions with low institutional quality and weak environmental protection regulations are more likely to experience environmental damage (Yang et al., 2022). Conversely, when national institutions or governance systems are sufficiently robust to enforce environmental standards and norms, environmental sustainability is enhanced and becomes effective in mitigating environmental degradation (Danish et al., 2019; Yang et al., 2022). The quality of institutions or governance contributes to lower CO_2 emissions and fosters environmental sustainability by enhancing income and power equality (Liu et al., 2020). A common counterargument is that a good governance system attracts more foreign direct investment (FDI) in the region (Qamruzzaman, 2023), which leads to industrialization, economic growth, and increased consumption of conventional energy sources that are the main drivers of environmental problems (Kousar et al., 2020). A different perspective on the relationship between the governance system and CO_2 is the low efficiency of institutions and the lack of stringent environmental regulations, which result in environmental damage and increased emissions (Yang et al., 2022). Corruption, as a manifestation of a weak governance system, undermines the performance of institutions and hinders the effective enforcement of environmental laws and regulations (Haseeb et al., 2018; Wang et al., 2018). To address this issue, more rigorous environmental laws and regulations are needed to curb environmental degradation (Farooq, 2021). Hence, many researchers advocate for the adoption of different strategies to control environmental degradation.

Figure 2 presents the theoretical link of environmental degradation with income inequality and governance quality.

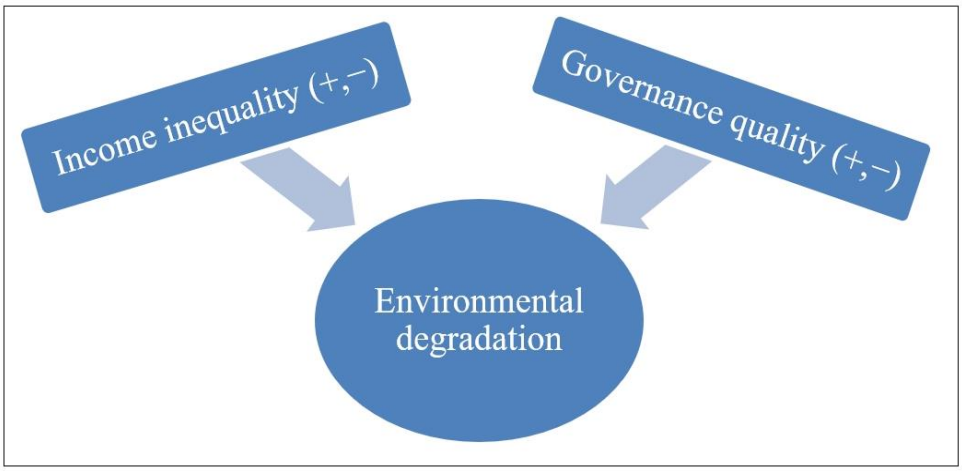


Figure 2. Theoretical link of environmental degradation with income inequality and governance quality.
Source: Authors' construction.

Figure 1 shows the trends of average CO_2 emissions, income inequality, and governance in Asian countries during 1999–2020. Over a period of time, the emissions of CO_2 have increased. Although income inequality exhibits a decreasing trend, it remains at a high magnitude. Governance quality showed deterioration until the mid-2000s, followed by an improvement.

3. Empirical literature

This section provides a concise overview of the existing literature on the empirical relationships between income inequality-environmental degradation and governance-environmental degradation.

3.1. Income inequality and environmental degradation

Boyce (1994) argued that the effect of income inequality on environmental degradation activity is mediated by political decision-making power. Environmental degradation activity is determined by the balance or dynamics of power between the beneficiaries (who gain from the activity) and the victims (who incur net costs) (Boyce, 1994). When the beneficiaries have more power than the victims, more environmental damage occurs than in the reverse situation (Boyce, 1994). Using the Autoregressive Distributed Lag Model (ARDL) model, Baloch et al. (2017) examined the relationship between income inequality and CO_2 emissions in Pakistan from 1966 to 2011. They revealed that higher income inequality leads to more CO_2 emissions. Hao et al. (2016) applied the first-difference GMM method to investigate the effect of income inequality on per capita emissions in 23 provinces of China from 1995 to 2012. They found a positive impact of income inequality on per capita emissions. The study by Korkut Pata et al. (2022) in South Asia from 2002 to 2016 showed that income inequality increased the ecological footprint. Hassan et al. (2015) study in Pakistan for the period 1980–2011 suggested that income inequality negatively affects the quality of the environment, i.e., with the rise in income inequality, the emission of CO_2 also rises. Using data from 90 countries across different levels of development for the period 1970–2000, Drabo (2011) applied the 2SLS method and found that income inequality

worsens the quality of the environment. The study by Masud et al. (2018) of five Association of Southeast Asian Nations (ASEAN) during 1985–2015 found that income inequality brings about an increase in CO_2 emissions, which in turn reduces environmental sustainability. Baloch et al. (2020), using data from 40 SSA countries during the period from 2010–2016 and applying the Driscoll-Kraay (DK) regression method, revealed that CO_2 emissions increase with the increase in income inequality. Using the DK regression method, the study by Khan et al. (2022) in 18 developing Asian nations during 2006–2017 showed that a higher degree of income inequality deteriorates the quality of the environment. Research by Yang et al. (2022) used DK regression, fully modified ordinary least squares (FMOLS), and pooled mean group (PMG) in 42 developing countries during 1984–2016 and showed that an increase in income inequality increases CO_2 emissions. Using panel data from 158 countries over a period of 28 years (1980–2008) and a group-fixed effect estimator, Grunewald et al. (2017) showed a negative association between income inequality and CO_2 emissions in low-and middle-income countries and a positive association between the two in upper-middle and high-income countries. An investigation by Wang et al. (2021) in Pakistan during 1990–2018 reported that an increase in income inequality decreases CO_2 emissions. Ching et al. (2022) examined the impact of income inequality on environmental degradation in 64 countries during 1990–2016. Using dynamic common correlated effects (DCCE), the study revealed the negative impact of income inequality on environmental degradation. An analysis by Ravallion et al. (2000) in 42 countries from 1975–1992 revealed that higher inequality is associated with lower levels of CO_2 emissions. Khan et al. (2023) investigation using OLS, fixed effect, system GMM, difference GMM, and seemingly unrelated regression (SUR) models in the Belt and Road Initiative countries during the period from 2002 to 2019 revealed that income inequality has aCO_2 emission reducing effect. Hailemariam et al. (2019), employing Dynamic Ordinary Least Squares (DOLS), FMOLS, and common correlated effects mean group estimator (CCEMG) from panel data of the Organization for Economic Cooperation and Development (OECD) countries during the period 1945–2010, revealed a negative effect of income inequality on CO_2.

3.2. Governance and environmental degradation

Korkut Pata et al. (2022) study in South Asian nations during the period 2002–2016 showed that political stability helps to reduce environmental degradation. Samimi et al. (2012) analyzed the impact of good governance quality on environmental degradation in 21 Middle East/North Africa (MENA) regions from the period 2002–2007. They used government effectiveness as a proxy for governance and applied the fixed effect (FE) model. The study suggested that good governance has a negative impact on environmental degradation. Jamil et al. (2021) using the GMM method in Belt and Road Initiative (BRI) countries from 1996 to 2014 found that both in the long and short run, governance helps to reduce CO_2 emissions. An investigation by Liu et al. (2020) using FMOLS and DOLS in five high CO_2 emitting countries during 1996–2017 indicated that governance helps to enhance environmental quality. A study by Farooq (2021) in Asian economics during 2001–2019 applied estimated generalized least squares (EGLS), two-stage least squares (2SLS), system generalized

method of moments (S-GMM), and FMOLS models and showed that governance negatively affects CO_2 emissions. A study by Danish et al. (2019) applying DK regression, DOLS, and a pooled mean group (PMG) estimator in BRICS countries for 1996–2017 found a negative effect of governance on CO_2. Yang et al. (2022) study using DK regression, FMOLS, and PMG in 42 developing countries during 1984–2016 showed that an improvement in institutional quality increased CO_2 emissions. Kinda's (2011) investigation using a panel of 122 developing countries during 1960–2008 and employing the system GMM method demonstrated that democratic institutions have a positive impact on income inequality. Haseeb et al. (2018), using democracy and corruption as indicators of governance and applying the fully modified ordinary least squares (FMOLS) model, revealed that the impact of corruption on CO_2 in low-income countries is higher than in high-income countries. Besides, democracy helps to reduce CO_2 emissions in all income group countries except low-income countries.

Based on the previous studies the following hypothesis has been framed:

(1) Income inequality exacerbates the environmental degradation, i.e., income inequality has positive impact on environmental degradation.

(2) Governance quality improves the quality of environment, i.e. governance quality has negative impact on environmental degradation.

(3) Interaction of governance quality with income inequality reduces CO_2, i.e., interaction term has a negative effect on environmental degradation.

Although researchers have investigated the nexus between income inequality, governance, and CO_2 emissions in different countries or groups of countries, there is no relevant research that has investigated such a nexus in the context of Asian countries. Moreover, the moderating effect of governance quality on the income inequality-environmental degradation nexus has not been systematically examined in Asian countries. This study aims to fill this gap by exploring how income inequality, governance quality, and their interactions influence environmental degradation in Asian countries within a unified framework.

4. Data and methodology

4.1. Data used

The entire data for the present study is accessed from secondary sources for 45 Asian countries during the period 1996–2020 as shown in **Table 1**. The selection of the countries (see Table A1 in the appendix) and period is based on the availability of data. To reduce the omitted variable issues, control independent variables are included along with the main independent variables, as shown in **Table 1**.

The present study selected the Asian economy because Asian countries are developing countries whose economies continue to strive to improve the living conditions of their most vulnerable citizens by promoting economic growth, combating poverty, and erasing all forms of inequality (Khan et al., 2022; Yang et al., 2022). However, many developing countries in Asia are experiencing rising inequality despite their recent economic growth (Gnangoin et al., 2019). In terms of the quality of the environment, more than half of the world's greenhouse gas emissions during the period 2020 came from the 49 nations that make up Asia and the Pacific (Economic

and Social Commission for Asia and the Pacific, 2022). In the meantime, Asian economies have had robust economic expansion in recent decades whereby, authorities have been gradually more concerned about the sustainability of output growth due to the region's rising pollution emissions (Khan and Rana, 2021). Furthermore, most of the studies identified that the quality of governance in Asian countries is weak, which can hamper the overall economic development of the region (Huang and Ho, 2017; Huynh et al., 2019).

Table 1. Variables, sources and role of variables.

Variables (proxy)	Symbol used	Description	Data source	Role of the variables
Environmental degradation {CO_2 emissions in kiloton (kt)}	CO_2	CO_2 emissions in kt	The World Bank	Main and dependent variable
Income inequality (Gini index)	INE	Inequality in income among individuals or households (index lies between 0 to 1, 0 means perfect equality and 1 means perfect inequality)	World Inequality Database (WID)	Main and independent variable
Governance quality (governance index)	GOV	Averages of six indicators of good governance[3] (index lies between −2.5 to +2.5, −2.5 means very weak governance and +2.5 means very strong governance)	The World Bank, Worldwide Governance Indicators (WGI)	Main and independent variable
Economic growth (Gross domestic product per capita (GDPPC)	EG	GDPPC measured in purchasing power parity (PPP), 2022 USD	World Inequality Database (WID)	Control and independent variable
Population (population growth)	POP	Population growth (annual %)	The World Bank	Control and independent variable
Urbanization (urban population growth)	URB	Urban population growth (annual %)	The World Bank	Control and independent variable
Natural resources (rent from natural resources)	NRR	Total rents from natural resources (% of GDP)	The World Bank	Control and independent variable

Source: Authors' compilation from secondary data.

4.2. Basic regression model

Based on the literature review, we assume income inequality, governance, economic growth, population, urbanization, and natural resources have an impact on environmental degradation. All the variables we used are in natural log form. We form the following basic regression model to investigate the impact of selected variables on environmental degradation with and without the interaction effect (lnGOV × lnINE). Hence, Equation (1) is the regression to be estimated without the interaction term, and Equation (2) is the regression to be estimated with the interaction term.

$$lnCO_{2\,it} = B_{0it} + B_{01}\,lnINE_{it} + B_{02}lnGOV_{it} + B_{04}lnEG_{it} + B_{05}lnPOP_{it} + B_{06}lnURB_{it} + B_{07}lnNRR_{it} + \epsilon_{it} \quad (1)$$

$$lnCO_{2\,it} = B_{0it} + B_{01}\,lnINE_{it} + B_{02}lnGOV_{it} + B_{03}lnGOV_{it} \times lnINE_{it} + B_{04}lnEG_{it} + B_{05}lnPOP_{it} + B_{06}lnURB_{it} + B_{07}lnNRR_{it} + \epsilon_{it} \quad (2)$$

where, ln denotes a natural log; it denotes combination of time series and cross sectional data (panel data); B_0 is the intercept; B_{01}, B_{02}, B_{03}, B_{04} B_{05}, B_{06}, and B_{07} are the coefficients of $lnINE$, $lnGOV$, $lnGOV \times lnINE$, $lnEG$, $lnPOP$, $lnURB, and\ lnNRR$ respectively; and ϵ is the error term.

4.3. Methodology procedure

This study applied different econometric techniques to ensure the reliability of the results. First, the Levin-Lin-Chu (LLC) unit root test has been applied to check the stationarity of the data (Levin et al., 2002). Then, to check the appropriate model between the random effect (RE) and FE model, the Hausman test (null hypothesis (H_0): RE model is suitable, and alternative hypothesis (H_a): FE model is suitable) has been performed (Hausman, 1978). But before interpreting the results from the FE or RE model, we need to make sure that series are free from serial correlation and heteroskedasticity because these are the common problems in these models (Greene, 2000). So, we checked the issues of serial correlation proposed by Wooldridge (2010) (H0: no issue of serial correlation, and Ha: the presence of serial correlation) and heteroskedasticity proposed by Greene (2000) (H_0: homogeneity in data and H_a: series are heteroskedastic). We also checked the cross-sectional dependence (CD), which is a serious issue in panel data, using the CD test (H_0: no issue of CD and H_a: issue of CD) proposed by Pesaran (2020). One of the advantages of using the DK regression estimator is that this method addresses the potential concerns of dependencies across countries, heteroskedasticity, and autocorrelation (Baloch et al., 2019; Sarkodie and Strezov, 2019). So, this method can produce effective results in both temporal dependence and cross-sectional forms (Sarkodie and Adams, 2020). We also verified the outcome obtained in the DK regression model using the S-GMM method developed by Arellano and Bover (1995) and Blundell and Bond (1998) by taking the lag of dependent variable. The key benefit of the S-GMM estimator is that it avoids potential endogeneity by using internal instruments rather than depending on external instruments (Ramzan et al., 2019). We also checked multicollinearity of the series using variance inflation factor (VIF).

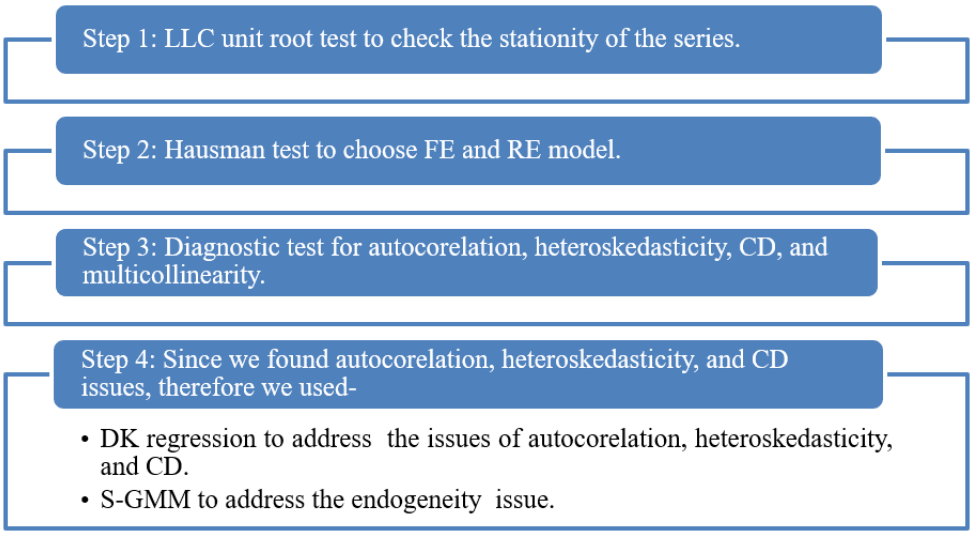


Figure 3. Steps used for main analysis.

Source: Authors' construction using Microsoft Word 2007.

5. Results and discussion

5.1. Descriptive statistics

Table 2 presents the descriptive statistics of the variables used in the study with their mean value, standard deviation (SD), maximum, and minimum values. The mean value of CO_2 is 306,732.24, which implies a higher level of environmental degradation. The SD of CO_2 is 1,146,331.6, which indicates that there is a lot of variation in CO_2 emissions across countries. The mean of income inequality is 0.58, which means that on average, there is a high degree of income inequality in the sample. The SD is 0.06, which shows less variation in income inequality within the countries. The mean of governance quality is 0.933, which means that on average, the sample country has moderate-level governance quality. The SD of governance quality of 0.685 shows some variance in governance quality across countries. The mean of EG is 35,350.459, which represents an average high rate of economic growth in the sample countries. The SD shows lots of variation in economic growth across the countries, with a value of 1631.622. The POP has a mean value of 4.128, representing a high rate of population growth with a variation of 3.703. The mean of urbanization is 5.722, which means on average low levels of urbanization across countries with an SD of 0.061. The mean value of the NRR is 11.061, which indicates a higher level of dependence on natural resources across the sample countries. The SD of the NRR is 14.483, representing a lot of variation across sample countries.

Table 2. Descriptive statistics.

Variable	Mean	Standard deviation (SD)	Minimum	Maximum
CO_2	306,732.24	1,146,331.6	281.6	10,944,686
INE	0.58	0.06	0.428	0.694
GOV	0.933	0.685	0.234	3.553
EG	35,350.459	37,855.575	1631.622	178,475.57
POP	4.128	3.703	0.073	38.747
URB	5.722	4.061	0.056	39.25
NRR	11.061	14.483	0	75.366

Source: Authors' calculation based on secondary data. Here the governance score is after transforming negative values into positive value using the method $[y = \ln(x + \sqrt{(x^2 + 1)})]$ used by Busse and Hefeker (2007) to generate natural log.

5.2. Bivariate correlation matrix

A bivariate correlation matrix is performed to check for a linear association between dependent and independent variables. **Table 3** shows the bivariate correlation between CO_2 and independent variables. The results show the negative correlation of CO_2 with INE, EG, POP, and NRR.

Table 3. Bivariate correlation matrix between dependent (CO_2) and independent variables.

Independent variables	Correlation (*r*-value)
INE	−0.080***
GOV	−0.005
EG	−0.055*

Table 3. (*Continued*).

Independent variables	Correlation (*r*-value)
POP	−0.123***
URB	−0.009
NRR	−0.092***

Source: Authors' calculation based on secondary data.
*** and * indicate significance level at 1% and 10% respectively.
Here the governance score is after transforming negative values into positive value using the method $[y = \ln(x + \sqrt{(x^2 + 1)})]$ used by Busse and Hefeker (2007) to generate natural log.

5.3. Unit root test

The results of the unit root displayed in **Table 4** show that all the variables are stationary at level, except population and governance. But population and governance become stationary after the first difference.

Table 4. LLC unit root test.

Variables	At level	1st Difference
$\ln CO_2$	−4.424***	-
lnINE	−4.3561***	-
lnGOV	−1.2722	−12.2073***
lnGOV × lnINE	−1.6003*	-
lnEG	−4.0011***	-
lnPOP	−1.0924	−11.503***
lnURB	−1.7602**	-
lnNRR	−1.3299*	-

Source: Authors' calculation based on secondary data.
***, **, and * indicate significance level at 1%, 5%, and 10% respectively.

5.4. Checking for appropriate model and diagnostic test

The Hausman test shown in **Table 5** suggests us to use the RE model as the p-value is not significant. But after detecting autocorrelation, heteroskedasticity, and CD issues as detected in **Table 5**, we move towards the DK standard error estimation regression model (RE results are not shown for these issues) (Driscoll and Kraay, 1998). To corroborate the results from the DK regression model, we applied the S-GMM method proposed by Arellano and Bover (1995) and Blundell and Bond (1998), which uses the lagged values of CO_2 emissions (the dependent variable). Moreover, the variance inflation factor (VIF), as shown in **Table 5** shows the absence of multicollinearity in our study as the VIF value is lower than 10 (Gujarati and Porter, 2009).

Table 5. Autocorrelation, heteroskedasticity and multicollinearity test.

Diagnostic Test	Hausman test	Autocorrelation	Heteroskedasticity	CD test	Mean VIF
Without interaction	$\chi^2 = 4.36$	F = 234.085***	$\chi^2 = 40048.62$***	17.754***	1.12
Including interaction	$\chi^2 = 3.15$	F = 234.808***	$\chi^2 = 42378.35$***	16.657***	1.67

Source: Authors' calculation based on secondary data.
*** indicates significance level at 1%.

5.5. Regression results

Table 6 shows the results of DK standard error estimation and S-GMM results with and without the interaction effect. The diagnostics test of S-GMM is tested by the Sargan test (H_0: instruments are valid, Ha: instruments are not valid) of overidentifying restrictions to check the overall validity of instruments (Chong and Gradstein, 2007). The Sargan test results indicate the overall validity of the instruments, as the p-values are not significant (models 3 and 4). The Arellano and Bond (1991) (H_0: no serial autocorrelation and H_a: the presence of serial autocorrelation) first order (AR 1) reveals the presence of serial autocorrelation as the p-values are significant at a 1% level (models 3 and 4). But the Arellano and Bond (1991) second-order (AR 2) shows the absence of serial autocorrelation as the p-values are statistically not significant in models 3 and 4. Hence, the S-GMM approach confirms the validity and consistency of the model.

Table 6. DK and S-GMM results (dependent variable: $lnCO_2$).

Independent variables	**DK (*t*-value)**	**DK (*t*-value)**	**S-GMM (*z*-value)**	**S-GMM (*z*-value)**
	(1)	(2)	(3)	(4)
$lnCO_{2\ t-1}$	-	-	0.890*** (30.04)	0.905*** (50.11)
lnINE	−0.382 (−0.36)	−0.349 (−0.34)	−0.121 (−0.97)	0.192* (1.78)
lnGOV	0.277 (0.32)	0.468 (0.52)	0.120*** (8.36)	0.193*** (6.72)
lnGOV × lnINE	-	−0.313** (−3.34)	-	−0.200*** (−4.09)
lnEG	0.559*** (108.18)	0.703*** (17.79)	0.163*** (3.18)	0.175*** (6.11)
lnPOP	−0.024 (−0.21)	−0.039 (−0.33)	0.014*** (3.34)	0.011*** (3.33)
lnURB	−0.082 (−1.64)	−0.069 (−1.27)	0.022*** (5.29)	0.025*** (6.98)
lnNRR	0.127*** (14.51)	0.105*** (7.22)	0.009*** (3.77)	0.003 (1.57)
Constant	4.879*** (6.89)	3.196*** (3.24)	−0.537** (−2.15)	−0.796*** (−5.16)
Sargan test (*p*-value)	-	-	χ^2 = 39.274 (1.000)	χ^2 = 41.097 (1.000)
AR(1) (*p*-value)	-	-	−3.877 (0.0001)	−3.885 (0.0001)
AR(2) (*p*-value)	-	-	−0.202 (0.840)	−0.230 (0.818)
R-squared	0.10	0.11	-	-

Source: Authors' calculation based on secondary data.
***, **, and * indicate significance level at 1%, 5%, and 10% respectively.

Impact of income inequality: the impact of income inequality on environmental degradation is positive. A 1% increase in income inequality deteriorates the quality of

environment by 19.2% (model 4). The result is collaboration with that of Baloch et al. (2017), Hao et al. (2016), Korkut Pata et al. (2022), Drabo (2011), Masud et al. (2018), Baloch et al. (2020), Khan et al. (2022), and Yang et al. (2022). This result indicated that if the beneficiaries are strong enough, they will exert political pressure on the government to relax the regulations, which will cause environmental degradation (Yang et al., 2022). Similarly, when inequality rises, the poor may overuse the environment to meet their requirements, including generating income by destroying the ecosystem, to meet their daily necessities (Boyce, 1994). A potential reason is that income inequality could elevate the rate of illiteracy and constrain the ability of the population to acquire energy-efficient and low-emitting products due to limited purchasing power, leading to higher energy consumption and consequently higher CO_2 emissions (Baloch et al., 2020; Khan et al., 2022).

Impact of governance quality: the coefficient of governance quality is positive and significant at a 1% level. It means that an improvement in governance quality by 1% deteriorates the quality of the environment by 12% (model 3) and 19.3% (model 4). This result follows a similar finding from previous studies by Kinda (2011), Haseeb et al. (2018) and Yang et al. (2022). A well-functioning governance system can enhance the foreign direct investment inflow in the country, which stimulates industrial development, economic growth, and conventional energy use, leading to environmental problems (Kousar et al., 2020). Another possible explanation for this phenomenon is that poor institutional performance, weak environmental regulations, and corruption, as indicators of low governance quality, may affect the effectiveness of environmental policies and enforcement either directly or indirectly which is harmful to the environment (Wang et al., 2018; Yang et al., 2022).

Interaction impact: the coefficient of the interaction of governance quality with income inequality is negative and significant at a 1% level in models 2 and 4. The result shows that a 1% improvement in governance quality by reducing income inequality can minimize environmental degradation by 31.3% (model 2) and 20% (model 4). This interaction impact indicates that improvement of governance quality by reducing income inequality can reduce environmental degradation and thereby improve the quality of the environment. Numerous studies have confirmed that a high quality of governance is essential to reducing income inequality (Acemoglu et al., 2001; Roy-Mukherjee and Udeogu, 2020). So, when income inequality declines, people become educated, aware of environmental degradation, and aware of the importance of environmental sustainability. This result demonstrates the importance of enhancing governance quality to reduce income inequality in Asian countries.

Impact of economic growth: economic growth has significantly a positive impact on CO_2. A 1% increase in economic growth worsens environmental quality by 55.9% (model 1), 70.3% (model 2), 16.3% (model 3), and 17.5% (model 4). This result is the same as that of Kahuthu (2006), Rahman (2020) and Karimi Alavijeh et al. (2023). Their study found the existence of the traditional Kuznets inverted U hypothesis. Since most of the Asian countries are developing countries, these countries are perhaps at the initial stage of development, and with the rapid increase in economic growth, the quality of the environment tends to degrade.

Impact of population: population has a positive and significant impact on environmental degradation at a 1% significance level as per the S-GMM approach.

The result shows that a 1% percent increase in population degrades the environment by 0.14% (model 3) and 0.11% (model 4). The study follows the same results as Shi (2003), O'Neil et al. (2012), Mohsin et al. (2019) and Karimi Alavijeh et al. (2022). A shocking rate of population expansion is responsible for the misuse of natural resources and energy sources (both renewable and non-renewable), which leads to ecological and environmental damage (Mohsin et al., 2019).

Impact of urbanization: the impact of urbanization is positive and significant at a 1% level in S-GMM. This indicates that a 1% expansion in urbanization deteriorates the environment by 0.22% (model 3) and 0.25% (model 4) in the S-GMM model. This result is consistent with the studies of Mohsin et al. (2019) and Raheem and Ogebe (2017). Over the last four decades, most of the Asian economies (Japan, the East Asian economies, Southeast Asia, and the PRC) underwent enormous economic transformations as workers migrated from the rural areas (primary agriculture) to the city, and manufacturing output increased sharply in parallel (Felipe, 2018). Raheem and Ogebe (2017) suggested that the transition from an agrarian to a manufactured industrial process brought about by urbanization is accompanied by an increase in energy consumption and environmental pollution. Raheem and Ogebe (2017) also added that the increased mobility of people and goods brought on by urbanization raises vehicular traffic and its related environmental pollutants.

Impact of natural resources: the coefficient of natural resources is positive and significant at a 1% level in models 1, 2, and 3. This shows that an increase in the extraction of natural resources by 1% pollutes the environment by 12.7% (model 1), 10.5% (model 2), and 0.09% (model 3). The result is parallel to the studies of Muhammad et al. (2021), and Nathaniel et al. (2020). Since the Asian economies underwent a remarkable economic transformation in the past four decades (Felipe, 2018), this process involved a shift from relying on natural resources to developing industrial sectors and enhancing economic growth, which has a negative impact on environmental quality.

6. Conclusion

We investigated the impact of income inequality, governance quality, and their interaction on environmental degradation in a panel of 45 Asian countries over the period 1996–2020. We investigated this relationship using DK regression estimation (with and without interaction terms) to address the issues of cross-sectional dependency, autocorrelation, and heteroskedasticity, and in addition to DK regression estimation, we also applied the S-GMM method (with and without interaction terms) to deal with the issue of endogeneity in panel data. The results of our study revealed that income inequality and governance quality deteriorate environmental quality, while the interaction of governance quality with income inequality helps mitigate environmental degradation. The control variables-economic growth, population growth, urbanization, and natural resources seemed to increase environmental degradation.

The study provides important policy recommendations to improve the quality of the environment in Asian countries. Income inequality across the Asian region should be reduced, which can be achieved through inclusive growth policies such as

progressive taxation, expenditure on health and education, etc. Implementation of strict environmental rules and regulations by improving the quality of governance can contribute to the achievement of a more sustainable development path. The improvement of governance quality should be accompanied by policies that reduce income inequality, lower environmental degradation, and achieve sustainable environmental outcomes. Effective initiatives that promote green economic growth with low-carbon technologies and energy efficiency must be put in place to reduce the inertia of CO_2 emissions. Population growth should be kept under control, which can be done by implementing family planning programs. To lessen the strain on the environment that promotes smart urban planning, investment in green infrastructure and public services is necessary to address the problems caused by population expansion and urbanization. Policies that promote the efficient and equitable management of natural resources and the diversification of the economy are needed to avoid the resource curse and its environmental consequences. The policies should also foster economic diversification and structural transformation to reduce dependence on natural resources and create more value-added sectors.

Although our study provides rigorous evidence on the determinants of CO_2 emissions while accounting for autocorrelation, heteroskedasticity, CD, and endogeneity, future researchers can reinvestigate this linkage in different groups of countries. Moreover, future research can test the Kuznets hypothesis and the short-term and long-term dynamics between the variables of interest.

Author contributions: Conceptualization, IRB and MD; methodology, IRB and SB; software, IRB; validation, MD, SM and RB; formal analysis, IRB, MD and SB; investigation, IRB, MD and SB; writing—original draft preparation, IRB, MD and SM; writing—review and editing, IRB, SB and RB; visualization, SM and RB; supervision, MD. All authors have read and agreed to the published version of the manuscript.

Funding: The research work of the author, who is in charge of correspondence (Iragdao Raja Basumatary), is supported by a Senior Research Fellowship (SRF) that the University Grants Commission (UGC) of India has awarded.

Acknowledgments: The corresponding author acknowledges the support of the University Grants Commission (UGC) of India for the Senior Research Fellowship (SRF).

Conflict of interest: The authors declare no conflict of interest.

Notes

1. Environmental degradation and CO_2emissions are interchangeably used in this paper. The higher the CO_2 emissions, the greater the environmental degradation.
2. Cooray (2009) classified levels of governance into four categories: very high governance ($\theta \geq 1.5$), high governance ($1.5 > \theta > 0$), low governance ($0 > \theta > -1.5$), and very low governance ($\theta \leq -1.5$), where θ is the governance index.
3. This study makes use of the overall average score of governance indicators because all the indicators are highly correlated (Buchanan et al., 2013) and the use of a single indicator may provide misleading and biased results (Kousar et al., 2020). Abbas et al. (2021) claimed that all six indicators provided by the WDIs appear to be connected to one another and have an impact on one another. For this, Abbas et al. (2021) gave the example from the study of Méon and Sekkat (2005) of how different indicators correlate to each other.

References

Abbas, Q., Junqing, L., Ramzan, M., et al. (2021). Role of Governance in Debt-Growth Relationship: Evidence from Panel Data Estimations. Sustainability, 13(11), 5954. https://doi.org/10.3390/su13115954

Acemoglu, D., Johnson, S., & Robinson, J. A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. American Economic Review, 91(5), 1369–1401. https://doi.org/10.1257/aer.91.5.1369

Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. The Review of Economic Studies, 58(2), 277-297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. Journal of Econometrics, 68 (1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Baloch, A., Shah, S. Z., Noor, Z. M., et al. (2017). The nexus between income inequality, economic growth and environmental degradation in Pakistan. Geo Journal, 83(2), 207–222. https://doi.org/10.1007/s10708-016-9766-3

Baloch, M. A., Danish, & Meng, F. (2019). Modeling the non-linear relationship between financial development and energy consumption: statistical experience from OECD countries. Environmental Science and Pollution Research, 26(9), 8838–8846. https://doi.org/10.1007/s11356-019-04317-9

Baloch, M. A., Danish, Khan, S. U.-D., et al. (2020). Analyzing the relationship between poverty, income inequality, and CO_2 emission in Sub-Saharan African countries. Science of The Total Environment, 740, 139867. https://doi.org/10.1016/j.scitotenv.2020.139867

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87 (1), 115–143. https://doi.org/10.1016/S0304-4076(98)00009-8

Boyce, J. K. (1994). Inequality as a cause of environmental degradation. Ecological Economics, 11 (3), 169–178. https://doi.org/10.1016/0921-8009(94)90198-8

Buchanan, J., Chai, D. H, & Deakin, S. (2013). Empirical analysis of legal institutions and institutional change: multiple-methods approaches and their application to corporate governance research. Journal of Institutional Economics, 10(1), 1–20. https://doi.org/10.1017/s1744137413000349

Busse, M., & Hefeker, C. (2007). Political risk, institutions and foreign direct investment. European Journal of Political Economy, 23(2), 397–415. https://doi.org/10.1016/j.ejpoleco.2006.02.003

Ching, S.-L., Lau, L.-S., & Choong, C.-K. (2022). Income inequality, educational attainment and environmental degradation: evidence from global panel. Environmental Science and Pollution Research, 30(15), 43056–43067. https://doi.org/10.1007/s11356-022-19256-1

Chong, A., & Gradstein, M. (2007). Inequality and Institutions. Review of Economics and Statistics, 89(3), 454–465. https://doi.org/10.1162/rest.89.3.454

Cooray, A. (2009). Government Expenditure, Governance and Economic Growth. Comparative Economic Studies, 51(3), 401–418. https://doi.org/10.1057/ces.2009.7

Danish, Baloch, M. A., & Wang, B. (2019). Analyzing the role of governance in CO_2 emissions mitigation: The BRICS experience. Structural Change and Economic Dynamics, 51, 119–125. https://doi.org/10.1016/j.strueco.2019.08.007

Dehdar, F., Fuinhas, J. A., Karimi Alavijeh, N., et al. (2022). Investigating the determinants of carbon emissions in the USA: a state-level analysis. Environmental Science and Pollution Research, 30(9), 23023–23034. https://doi.org/10.1007/s11356-022-23831-x

Demir, C., Cergibozan, R., & Gök, A. (2018). Income inequality and CO_2 emissions: Empirical evidence from Turkey. Energy & Environment, 30(3), 444–461. https://doi.org/10.1177/0958305x18793109

Drabo, A. (2011). Impact of Income Inequality on Health: Does Environment Quality Matter? Environment and Planning A: Economy and Space, 43(1), 146–165. https://doi.org/10.1068/a43307

Driscoll, J. C., & Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. Review of Economics and Statistics, 80(4), 549–560. https://doi.org/10.1162/003465398557825

Farooq, U. (2021). Foreign direct investment, foreign aid, and CO_2 emissions in Asian economies: does governance matter? Environmental Science and Pollution Research, 29(5), 7532–7547. https://doi.org/10.1007/s11356-021-16115-3

Felipe, J. (2018). Asia's Industrial Transformation: The Role of Manufacturing and Global Value Chains (Part 1). SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3339076

Gnangoin, Y. T. B., Du, L., Assamoi, G., et al. (2019). Public Spending, Income Inequality and Economic Growth in Asian Countries: A Panel GMM Approach. Economies, 7(4), 115. https://doi.org/10.3390/economies7040115

Greene, W. H. (2000). Econometrics Analysis. NJ: Prentice Hall.

Grunewald, N., Klasen, S., Martínez-Zarzoso, I., et al. (2017). The Trade-off Between Income Inequality and Carbon Dioxide Emissions. Ecological Economics, 142, 249–256. https://doi.org/10.1016/j.ecolecon.2017.06.034

Gujarati, D. N. & Porter, D. C. (2009). Basic Econometrics. McGraw-Hill, New York.

Hailemariam, A., Dzhumashev, R., & Shahbaz, M. (2019). Carbon emissions, income inequality and economic development. Empirical Economics, 59(3), 1139–1159. https://doi.org/10.1007/s00181-019-01664-x

Hao, Y., Chen, H., & Zhang, Q. (2016). Will income inequality affect environmental quality? Analysis based on China's provincial panel data. Ecological Indicators, 67, 533–542. https://doi.org/10.1016/j.ecolind.2016.03.025

Haseeb, M., Hassan, S., Azam, M., et al. (2018). The dynamics of governance, tourism and environmental degradation: the world evidence. International Journal of Global Environmental Issues, 17(4), 340. https://doi.org/10.1504/ijgenvi.2018.095155

Hassan, S. A., Zaman, K., & Gul, S. (2015). The Relationship between Growth-Inequality-Poverty Triangle and Environmental Degradation: Unveiling the Reality. Arab Economic and Business Journal, 10(1), 57–71. https://doi.org/10.1016/j.aebj.2014.05.007

Hausman, J. A. (1978). Specification Tests in Econometrics. Econometrics, 46(6), 1251-1271. https://doi.org/10.2307/1913827

Huang, C.-J., & Ho, Y.-H. (2017). Governance and economic growth in Asia. The North American Journal of Economics and Finance, 39, 260–272. https://doi.org/10.1016/j.najef.2016.10.010

Huynh, C. M., Nguyen, V. H. T., Nguyen, H. B., et al. (2019). One-way effect or multiple-way causality: foreign direct investment, institutional quality and shadow economy? International Economics and Economic Policy, 17(1), 219–239. https://doi.org/10.1007/s10368-019-00454-1

International Energy Agency (IEA). (2023). CO_2 Emissions in 2022. Available online: https://www.iea.org/reports/co2-emissions-in-2022 (accessed on 9 November 2023).

Jamil, B., Yaping, S., Ud Din, N., et al. (2021). Do governance indicators interact with technological innovation and income inequality in mitigating CO_2 emissions in Belt and Road Initiative countries? Environmental Science and Pollution Research, 28(37), 51278–51296. https://doi.org/10.1007/s11356-021-14096-x

Jarrett, M. B. (2017). Lights out: Poor governance and Africa's energy crisis. Available online: https://www.theafricareport.com/826/lights-out-poor-governance-and-africas-energy-crisis (accessed on 12 November 2023)

Kahuthu, A. (2006). Economic Growth and Environmental Degradation in a Global Context. Environment, Development and Sustainability, 8(1), 55–68. https://doi.org/10.1007/s10668-005-0785-3

Karimi Alavijeh, N., Ahmadi Shadmehri, M. T., Nazeer, N., et al. (2023). The role of renewable energy consumption on environmental degradation in EU countries: do institutional quality, technological innovation, and GDP matter? Environmental Science and Pollution Research, 30(15), 44607–44624. https://doi.org/10.1007/s11356-023-25428-4

Karimi Alavijeh, N., Salehnia, N., Salehnia, N., et al. (2022). The effects of agricultural development on CO_2 emissions: empirical evidence from the most populous developing countries. Environment, Development and Sustainability, 25(10), 12011–12031. https://doi.org/10.1007/s10668-022-02567-1

Khan, I., Han, L., Zhong, R., et al. (2023). Income inequality, economic growth, renewable energy usage, and environmental degradation in the Belt and Road initiative countries: dynamic panel estimation. Environmental Science and Pollution Research, 30(19), 57142–57154. https://doi.org/10.1007/s11356-023-26273-1

Khan, M., & Rana, A. T. (2021). Institutional quality and CO_2 emission–output relations: The case of Asian countries. Journal of Environmental Management, 279, 111569. https://doi.org/10.1016/j.jenvman.2020.111569

Khan, S., Yahong, W., & Zeeshan, A. (2022). Impact of poverty and income inequality on the ecological footprint in Asian developing economies: Assessment of Sustainable Development Goals. Energy Reports, 8, 670–679. https://doi.org/10.1016/j.egyr.2021.12.001

Kinda, S. R. (2011). Democratic Institutions and Environmental Quality: Effects and Transmission Channels. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.2714300

Korkut Pata, U., Yilanci, V., Hussain, B., et al. (2022). Analyzing the role of income inequality and political stability in environmental degradation: Evidence from South Asia. Gondwana Research, 107, 13–29. https://doi.org/10.1016/j.gr.2022.02.009

Kousar, S., Ahmed, F., López García, M. de las N., et al. (2020). Renewable Energy Consumption, Water Crises, and Environmental Degradation with Moderating Role of Governance: Dynamic Panel Analysis under Cross-Sectional Dependence. Sustainability, 12(24), 10308. https://doi.org/10.3390/su122410308

Levin, A., Lin, C.-F., & Chu, C.-S. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. Journal of Econometrics, 108, 1–24. https://doi.org/10.1016/S0304-4076(01)00098-7

Liu, X., Latif, K., Latif, Z., et al. (2020). Relationship between economic growth and CO_2 emissions: does governance matter? Environmental Science and Pollution Research, 27(14), 17221–17228. https://doi.org/10.1007/s11356-020-08142-3

Masud, M. M., Kari, F. B., Banna, H., et al. (2018). Does income inequality affect environmental sustainability? Evidence from the ASEAN-5. Journal of the Asia Pacific Economy, 23(2), 213–228. https://doi.org/10.1080/13547860.2018.1442146

Méon, P.-G., & Sekkat, K. (2005). Does corruption grease or sand the wheels of growth? Public Choice, 122(1–2), 69–97. https://doi.org/10.1007/s11127-005-3988-0

Mohsin, M., Abbas, Q., Zhang, J., et al. (2019). Integrated effect of energy consumption, economic development, and population growth on CO_2 based environmental degradation: a case of transport sector. Environmental Science and Pollution Research, 26(32), 32824–32835. https://doi.org/10.1007/s11356-019-06372-8

Muhammad, B., Khan, M. K., Khan, M. I., et al. (2021). Impact of foreign direct investment, natural resources, renewable energy consumption, and economic growth on environmental degradation: evidence from BRICS, developing, developed and global countries. Environmental Science and Pollution Research, 28(17), 21789–21798. https://doi.org/10.1007/s11356-020-12084-1

Nathaniel, S. P., Nwulu, N., & Bekun, F. (2020). Natural resource, globalization, urbanization, human capital, and environmental degradation in Latin American and Caribbean countries. Environmental Science and Pollution Research, 28(5), 6207–6221. https://doi.org/10.1007/s11356-020-10850-9

New UN report reveals that climate pledges by countries in the Asia-Pacific are off track with the 1.5°C pathway. (2022). United Nations ESCAP. Available online: https://www.unescap.org/news/new-un-report-reveals-climate-pledges-countries-asia-pacific-are-track-15degc-pathway#:~:text=Collectively%2C%20the%2049%20countries%20in,the%201.5%C2%B0C%20pathway. (accessed on 9 November 2023).

O'Neil, B. C., Liddle, B., Jiang, L., et al. (2012). Demographic change and carbon dioxide emissions. Lancet, 380, 157-164. https://doi.org/10.1016/S0140-6736(12)60958-1

Pao, H.-T., Yu, H.-C., & Yang, Y.-H. (2011). Modeling the CO_2 emissions, energy use, and economic growth in Russia. Energy, 36(8), 5094–5100. https://doi.org/10.1016/j.energy.2011.06.004

Pesaran, M. H. (2020). General diagnostic tests for cross-sectional dependence in panels. Empirical Economics, 60(1), 13–50. https://doi.org/10.1007/s00181-020-01875-7

Qamruzzaman, M. (2023). An asymmetric nexus between clean energy, good governance, education and inward FDI in China: Do environment and technology matter? Evidence for chines provincial data. Heliyon, 9(5), e15612. https://doi.org/10.1016/j.heliyon.2023.e15612

Raheem, I. D., & Ogebe, J. O. (2017). CO_2 emissions, urbanization and industrialization: Evidence from a direct and indirect heterogeneous panel analysis. Management of Environmental Quality: An International Journal, 28(6), 851–867. https://doi.org/10.1108/meq-09-2015-0177

Rahman, M. M. (2020). Environmental degradation: The role of electricity consumption, economic growth and globalisation. Journal of Environmental Management, 253, 109742. https://doi.org/10.1016/j.jenvman.2019.109742

Ramzan, M., Sheng, B., Shahbaz, M., et al. (2019). Impact of trade openness on GDP growth: Does TFP matter? The Journal of International Trade & Economic Development, 28(8), 960–995. https://doi.org/10.1080/09638199.2019.1616805

Ravallion, M., Heil, M., & Jalan, J. (2000). Carbon emissions and income inequality. Oxford Economic Papers, 52(4), 651–669. https://doi.org/10.1093/oep/52.4.651

Ritchie, H. (2019). Who emits the most CO_2 today? Published online at OurWorldInData.org. Our World in Data. https://ourworldindata.org/annual-co2-emissions

Roy-Mukherjee, S., & Udeogu, E. (2020). Neo-liberal Globalization and Income Inequality: Panel Data Evidence from OECD and Western Balkan Countries. Journal of Balkan and Near Eastern Studies, 23(1), 15–39. https://doi.org/10.1080/19448953.2020.1852004

Safar, W. (2022). Income inequality and CO_2 emissions in France: Does income inequality indicator matter? Journal of Cleaner Production, 370, 133457. https://doi.org/10.1016/j.jclepro.2022.133457

Samimi, A. J., Ahmadpour, M., & Ghaderi, S. (2012). Governance and Environmental Degradation in MENA Region. Procedia-Social and Behavioral Sciences, 62, 503–507. https://doi.org/10.1016/j.sbspro.2012.09.082

Sarkodie, S. A., & Adams, S. (2020). Electricity access, human development index, governance and income inequality in Sub-Saharan Africa. Energy Reports, 6, 455–466. https://doi.org/10.1016/j.egyr.2020.02.009

Sarkodie, S. A., & Strezov, V. (2019). Effect of foreign direct investments, economic development and energy consumption on greenhouse gas emissions in developing countries. Science of The Total Environment, 646, 862–871. https://doi.org/10.1016/j.scitotenv.2018.07.365

Shi, A. (2003). The impact of population pressure on global carbon dioxide emissions, 1975–1996: evidence from pooled cross-country data. Ecological Economics, 44, 29–42. https://doi.org/10.1016/S0921-8009(02)00223-9

Shrinkhal, R. (2019). Economics, Technology, and Environmental Protection. Phyto management of Polluted Sites, 569–580. https://doi.org/10.1016/b978-0-12-813912-7.00022-3

The World Bank Data. Available online: https://data.worldbank.org (accessed on 8 November 2023).

The World Bank, Worldwide Governance Indicators Data. Available online: https://databank.worldbank.org/source/worldwide-governance-indicators (accessed on 8 November 2023).

United Nations. (2019). The sixth edition of the global environment outlook (GEO-6). Available online: https://www.unep.org/resources/global-environment-outlook-6 (accessed on 8 November 2023)

United Nations, Statistics Division. (n.d.). Available online: https://unstats.un.org/unsd/methodology/m49/ (accessed on 10 August 2023).

Uzar, U. (2020). Is income inequality a driver for renewable energy consumption? Journal of Cleaner Production, 255, 120287. https://doi.org/10.1016/j.jclepro.2020.120287

Wang, Y., Uddin, I., & Gong, Y. (2021). Nexus between Natural Resources and Environmental Degradation: Analyzing the Role of Income Inequality and Renewable Energy. Sustainability, 13(15), 8364. https://doi.org/10.3390/su13158364

Wang, Z., Danish, Zhang, B., et al. (2018). The moderating role of corruption between economic growth and CO_2 emissions: Evidence from BRICS economies. Energy, 148, 506–513. https://doi.org/10.1016/j.energy.2018.01.167

Wooldridge, J. M. (2010). Econometric analysis of cross section and panel data. Cambridge: MIT Press.

World Inequality Database (WID) Data. (2023). Available online: https://wid.world/ (accessed on 8 November 2023).

World Inequality Database. (2023). What's new about inequality in South and Southest Asia in 2023? Available online: https://wid.world/news-article/2023-wid-update-south-and-southeast-asia (accessed on 8 August 2023).

Yang, B., Ali, M., Hashmi, S. H., et al. (2022). Do Income Inequality and Institutional Quality affect CO_2 Emissions in Developing Economies? Environmental Science and Pollution Research, 29(28), 42720–42741. https://doi.org/10.1007/s11356-021-18278-5

Appendix

Table A1. list of 45 Asian countries.

Afghanistan, Armenia, Azerbaijan, Bahrain, Bangladesh, Bhutan, Brunei, Cambodia, China, Cyprus, Georgia, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Laos, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, South Korea, Sri Lanka, Syria, Tajikistan, Thailand, Turkey, Turkmenistan, UAE, Uzbekistan, Vietnam, Yemen.

Missing values for the rent from natural resources for Afghanistan (1996–2001), Turkmenistan (2020), and Yemen (2019–2020), and governance indicators data for all selected countries (1997, 1999, and 2001) are generated by the method of interpolation and extrapolation using STATA software.
Source: United Nations, Statistics Division.

The Economic Research Guardian – Vol. 14(1)2024
Semi-annual Online Journal, www.ecrg.ro
ISSN: 2247-8531, ISSN-L: 2247-8531
Econ Res Guard 14(1): 16-31

Investigating the Effect of Democracy and Governance Quality on Income Inequality: Evidence from BRICS

Iragdao Raja Basumatary
Department of Economics, Bodoland University, Kokrajhar, Assam, India
Email: rajairagdao@gmail.com

Manjit Das
Department of Economics, Bodoland University, Kokrajhar, Assam, India
Email: manjitdas4842@gmail.com

Abstract

This paper empirically investigates the influence of democracy and governance quality on income inequality in the rapidly growing emerging BRICS (Brazil, Russia, India, China, and South Africa) countries during the period from 1996-2020. The study employed feasible generalized least squares (FGLS), panel corrected standard errors (PCSE), and the Driscoll-Kraay (DK) standard error estimation method to deal with the problems of autocorrelation, heteroskedasticity, and cross-sectional dependence and to find the effect of democracy and governance quality on income inequality. The results of the study indicate that democracy in BRICS countries exacerbates income inequality, while governance quality helps reduce income inequality. These insights offer valuable implications for decision-makers in crafting policies within these spheres.

Keywords: Income Inequality, Democracy, Governance, FGLS, PCSE, DK

JEL classification: O15, P16, O17

Received: 9 February 2024; Received in revised form: 26 March 2024; Accepted: 26 March 2024

1. Introduction and Theoretical Framework

This phenomenon is not surprising that the global rise of income inequality affects almost every country, regardless of their development level, and has a severe impact on the social welfare of the people (Moheddine and Marwa, 2018). Over recent decades, this trend of widening income inequality has been observed worldwide, even against the backdrop of substantial economic expansion (Piketty, 2015; Asamoah, 2021). The BRICS economies - Brazil, Russia, India, China, and South Africa—exemplify this paradox, having seen their economies expand significantly in recent years. This group of nations has increasingly influenced international economic and political dynamics, marking a shift that has been particularly notable over the past decade (Degaut, 2015; Wang, 2019). A remarkable aspect of this growth is that out of the total annual rise in global income, more than three quarters is accounted for by developing and emerging economies, of which more than half is accounted for by the BRICS nations alone, and since 2008, BRICS countries have contributed 56 percent of the total global growth (Reddy, 2018). According to the World Bank (2020), the collective gross domestic product (GDP) of BRICS economies amounted to US$19.6 trillion GDP, and also BRICS represents 42% of the global population and 23% of the world GDP (Zhao et al., 2021). This economic surge, characterized by rapid GDP growth, positions the BRICS

as strong competitors in the global economy (Chotia and Rao, 2017). The acceleration in GDP growth within these countries has not only showcased their economic potential but also highlighted the need for systematic progress to bolster economic performance and enhance the well-being of their citizens (Younsi and Bechtini, 2018). Although the member countries have similar economic growth potential, their governance frameworks and systems vary significantly. For e.g., China and Russia are examples of nations where a single political party largely influences governance, with dominant ideologies that guide their coexistence and the formulation of policies (Öniş & Gençer, 2018). However, despite the rapid economic expansion, the BRICS nations have encountered challenges with income inequality in recent years, posing a significant threat to their social, economic, and political stability (Chotia and Rao, 2017; Younsi and Bechtin, 2018; Berisha et al., 2020). Despite growth and development, why does income inequality remain a major challenge in BRICS economics? Theoretically, the literature suggests a multitude of socio-economic, political, and demographic variables as potential influencers of income inequality. So, this paper tries to examine how democracy and governance quality affect income inequality in BRICS economies.

The relationship between democracy and income inequality remains a pivotal issue in the field of comparative political economy. Democracy is often assumed to have a redistributive effect, as it empowers the poor and middle classes to demand more resources and public goods from the state through redistributive policies (e.g., progressive taxation, welfare spending, price subsidies, minimum wage laws, and public work provisions) (Reuveny and Li, 2003). However, empirical evidence on this relationship is mixed and inconclusive, as different types of democracy and welfare systems may have different effects on inequality. With an increase in democratic engagement, as seen through greater public participation in elections, the political power shifts from the elites to the middle and less advantaged sections of society, forcing the politicians virtually to increase public programmes due to the underlying redistributive pressures (Boix, 2001; Meltzer and Richard, 1981). On the other hand, Simpson (1990) argued that democracy increases income inequality with the early introduction of political rights by facilitating only a few numbers of the wealthy, whereas further extension of political rights strengthens social democratic power and results in a decrease in inequality in income. Long-lasting democratic countries have a lower level of inequality because, in democracy, the voice of the underprivileged is heard by the political party (Huber et al., 2006). However, the notion that democracy reduces income inequality through redistributive policy fails if income inequality becomes high when democracy provides the elite or wealthier population with means and incentives to take over the government indirectly through de facto power (Kotschy and Sunde, 2017; Acheampong et al., 2023). But if a democratic institution provides political rights to the majority of the people, the redistribution policy is decided by the median voters, which reduces income inequality (Bourguignon, 2004). However, it has been observed that certain nations, including Singapore, the Republic of Korea, and East European countries, which may have unique political ideologies and lower democratic ratings, also exhibit lower levels of income inequality (Blancheton and Chhorn, 2021). Gradstein et al. (2001) asserted that ideological influences could play a pivotal role in shaping income distribution. The process of democratization might lead to a marked reduction in income disparities, particularly within societies with Judeo-Christian values, as opposed to societies with other cultural or religious foundations such as Buddhism, Hinduism, or Confucianism (Gradstein et al. 2001). Furthermore, Gradstein et al. (2001) indicated that parliamentary forms of governance might be more effective in addressing income inequality compared to presidential systems. Democracy at the grassroots level has the potential to lower income inequality by raising the responsiveness of local authorities, which in turn increases the income share of the poorer section of the population (Shen and Yao, 2008).

The quality of governance or institutions can affect income distribution, and their effect on income inequality depends on a country's development level. In today's contemporary era, developed

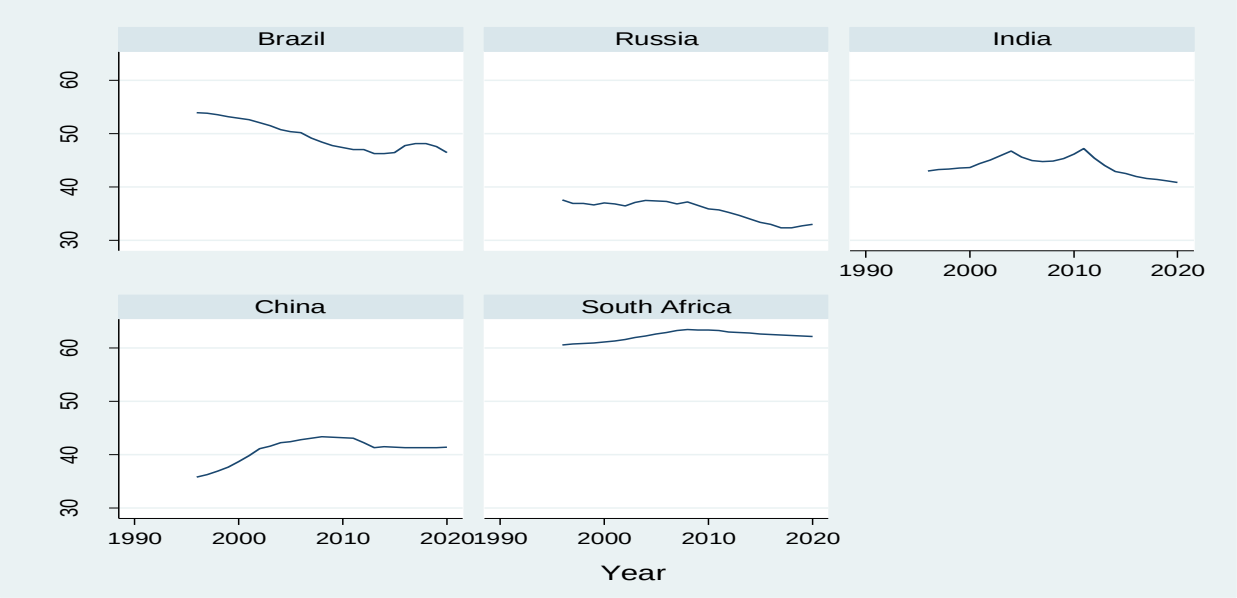
countries have better quality governance, and developing and underdeveloped nations have bad to worse governance quality (Hassan et al., 2021). Countries with poor governance and weak rule of law tend to exhibit higher levels of income inequality, while countries with sound institutions and effective policies tend to have more equitable outcomes (Chong and Gradstein, 2007). Few other authors argued that improvement in institutional quality always does not mean a reduction in income inequality. For e.g., Chong and Calderón (2000) asserted that improvement in the quality of institutions in developing countries tends to result in a more unequal distribution of income. They reasoned that institutional changes in these countries may create high costs for those who work in the informal sector, which consists of not only poor people but also a large share of the population. Nguyen et al. (2020) asserted that good governance increases income inequality, where only the rich people with larger capital enjoy the benefits of economic activity. While a few studies claimed that weak governance has a negative impact on income inequality. For e.g., Andres and Ramlogan-Dobson (2011) demonstrated the dependence of poor people on the informal sector for this reason because these people lack the personal qualities required to get a job in the formal economy. Polacko (2021) argued that neoliberal policies since the 1980s have eroded governance quality and increased income inequality in advanced economies by weakening unions, increasing executive pay, cutting welfare state spending, and reducing tax progressivity. When the judicial system fails to protect the rights of the disadvantaged, they have less opportunity to benefit from rent-seeking activities than the privileged, and high-income disparity may enable the wealthy to exert more political power and undermine institutional quality (Chong and Gradstein, 2007).

1.1. Stylized facts: trends of income inequality (Gini index), democracy (liberal democracy), and governance (governance quality) in BRICS countries

In contemporary times, income inequality has emerged as a pervasive global issue. During the 1990s, a discernible shift in the global pattern of income disparity was observed, characterized by a contraction of the inequality gap. Nonetheless, this shift was not uniformly experienced across nations; a significant number of countries reported an escalation in income inequality within their territorial confines (World Inequality Report, 2022). Therefore, before proceeding to the main econometric analysis, it is important to see the trends of income inequality and its determinants, i.e., democracy and governance quality, in BRICS countries.

Figure 1 provided showcases the Gini index, a measure of income inequality, for BRICS countries from 1996 to 2020. Over this period, Brazil's Gini index shows a gradual decrease, indicating a reduction in income inequality, with a notable drop from 53.9 in 1996 to 46.5 in 2020. Russia's Gini index also displays a downward trend, moving from 37.6 in 1996 to 33 in 2020. India's Gini initially increased, peaking at 47.2 in 2011, before decreasing to 40.9 by 2020. China's Gini index, on the other hand, rose steadily from 35.8 in 1996 to 41.4 in 2020, suggesting growing income inequality. South Africa had the highest Gini index throughout the period, starting at 60.5 in 1996 and slightly decreasing to 62.1 in 2020, remaining significantly higher than the other countries, which reflects its status as one of the most unequal societies in terms of income distribution.

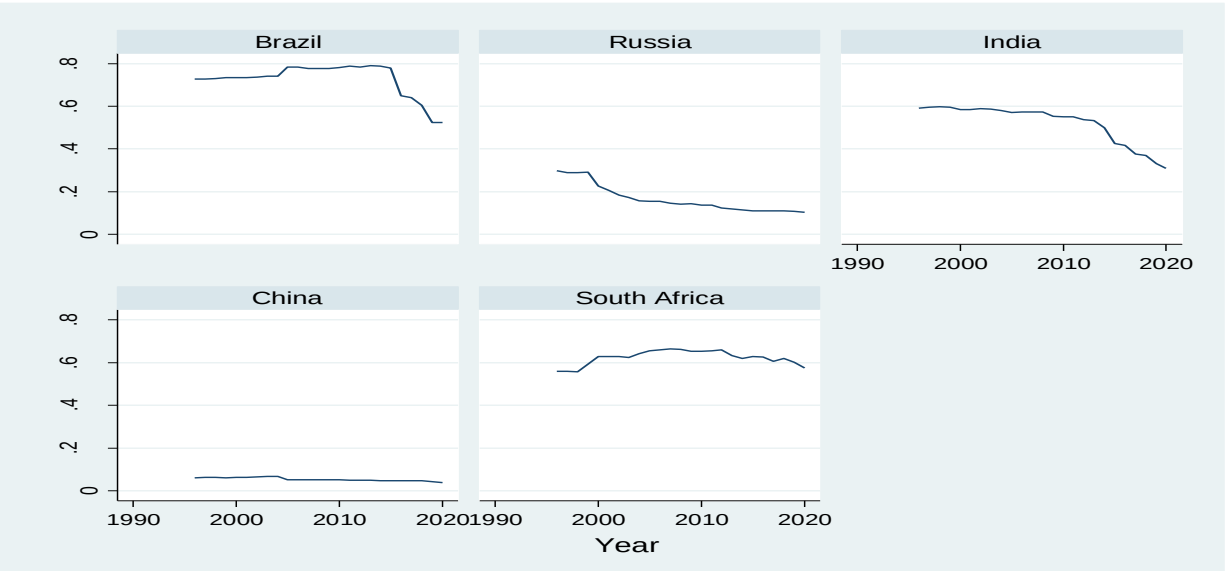
Figure 1 – Trends of income inequality in BRICS during 1996-2020



Source: Standardized World Income Inequality Database (SWIID).

Figure 2 presents a comparative view of democracy index for BRICS countries from 1996 to 2020. Brazil's democracy index started at 0.728 in 1996 and saw fluctuations, reaching a peak of 0.791 in 2013 before declining to 0.523 by 2020. Russia's index remained relatively low, beginning at 0.297 in 1996 and decreasing to 0.104 in 2020. India's index showed more stability in the earlier years, maintaining values around 0.59, but it experienced a significant drop after 2014, ending at 0.31. China's index was consistently low, starting at 0.061 in 1996 and slightly decreasing to 0.039 in 2020. South Africa's index fluctuated, starting at 0.559, peaking at 0.664 in 2007, and then decreasing to 0.575 in 2020.

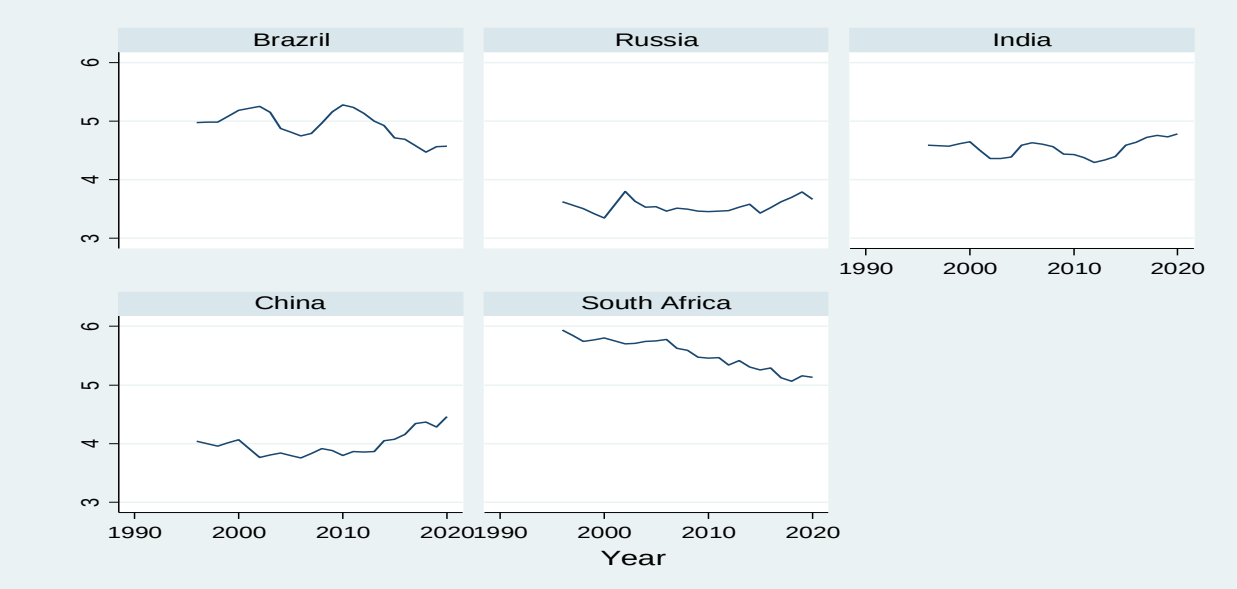
Figure 2 – Trends of democracy in BRICS during 1996-2020



Source: V-Dem, Varieties of Democracy.

The BRICS nations have shown varied governance scores from 1996 to 2020, as shown in Figure 3. Brazil's governance score fluctuated, peaking at 5.28 in 2010 before declining to 4.57 in 2020. Russia's score saw a gradual increase from 3.34 in 2000 to 3.79 in 2019, and then slightly decreased to 3.67 in 2020. India's governance score generally increased, reaching its highest at 4.78 in 2020. China's score also increased over the years, with a notable rise to 4.46 in 2020. South Africa started with the highest governance score among the BRICS in 1996 at 5.94 but experienced a downward trend to 5.13 in 2020.

Figure 3 – Trends of governance quality in BRICS during 1996-2020



Source: The World Bank, Worldwide Governance Indicators (note: the calculation of governance quality is provided in methodology section).

The organization of the study follows: in Section 2, a literature review is discussed; Section 3 deals with data sources and methodology; Section 4 provides the findings and their interpretation; and Section 5 summarizes the conclusions drawn from the study.

2. Literature Review

This segment examines scholarly works that discuss the relationship between democracy and income inequality, as well as the impact of governance quality on income inequality.

2.1. Democracy and Income Inequality

Research conducted by Reuveny and Li (2003) in 69 countries during 1960-1966 revealed that democracy helps to narrow income inequality in both less-developed and developed countries. Shen and Yao (2008), using data from eight Chinese provinces (48 villages), showed grassroots democracy helps in the reduction of income inequality. Boix (2001) and Huber et al. (2006) demonstrated that the presence of a stable democracy contributes to the reduction of income inequality. Conversely, Gradstein et al. (2001) observed that inequality is negatively, but only marginally, affected by democracy. However, other studies (e.g., Acemoglu et al., 2013) have reported an absence of a robust relationship between the presence of democracy and the level of

income inequality. A study by Islam (2016), encompassing a dataset from 83 countries during 1968-2011, concluded that political liberty has a negative impact on income inequality in democratic regimes but not in others. Burkhart (2007) claimed that a declining level of income inequality is associated with a higher level of democracy. Acheampong et al. (2023) study in SSA revealed that democracy increases income inequality by shifting political power to middle-class people instead of poor people, who form the majority of the population. Bahamonde and Trasberg (2021) noted that democratic rule widens income inequality when accompanied by strong state capacity because strong state capacity attracting more FDI increases the demand for skilled labour or workers and creates wage discrepancies between skilled and low-skilled labour and workers. Trinugroho et al. (2023) pointed out that democracy reduces income inequality because democratic governments are less corrupt and are interested in providing equal improvements to society.

2.2. Governance or Institutional Quality and Income Inequality

Chong and Gradstein (2007) and Ullah et al. (2021) showed that weaker institutional quality increases income inequality. Chong and Calderón (2000) concluded that for developing countries, better institutions may lead to more inequality, while for developed countries, better institutions may reduce income inequality. Research by Blancheton and Chhorn (2021) demonstrated the negative long-run and steady-state effects of institutional quality on income inequality. A study by Nguyen et al. (2019) in Vietnam concluded that good governance helps to lower income inequality by providing income-increasing benefits to lower-income households. Nguyen et al. (2020) showed that institutional quality increases income inequality in low- and lower-middle-income and upper-middle-income countries, whereas in high-income countries, institutional quality reduces income inequality. Gupta et al. (2002) demonstrated that poor governance quality or a higher degree of corruption widens income inequality. But Andres and Ramlogan-Dobson (2011) posit an inverse association between corruption and income inequality. Research by Kunawotor et al. (2020) in Africa over the period from 1990 to 2017 found no significant impact of institutional quality on income inequality.

This study contributes to the existing literature in three ways: first, by investigating the effect of democracy and governance quality on income inequality in BRICS economies. To our comprehension, this is the inaugural inquiry into such a relationship within the context of BRICS economies. Second, it encompasses the long time period from 1996 to 2020 to thoroughly comprehend the objectives pursued, and third, the study used feasible generalized least squares (FGLS), panel-corrected standard errors (PCSE), and the Driscoll-Kraay (DK) estimation method to tackle the issues of heteroskedasticity, autocorrelation, and cross-sectional dependence (CD).

3. Data Sources and Methodology

3.1. Data Sources and Model Specification

We collected secondary data from different sources during the period 1996-2020. The variables and proxy used, unit of measurement, description, sources, and expected sign are reported in Table 1.

Table 1 – Variables and Proxy Used, Unit of Measurement, Description, Sources, and Expected Sign

Variables	Proxy used	Unit	Description	Sources	Expected sign
Income inequality (INE)	Gini disposable income[1]	Index	Unequal distribution of income	Standardized World Income Inequality Database (SWIID)	Not applicable
Democracy (DEM)	liberal democracy	Index	Information on voting rights, election integrity, civil freedoms, and checks on executive power (index ranges from 0 to 1 (fully democratic).	V-Dem, Varieties of Democracy	Negative
Governance quality (GOV)	Governance indicators[2]	Score	The exercise of power in managing a nation's economic and social resources for development.	The World Bank, Worldwide Governance Indicators (WGIs)	Negative
Economic growth (GDPPC)	GDP per capita	Constant 2015 US$	Total GDP divided by the country's population.	The World Bank, World Development Indicators	Positive
Population (POP)	Population growth	(Annual %)	Percentage increase of the population from the middle of the previous year to current year.	The World Bank, World Development Indicators	Positive
Urbanization (UB)	Urban population growth	(Annual %)	People reside in urban areas.	The World Bank, World Development Indicators	Negative
Inflation (INFL)	Consumer price index	(Annual %)	Yearly percentage change in the average cost of a set basket of goods and services.	The World Bank, World Development Indicators	Positive
Globalization (GLOB)	Globalization index	Index	How much countries are interconnected economically, socially, and politically.	KOF Swiss Economic Institute	Negative

Source: Authors' compilation from secondary sources.

[1] As the Gini index data for South Africa is available only up to 2017, to ensure homogeneity in data with other countries, Gini index data for South Africa is generated by the method of extrapolation for the years 2018, 2019, and 2020.

[2] According to WGIs, six indicators of governance[2] are: (i) government effectiveness (GE) (ii) regulatory quality (RQ), (iii) control of corruption (CC), (iv) rule of law (RL), (v) voice and accountability (VA), and (vi) political stability and no violence (PV). The score of each of the indicators lies between -2.5 to +2.5. -2.5 indicates a very weak quality of indicators, and +2.5 indicates a very strong quality of indicators.

Following Abbas et al. (2021), we calculate the governance quality index as: governance quality index= $(\frac{\text{sum of six indicators}}{6} + 2.5) \times 2$, where the score lies between 0 (very poor quality of governance) to 10 (very strong quality of governance). This study makes use of an aggregate index of governance quality because the governance indicators of WGIs seem to be correlated with each other (Abbas et al., 2021).

All the variables used are transformed into log form. Again, to create a log of negative values, variables with negatives are converted into positives by the method applied by Busse and Hefeker (2007): $= \ln(x + \sqrt{(x^2 + 1)}$.

We then generate the following general regression equation for the analysis:

$$\ln INE_{it} = \alpha_{it} + \phi_1 \ln DEM_{it} + \phi_2 \ln GOV_{it} + \phi_3 \ln GDPPC_{it} + \phi_4 \ln POP_{it} + \phi_5 \ln UB_{it} + \phi_6 \ln INFL_{it} + \phi_7 \ln GLOB_{it} + \varepsilon_{it} \quad (1)$$

Where ln represents the natural log; i and t indicate country and time period, respectively; α is the intercept; $\phi_1, \phi_2, \phi_3, \phi_4, \phi_5, \phi_6,$ and ϕ_7 are the coefficients of democracy, governance quality, economic growth, population, urbanization, inflation, and globalization respectively; and $\boldsymbol{\epsilon}$ is the error term. We assume economic growth, population, urbanization, inflation, and globalization as control variables. In our analysis, we run two econometric models with and without control variables, as given below:

$$\ln INE_{it} = \alpha_{it} + \phi_1 \ln DEM_{it} + \phi_2 \ln GOV_{it} + \phi_3 \ln GDPPC_{it} + \phi_4 \ln POP_{it} + \phi_5 \ln UB_{it} + \phi_6 \ln INFL_{it} + \phi_7 \ln GLOB_{it} + \varepsilon_{it} \quad (2)$$

$$\ln INE_{it} = \alpha_{it} + \phi_1 \ln DEM_{it} + \phi_2 \ln GOV_{it} + \varepsilon_{it} \quad (3)$$

Where Equation (2) is the regression to be estimated with control variables and Equation (3) is the regression to be estimated without control variables.

4. Results and Discussion

4.1. Descriptive Statistics and Correlation Matrix

The summary statistics and the correlation matrix for the variables studied are reported in Tables A1 and A2 in the appendix.

4.2. Levin Lin Chu (LLC) Stationarity Test

To confirm that the data series is stationary, the LLC test formulated by Levin et al. (2002) is utilized. The result from Table 2 indicates that income inequality, economic growth, inflation, and globalization are stationary at the level, whereas population, urbanization, democracy, and governance are not stationary at the level but become stationary after the first difference.

Table 2 – LLC Unit Root Test

Variables	At level	First difference
lnINE	-1.3078*	--
lnDEM	1.5788	-2.3751***
lnGOV	-0.4806	-5.2024***
lnGDPPC	-2.4597***	-
lnPOP	1.0851	-1.6959**
lnUB	-0.3091	-3.3455***
lnINFL	-2.2247**	-
lnGLOB	-5.4656***	-

Source: Authors' calculation.

Note: ***, **, and * denotes significance level at 1%, 5%, and 10% respectively.

4.3. Robustness Check

Table 3 shows the Hausman test, heteroskedasticity, autocorrelation test, multicollinearity, and cross-sectional dependence (CD) test of the series. The Hausman test proposed by Hausman (1978) and presented in Table 3 shows that the fixed effect (FE) model is appropriate. But a common problem in panel data analysis is that the random effect (RE) and FE estimators may not be consistent and efficient due to the existence of serial correlation (autocorrelation) and cross-sectional heterogeneity (Greene, 2000). We checked the robustness of autocorrelation proposed by Wooldridge (2010) and heteroskedasticity proposed by Greene (2000), and the results in Table 3 indicate the existence of autocorrelation and heteroskedasticity within the data. Consequently, the FGLS and PCSE methods are suitable for addressing disturbances that exhibit autocorrelation, heteroskedasticity, and are interrelated across panels (Greene, 2012; Reed and Ye, 2011; Zhang and Zhao, 2014). However, our series is free from the multicollinearity problem as the mean variance inflation factor (VIF) is less than 10 (Gujarati and Sangeetha, 2007). Again, we also checked for CD, which is also a major issue in panel data, using the CD test propounded by Pesaran (2021). The test presented in Table 3 shows the absence of CD for Equation (1), but for Equation (2), the result shows the presence of CD. Since our data suffers from autocorrelation, heteroskedasticity, and cross-sectional dependence, it can be handled using the DK standard error estimation method developed by Driscoll and Kraay (1998) (Hoechle, 2007). The DK standard error estimation can be applied when there is an issue of autocorrelation, heteroskedasticity, or cross-sectional dependence in the series. Therefore, to make our results more robust, we apply FGLS, PCSE, and DK regression estimation.

Table 3 – Robustness Check

Tests	Equation 1	Equation 2
Hausman test	χ^2 = 106.82	χ^2=34.66
	p-value = 0.000	p-value=0.000
Wald test for groupwise heteroskedasticity	χ^2 = 29.96	χ^2=1639.46
	p-value = 0.000	p-value=0.000
Wooldridge test for autocorrelation	F = 273.177	F=277.934
	p-value = 0.0001	p-value=0.0001
Mean VIF	3.52	1.02
CD test	-0.735, p-value = 0.4626	1.951, p-value =0.051

Source: Authors' calculation.

Note: (1) Hausman test assumes H_0: RE is appropriate, H_a: FE is appropriate; (2) Wald test assumes H_0: series are homogeneous, H_a: series are not homogeneous; (3) Wooldridge test assumes H_0: series are not serially correlated, H_a: series are serially correlated; (4) CD test assumes H_0: absence of cross-sectional dependence, H_a: presence cross-sectional dependence.

4.4. FGLS, PCSE, and DK Results

Table 4 – FGLS, PCSE, and DK Results (dependent variable: lnINE)

Variables	FGLS (1)	FGLS (2)	PCSE (3)	PCSE (4)	DK (5)	DK (6)
lnDEM	0.988***	1.027***	0.988***	1.027***	.988***	1.027***
	(2.82)	(3.00)	(2.62)	(2.68)	(3.19)	(3.83)
lnGOV	-1.302*	-.958	-1.302	-.957	-1.302	-.958
	(-1.66)	(-1.24)	(1.56)	(-1.21)	(-1.57)	(-1.19)
lnGDPPC	0.002	_	0.002	_	.002	_
	(0.05)		(0.08)		(0.05)	
lnPOP	0.932**	_	0.932**	_	.932**	_
	(2.07)		(2.07)		(2.45)	
lnUB	-1.242**	_	-1.242**	_	-1.242**	_
	(-2.12)		(-2.34)		(-2.52)	
lnINFL	-0.002	_	-0.002	_	-.002	_
	(-0.12)		(-0.15)		(-0.13)	
lnGLOB	-0.009	_	-0.009	_	-.009	_
	(-0.04)		(-0.06)		(-0.06)	
Constant	3.867***	3.840***	3.867***	3.840***	3.867**	3.840***
	(5.54)	(210.01)	(9.24)	(424.93)	(11.33)	(418.31)

Source: Authors' calculation.

Note: ***, **, and * denotes significance level at 1%, 5%, and 10% respectively.

Table 4 displays the outcomes from the FGLS, PCSE, and DK regression analyses, both including and excluding control variables. The findings indicate a significant and positive impact of democracy on income inequality. The result corroborates the findings of Simpson (1990) and Kotschy and Sunde (2017). It suggests that the level of democracy may not yet be sufficient to

contribute effectively to lowering income inequality (Simpson, 1990). Our result also goes along with the argument given by Kotschy and Sunde (2017), who claimed that the elite may use their means and resources indirectly to influence the government in a democratic system, leading to high income inequality. Governance quality has a negative impact on income inequality. It implies that governance plays a significant role in diminishing income inequality within BRICS economies. It is possible that this negative effect is due to the effective and efficient delivery of public services (Chong and Calderón, 2000). However, in models 2 through 6, the data does not demonstrate a significant influence of governance on income inequality. The reason could be the weak nature of governance quality and the lack of statistical strength to cause a major impact on income inequality (Kunawotor et al., 2020). The impact of control variables, like an increase in population, leads to an increase in income inequality. Urbanization helps in the reduction of income inequality. Economic growth, inflation, and globalization do not show a significant impact on income inequality in our study.

5. Conclusion

This study aims to explore the effects of governance and democracy on income disparity within the BRICS nations over the period 1996-2020. Addressing the challenges of autocorrelation and heteroskedasticity, the research employs FGLS and PCSE. Additionally, to manage issues of autocorrelation, heteroskedasticity, and cross-sectional dependence, the DK regression technique is utilized. The findings of our study revealed that democracy increases income inequality, while the governance quality helps to mitigate it. Control variables like population increase income inequality, and urbanization tends to lower income inequality.

Based on the results, this study has important policy implications for lowering income inequality in BRICS countries. First, promoting democratic institutions and practices may not necessarily lead to lower income inequality and may even exacerbate it in some cases. Therefore, policymakers should be aware of the potential trade-offs between democracy and equity and seek to balance them with other social and economic goals. Second, further improving governance quality is an effective way to further lower income inequality, as it enhances accountability, transparency, and participation in public decision-making. Third, managing population growth is crucial for reducing income inequality, as this factor tends to increase the gap between the rich and the poor. Fourth, supporting urbanization may also contribute to lower income inequality, as it can facilitate economic diversification, innovation, and productivity, create more jobs and incomes, and improve access to infrastructure and amenities.

The shortcoming of this study is that it considers SWIID's Gini disposable income as a proxy for income inequality. Gini index from other sources, such as the World Inequality Database, the World Bank, the World Income Inequality Database (WIID), etc., can be used to check the robustness of the results. A future study can also reinvestigate the results using different alternative independent variables and econometric models. A country-wise analysis using time series data is also suggested to get the results for specific countries. However, our study is robust in terms of addressing autocorrelation, heteroskedasticity, and cross-sectional dependence.

Acknowledgement

The corresponding author acknowledges the support of the University Grants Commission (UGC) of India for the Senior Research Fellowship (SRF).

Conflict of interest

The authors declare that there is no conflict of interest.

References

Abbas, Q., Junqing, L., Ramzan, M., Fatima, S. (2021). Role of Governance in Debt-Growth Relationship: Evidence from Panel Data Estimations. *Sustainability, 13, 5954*.

Acemoglu, D., Naidu, S., Restrepo, P., Robinson, J. (2013). Democracy, redistribution and inequality. *NBER Working Paper 19746* .

Acheampong, A., Dzator, J., Abunyewah, M., Erdiaw-Kwasie, M., Opoku, E. (2023). Sub-Saharan Africa's Tragedy: Resource Curse, Democracy and Income Inequality. *Social Indicators Research, 168*, 471–509.

Andres, A. R., Ramlogan-Dobson, C. (2011). Is corruption really bad for inequality? Evidence from Latin America. *Journal of Development Studies, 47*(7), 959–976.

Asamoah, L. (2021). Institutional Quality and Income Inequality in Developing Countries: A Dynamic Panel Threshold Analysis. *Progress in Development Studies, 21*(2), 123–143.

Bahamonde, H., Trasberg, M. (2021). Inclusive institutions, unequal outcomes: Democracy, state capacity, and income inequality. *European Journal of Political Economy, 70*.

Berisha, E., Gupta, R., Meszaros, J. (2020). The impact of macroeconomic factors on income inequality: Evidence from the BRICS. *Economic Modelling, 91*, 559-567.

Blancheton, B., Chhorn, D. (2021). Government Intervention, Institutional Quality, and Income Inequality: Evidence from Asia and the Pacific, 1988–2014. *Asian Development Review, 38*(1), 176–206.

Boix, C. (2001). Democracy and Inequality. Department of Political Science, University of Chicago. *Working Paper No. 2001/161*.

Bourguignon, F. (2004). *Poverty-Growth-Inequality Triangle.* Washington, DC:World Bank.

Burkhart, R. (2007). Democracy, Capitalism, and Income Inequality:Seeking Causal Directions. *Comparative Sociology , 6*(4), 481–507.

Busse, M., Hefeker, C. (2007). Political risk, institutions and foreign direct investment. *European Journal of Political Economy, 23*(2), 397-415.

Chong, A., Calderón, C. (2000). Institutional Quality and Income Distribution. *Economic Development and Cultural Change, 48*(4), 761-786.

Chong, A., Gradstein, M. (2007). Inequality and Institutions. *The Review of Economics and Statistics, 89*(3), 454-465.

Chotia, V., Rao, N. (2017). Investigating the interlinkages between infrastructure development, poverty and rural–urban income inequality: Evidence from BRICS nations. *Studies in Economics and Finance, 34*(4), 466-484.

Degaut, M. (2015). *Governance Capacities in the BRICS*. Washington, DC: Center for Strategic & International Studies.

Driscoll, J. C., Kraay, A. C. (1998). Consistent Covariance Matrix Estimation with Spatially Dependent Panel Data. *The Review of Economics and Statistics, 80*(4), 549-560.

Gradstein, M., Milanovic, B., Ying, Y. (2001). Democracy and Income Inequality: An Empirical Analysis. *Policy Research Working Paper 2561, World Bank, Washington, DC.*

Greene, W. (2012). *Econometric analysis (7th ed.).* Upper Saddle River, NJ: Prentice Hall.

Greene, W. (2000). *Econometrics Analysis.* NJ: Prentice Hall.

Gujarati, D., Sangeetha, N. (2007). *Basic Econometrics.* McGraw-Hill, New York.

Gupta, S., Davoodi, H., Alonso-Terme, R. (2002). Does corruption affect income inequality and poverty? *Economics of Governance, 3*, 23–45.

Hassan, M., Mahmood, H., Saeed, M., Alkhateeb, T., Arshed, N., Mahmoud, D. (2021). Investment Portfolio, Democratic Accountability, Poverty and Income Inequality Nexus in Pakistan: A Way to Social Sustainability. *Sustainability, 13*(11), 1-16.

Hausman, J. (1978). Specification tests in econometrics. *Econometrica, 46*(6), 1251-1271.

Hoechle, D. (2007). Robust Standard Errors for Panel Regressions with Cross-Sectional Dependence. *The Stata Journal, 7*(3), 281-312.

Huber, E., Nielsen, F., Pribble, J., Stephens, J. D. (2006). Politics and Inequality in Latin America and the Caribbean. *American Sociological Review, 71*(6), 943–963.

Islam, M. (2016). Does democracy reduce income inequality? *Empirical Economics, 51*, 1299–1318.

KOF Swiss Economic Institute. Data. Globalization data. Retrieved from https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html.

Kotschy, R., Sunde, U. (2017). Democracy, Inequality, and Institutional Quality. *European Economic Review,* 29, 209–228 .

Kunawotor, M., Bokpin, G., Barnor, C. (2020). Drivers of income inequality in Africa: Does institutional quality matter? *African Development Bank*, 32(4), 718-729.

Levin, A., Lin, C.-F., Chu, C.-S. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics,* 108(1), 1-24.

Meltzer, A., Richard, S. (1981). A Rational Theory of the Size of Government. *Journal of Political Economy,* 89(5), 914-927.

Moheddine, Y., Marwa, B. (2018). Economic Growth, Financial Development and Income Inequality in BRICS Countries: Evidence from Panel Granger Causality Tests. *MPRA Paper No. 85182* .

Nguyen, C., Giang, L., Tran, A., Do, H. (2019). Do Good Governance and Public Administration Improve Economic Growth and Poverty Reduction? The Case of Vietnam. *International Public Management Journal, 24*(1), 1-27.

Nguyen, C., Schinckus, C., Su, T., Chong, F. (2020). The Influence of Tourism on Income Inequality. *Journal of Travel Research,* 60(7), 1426-1444.

Öniş, Z., Gençer, A. (2018). Democratic BRICS as role models in a shifting global order: Inherent dilemmas and the challenges ahead. *Third World Quarterly,* 39(9), 1791–1811.

Pesaran, M. (2021). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics , 60*, 13-50.

Piketty, T. (2015). Capital in the twenty-first century. *American Economic Review,* 105(5), 48-53.

Polacko, M. (2021). Causes and Consequences of Income Inequality – An Overview. *Statistics, Politics and Policy,* 12(2), 341-357.

Reddy, S. (2018). The Growing BRICS Economies: An INET Series. https://www.ineteconomics.org/perspectives/blog/the-growing-brics-economies-an-inet-series (Accessed in October 27, 2023).

Reed, W., Ye, H. (2011). Which Panel Data Estimator Should I Use? *Applied Economics,* 43(8), 985-1000.

Reuveny, R., Li, Q. (2003). Economic Openness, Democracy, and Income Inequality: An Empirical Analysis. *Comparative Political Studies,* 36(5), 575–601.

Shen, Y., Yao, Y. (2008). Does grassroots democracy reduce income inequality in China? *Journal of Public Economics,* 92(10-11), 2182–2198.

Simpson, M. (1990). Political Rights and Income Inequality: A Cross-National Test. *American Sociological Review,* 55(5), 682-693.

Standardized World Income Inequality Database (SWIID). Data. https://fsolt.org/swiid/. (Accessed in October 20, 2023).

The World Bank, World Development Indicators. Data. https://databank.worldbank.org/source/world-development-indicators (Accessed in October 20, 2023).

The World Bank, Worldwide Governance Indicators. Data. https://databank.worldbank.org/source/worldwide-governance-indicators (Accessed in October 20, 2023).

Trinugroho, I., Achsanta, A., Pamungkas, P., Saputro, N., Yuniart, S. (2023). Democracy, economic growth, and income inequality: Evidence from province level data. *Cogent Economics & Finance,* 11, 1-12.

Ullah, A., Kui, Z., Ullah, S., Pinglu, C., Khan, S. (2021). Sustainable Utilization of Financial and Institutional Resources in Reducing Income Inequality and Poverty. *Sustainability,* 13(3), 1-25.

V-Dem, Varieties of Democracy. Data. https://v-dem.net/data/the-v-dem-dataset/country-year-v-dem-core-v13/ (Accessed in October 20, 2023).

Wang, B. (2019). Analyzing the role of governance in CO2 emissions mitigation: The BRICS experience. *Structural Change and Economic Dynamics,* 51, 119-125.

Wooldridge, J. (2010). *Econometric analysis of cross section and panel data.* Cambridge: MIT Press.

World Bank. (2020). *World Development Indicators*. World Bank, Washington, DC.

World Inequality Report. (2022). https://wir2022.wid.world/wwwsite/uploads/2021/12/WorldInequalityReport2022_Full_Report.pdf (Accessed in March 03, 2024).

Younsi, M., Bechtin, M. (2018). Economic Growth, Financial Development and Income Inequality in BRICS Countries: Evidence from Panel Granger Causality Tests. *MPRA Paper No. 85182*.

Younsi, M., Bechtini, M. (2018). Economic Growth, Financial Development, and Income Inequality in BRICS Countries: Does Kuznets' Inverted U-Shaped Curve Exist? *Journal of the Knowledge Economy ,* 11, 721–742.

Zhang, C., Zhao, W. (2014). Panel estimation for income inequality and CO2 emissions: A regional analysis in China. *Applied Energy, 136*, 382-392.

Zhao, W., Hafeez, M., Maqbool, A., Ullah, S., Sohail, S. (2021). Analysis of income inequality and environmental pollution in BRICS using fresh asymmetric approach. *Environmental Science and Pollution Research,* 28, 51199–51209.

Appendices

Table A1 – Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
lnINE	3.82	0.195	3.478	4.149
lnDEM	-1.252	1.023	-3.244	-0.234
lnGOV	1.493	0.162	1.207	1.782
lnGDPPC	8.383	0.795	6.48	9.246
lnPOP	0.708	0.49	-0.445	1.476
lnUB	1.233	0.711	-0.451	2.142
lnINFL	2.31	0.934	-1.139	5.145
lnGLOB	4.109	0.126	3.725	4.279

Source: Authors' calculation.

Table A2 – Correlation Matrix

Variables	lnIEQ	lnDEM	lnGOV	lnGDPPC	lnPOP	lnUB	lnINFL	lnGLOB
lnINE	1.000							
lnDEM	0.654	1.000						
lnGOV	0.905	0.721	1.000					
lnGDPPC	0.048	-0.161	-0.045	1.000				
lnPOP	0.629	0.554	0.729	-0.521	1.000			
lnUB	0.416	-0.007	0.456	-0.481	0.792	1.000		
lnINFL	-0.031	0.378	-0.060	0.066	-0.206	-0.547	1.000	
lnGLOB	-0.050	-0.134	-0.180	0.668	-0.529	-0.499	0.122	1.000

Source: Authors' calculation.

Journal of Social Economics Research
2024 Vol. 11, No. 1, pp. 111-125
ISSN(e): 2312-6264
ISSN(p): 2312-6329
DOI: 10.18488/35.v11i1.3614

Macroeconomic determinants of income inequality among different income group countries: Evidence from panel data

Iragdao Raja Basumatary[1+]
Manjit Das[2]
Sijousa Basumatary[3]
Konita Basumatary[4]

[1,2,3,4]*Department of Economics, Bodoland University, Kokrajhar, Assam, India.*
[1]*Email: rajairagdao@gmail.com*
[2]*Email: manjitdas4842@gmail.com*
[3]*Email: sbbasu6@gmail.com*
[4]*Email: konitabasumatary@gmail.com*

(+ Corresponding author)

Article History
Received: 1 August 2023
Revised: 16 November 2023
Accepted: 28 December 2023
Published: 23 January 2024

Keywords
Determinants
FGLS
Income inequality
Panel data
PCSE
Policy.

JEL Classification:
C23; D31; O29.

ABSTRACT

This paper investigates the macroeconomic determinants of income inequality among different income-group countries across the world by using panel data over the period from 1996 to 2019. In our research, we employ various econometric techniques to determine the model that best aligns with our purpose. Additionally, we assess the presence of autocorrelation and heteroskedasticity. Finally, we have employed FGLS and PCSE methods to estimate the impact of selected variables on income inequality and to counter the issues of autocorrelation and heteroskedasticity. Our results indicate that in low-income countries, population growth, gender equality, and globalization have a negative impact on income inequality, while HDI, civil liberty, and governance have a positive impact on income inequality. In lower-middle-income countries, economic growth, urbanization, HDI, and gender equality are inversely related to income inequality, while population growth, globalization, and governance are positively associated with income inequality. In upper-middle-income countries, urbanization, HDI, and unemployment are negatively associated with income inequality, whereas economic growth, population growth, civil liberty, and governance are positively related to it. In high-income countries, urbanization, HDI, inflation, civil liberty, globalization, and governance have a negative effect on income inequality, while economic growth, population growth, gender equality, and natural resources have a positive impact on it. The findings of the study suggest viable policy recommendations to reduce income inequality in different income-group countries.

Contribution/Originality: This study investigates the macroeconomic determinants of income inequality among different income group countries during the period 1996-2019, which is a novel contribution to the literature.

1. INTRODUCTION

The factors that determine income inequality have been a long-standing and empirically investigated topic in research (Ali, Attiaoui, Khalfaoui, & Tiwari, 2021; Alvarado, Tillaguango, López-Sánchez, Ponce, & Işık, 2021; Amate-Fortes, Guarnido-Rueda, Martínez-Navarro, & Oliver-Márquez, 2021; Batuo, Kararach, & Malki, 2022; Perugini & Tekin, 2022; Saha, Beladi, & Kar, 2021; Taresh, Sari, & Purwono, 2021; Ullah, Kui, Ullah, Pinglu, & Khan, 2021; Wolde, Sera, & Merra, 2022). A global trend of decreasing income inequality occurred in the 1990s, reversing the historical trend that had persisted since the early 19th century. However, this trend was not homogeneous among

countries, since most of them witnessed an upward trend in income inequality within their boundaries (United Nations, 2020; World Inequality Report, 2022). As per the World Inequality Report (2022), the richest 10 percent dominate up to 52 percent of the total global income, while the poorest half segment of the population earns only 8.5 percent of it World Inequality Report (2022). The UNDP's latest policy brief revealed that the poverty rate in poor countries has worsened over the past three years, with 165 million more people living below the $3.65-a-day threshold by 2023 (UNDP, 2023). This tremendous rise in income inequality is a growing worldwide issue, sending greater awareness to policy agendas and also being a topic of political and economic debates in recent decades (Sebri & Dachraoui, 2021). Many researchers and experts have discussed the consequences of income inequality on economic development. The pioneer economist Simon Kuznets hypothesized the association between income inequality and economic development as a reverse U-shaped curve. According to this hypothesis, income inequality rises with the initial increase in income, reaches a peak, and then declines as income continues to rise (Kuznets, 1955). In the initial phases of rapid economic development, when income inequalities tend to widen across social and spatial dimensions, such income inequality may be acceptable to society (Hirschman & Rothschild, 1973). But the persistent increase in income inequality poses an enormous issue for the contemporary world across various economic, social, and political dimensions (Huang, Morgan, & Yoshino, 2019; OECD, 2015). The evolution of income inequality is a multifaceted phenomenon that has various social issues, such as human rights violations, which indicate severe injustice, and obstacles to human development that constantly and persistently attract global attention (Mishchuk, Samoliuk, Bilan, & Streimikiene, 2018). According to Dabla-Norris, Kochhar, Suphaphiphat, Ricka, and Tsounta (2015), rising inequality poses a serious threat to the economy and society as it reduces investment and growth, disturbs economic, financial, and political stability, results in inefficient use of resources, corruption, and nepotism, and leads to adverse economic and social outcomes. However, according to Li and Zou (1998) and Alesina and Perotti (1996), income inequality has a beneficial effect on economic development. According to their assertion, fiscal redistribution, which involves imposing higher taxes on investors and capitalists, diminishes their motivation to invest. Conversely, this policy enhances the socio-political atmosphere by alleviating social conflict, which subsequently stimulates productive activities and the accumulation of capital within the country (Alesina & Perotti, 1996).

This present study adds to the body of research literature by investigating various determinants of income inequality among different income-group countries. While the previous research mostly focused on specific regions or countries or different groups of countries and provided mixed results, this present study adopts a global perspective and uses panel data from 90 countries over the period from 1996 to 2019, which are further divided into four income group countries (see details in section 3.1). There is a lack of comprehensive and comparative analysis on how the macroeconomic determinants of income inequality vary across different income group countries. Second, our study uses Gini index data as a proxy for income inequality from the World Inequality Database (WID), while previous research used income inequality data from the World Bank, the Standardized World Income Inequality Database (SWIID), the World Income Inequality Database (WIID), etc. We use econometric techniques like feasible generalized least squares (FGLS) and panel-corrected standard errors (PCSE) in this study to deal with the issue of heterogeneity and autocorrelation problems in panel data that are specific to each country. Thus, this study adds to the research literature by providing new insights and evidence on the heterogeneous effects of macroeconomic determinants on income inequality across different income group countries during the period from 1996 to 2019.

The subsequent sections of the paper are organized in the following manner: Section 2 pertains to the comprehensive examination of existing literature. Section 3 outlines the data utilized and the technique employed. Section 4 analyses and deliberates on the results obtained. Lastly, Section 5 ends the study and presents its implications for policy.

2. REVIEW OF LITERATURE

Following are the related reviews of literature based on empirical findings.

A very well-known Kuznets "inverted U" hypothesis was examined by many researchers in different countries. Bahmani-Oskooee, Hegerty, and Wilmeth (2008), while analyzing the factors influencing income inequality in 16 nations, found that Kenya conforms to the classic Kuznets hypothesis, while in Panama, national income has a long-run positive impact on income inequality that follows an "uninverted U" shape pattern. An investigation by Deyshappriya (2017) on the macroeconomic factors of income inequality in Asian nations supported the inverted U-shaped relationship between income inequality and gross domestic product (GDP). But Batuo, Kararach, and Malki (2022) found that the Kuznets curve is valid only for the bottom of income distribution countries. A study by Ullah et al. (2021) in 64 Belt and Road countries found a negative effect of economic growth on income inequality. Kim (2016) investigated this relationship for developed, developing, and underdeveloped countries using panel data and found a negative association for developing and underdeveloped countries and a positive association for developed countries. A study by Odedokun and Round (2001) found economic development to have an income-disequalizing effect. Wolde, Sera, and Merra (2022) investigated the income inequality-economic growth nexus in Ethiopia during 1980-2017 and revealed that there is a long-term negative relationship between the two; however, the relationship is positive in the short-term.

By conducting the study in 88 less-developed countries, Kentor (2001) found that the size of the population has a positive impact on income inequality. Ullah et al. (2021) in their study of 64 Belt and Road countries and Marsh (2015) in 142 developing, transitional, and developed societies both support such a similar outcome. However, a study by Butler, Wildermuth, Thiede, and Brown (2020) in rural America found a negative nexus between population growth and income inequality.

Sarkodie and Adams (2020); Taresh et al. (2021) and Amiti and Cameron (2012) revealed that income inequality is negatively associated with the human development index (HDI). But Prawoto and Cahyani (2020) found that HDI has a positive impact on income inequality. Theyson and Heller (2015), using 147 countries' data over the years 1992-2007, revealed an S-curve relationship between income inequality and human development (HDI).

As a macroeconomic factor, Kanbur and Zhuang (2013) and Sulemana, Nketiah-Amponsah, Codjoe, and Andoh (2019) suggest that urbanization prompts income inequality to increase. Ali, Attiaoui, Khalfaoui, and Tiwari (2021) analyzed the effect of industrialization and urbanization on income inequality and found that in the long run, urbanization can reduce income inequality. Castells-Quintana and Royuela (2012) differentiated the countries based on the level of urbanization and found that rising income inequality harms economic growth in both high and low levels of urbanization where a high level of unemployment exists.

Martínez, Ayala, and Ruiz-Huerta (2001) and Deyshappriya (2017) found a positive association between income inequality and unemployment. But Muryani, Sethi, and Iswanti (2021) provide a negative link between the two in the case of Indonesia. Law and Soon (2020) provided evidence that inflation worsens income inequality. Thalassinos, Uğurlu, and Muratoğlu (2012) revealed a positive effect of inflation on income inequality. The study by Jäntti and Jenkins (2010) did not find any evidence of inflation and unemployment as determinants of income inequality.

Grotti and Scherer (2016) and Baloch, Noor, Habibullah, and Bani (2018) found a negative effect of gender equality on income inequality. Research by Maxwell (1990) in the U.S. found a positive link between gender equality and income inequality. Amate-Fortes, Guarnido-Rueda, Martínez-Navarro, and Oliver-Márquez (2021), while analyzing the factors that determine income inequality in 33 European countries during the period 2003-2017, also showed a positive association between gender inequality and income inequality.

ElGindi (2017) revealed that natural resource dependency is positively interlinked with the increase in income inequality. Hartwell, Horvath, Horvathova, and Popova (2019) discovered that in non-democratic nations, natural resources worsen income inequality, while in democratic nations, natural resources seem to be effective in reducing income inequality. Alvarado et al. (2021) investigation on the impact of natural resource dependence on income inequality found that the relationship between the two is negative for lower-middle and upper-middle-income countries.

Munir and Bukhari (2020) revealed that trade globalization helps reduce income disparity in Asian emerging countries. The study by Ullah et al. (2021) analyzed the role of globalization on income inequality in One Belt One Road countries and found a negative effect of globalization on income inequality. But Milanovic (2005) and Thalassinos et al. (2012) showed a positive link between globalization and income inequality.

Perugini and Tekin (2022) analyzed how governance affects financial development and income inequality. Their study revealed that governance quality has a positive impact on income inequality. Saha, Beladi, and Kar (2021) and Xu, Han, Dossou, and Bekun (2021) found that there is a positive link between political stability, the rule of law, corruption, and income inequality. Such a similar result was also disclosed by Ullah et al. (2021) in One Belt One Road countries, as the countries are developing countries and weak institutional quality exists in such countries. Chaudhuri and Ravallion (2006) also argued that a failure in governance increases bad inequalities. Besides, prior studies by Law and Soon (2020), Sarkodie and Adams (2020), and Alesina and Perotti (1996) suggested that institutional quality reduces income inequality.

3. DATA USED AND METHODOLOGY

The present research entirely relies on secondary sources of data. Data were collected from different sources, as shown in Table 2, during the period from 1996 to 2019.

3.1. Classification and Selection of Countries

Table 1 shows the criteria for the classification of countries. Countries are classified using the World Bank classification method of the year 2021 based on GNI per capita in current US$ (Hamadeh, Rompaeyeric, & Metreau, 2022).

Table1. Classification of countries.

Group	GNI per capita in current US$
Low-income countries (LIC)	Less than 1,045
Lower-middle-income countries (LMIC)	Between 1,046 – 4,095
Upper-middle-income countries (UMIC)	Between 4,096 -12,695
High–income countries (HIC)	More than 12,695

Source: World Bank.

3.2. Data Source

Table 2 shows a description of the variables used and the data sources.

Table 2. Description of the variables used and data source.

Variable	Proxy	Symbol used	Description	Sources
Income inequality	Gini index	GINI	It measures the inequality of resources in an economy in a synthetic manner, and the index ranges from 0 to 1. (0 means perfect equality, and 1 means perfect inequality).	World inequality database
Economic growth	GDP purchasing power parity (PPP)	GDP	GDP is measured in terms of PPP.	World inequality database
Population	Population growth rate (Annual %)	POP	Rate of mid-year population growth (%) from t-1 to t.	World bank
Urbanization	Urban population growth (Annual %)	UB	People residing in urban areas.	World bank

Variable	Proxy	Symbol used	Description	Sources
Human development	Human development index	HDI	A concise summary of average performance or achievement in three essential aspects of human development: a healthy life, education, and standard of living. (Index: low (Less than 0.550), medium (Between 0.550-0.699), high (Between 0.700-0.799), very high (Greater than or equal to 0.800)).	UNDP
Inflation	Consumer prices (Annual %)	INF	Annual percentage change in the average consumer's cost of purchasing a basket of goods and services, which may be fixed or altered at predetermined periods.	World bank
Unemployment	Unemployment total	UNE	Percentage of the labor force that is unemployed but willing and able to work.	World bank
Gender equality	Gender equality index	GE	The country's execution of institutions and initiatives to enact laws and regulations that support fair and equitable access for men and women to the economy in terms of education, health, and legal protection (0=lowest score, 1=highest score).	World bank
Natural resource	Total natural resources rent (% of GDP)	NRR	Sum of rents from oil, natural gas, forest, minerals, and coal (Hard and soft).	World bank
Civil liberties	Civil liberties index	CL	It encapsulates the extent of individual liberty, the rule of law, and freedom of expression. Higher scores correspond to more liberties (0=lowest score, 1=highest score).	World bank
Globalization	Globalization index	GLOB	A simple average of economic, social, and political globalization (ranging from 0 to 100 score).	KOF swiss economic institute
Governance	Governance index	GOV	Six components[1] viz. rule of law (RL), government effectiveness (GE), control of corruption (CC), political stability and absence of or no violence (PV), regulatory quality (RQ), and voice and accountability (VA) (each of the components ranges from -2.5 to +2.5).	World bank, worldwide governance indicators (WGI)

3.3. Empirical Model

The present study formulates the model based on previous literature, which is as follows:

$$GINI = f(GDP, POP, UB, HDI, INF, UNE, GE, NRR, CL, GLOB, GOV) \quad (1)$$

All the variables used in Equation 1 are converted into log form, as conversion into log is an appropriate way to transform highly skewed variables into a normal distribution and reduce heteroskedasticity (Benoit, 2011). We estimate the following newly generated Equation 2 panel data regression model to investigate the impact of selected variables on income inequality. Panel data represents the combination of both cross-sectional data and time series data. In our study, we include a total of 90 countries (from LIC=12, LMIC=24, UMIC=24, and HIC=30) (see countries list in Annexure 1) and periods from 1996 to 2019, which differs from past studies. The availability of data determines the selection of nations and time periods for each income group.

[1]RL-upholds a healthy legal system, which includes property rights and the ability to enforce enforcement; GE-assesses the government's capacity to carry out effective policies and uphold its credibility; CC-the degree wherein public power is utilized for personal gain; PV-measures a government's resilience to political violence and terrorism; RQ-the government's capacity to design and carry out good policies and regulations that encourage the expansion of the private sector; VA-the degree to which a country's citizens can engage in political decision-making (Kaufmann, Kraay, & Mastruzzi, 2006).

$$\ln GINI_{it} = \alpha_{it} + \alpha_1 \ln GDP_{it} + \alpha_2 \ln POP_{it} + \alpha_3 \ln UB_{it} + \alpha_4 \ln HDI_{it} + \alpha_5 \ln INF_{it} + \alpha_6 \ln UNE_{it} + \alpha_7 \ln GE_{it} + \alpha_8 \ln NRR_{it} + \alpha_9 \ln CL_{it} + \alpha_{10} \ln GLOB_{it} + \alpha_{11} \ln GOV_{it} + \varepsilon_{it} \quad (2)$$

Where, in Equation 2, i stands for a country and t stands time period; $\ln$ denotes natural logs; α is the intercept; $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8, \alpha_9, \alpha_{10}$, and α_{11} are the coefficients of GDP, POP, UB, HDI, INF, UNE, GE, NRR, CL, GLOB, and GOV, respectively; and $\boldsymbol{\epsilon}$ is the error term.

To transform into a log, the variables having negative values, including population growth, urban population growth, and inflation rate in our study, are transformed into positive values by following the method adopted by Busse and Hefeker (2007), as shown in Equation 3:

$$y = \ln(x + \sqrt{(x^2 + 1)} \quad (3)$$

Again, following the method used by Abbas, Junqing, Ramzan, and Fatima (2021), the governance index is calculated by taking the averages of all six components of governance and adding 2.5 to the mean value and multiplying it by 2 (the score ranges from 0 representing very weak governance to 10 representing very strong governance).

3.4. Estimation Method

3.4.1. Panel Unit Root Test

To check the stationarity or non-stationarity of the variables, the Levin-Lin-Chu (LLC) test has been performed (Levin, Lin, & Chu, 2002). The null hypothesis (H_0) in LLC assumes non-stationarity of the series, and the alternative hypothesis (H_a) assumes stationarity of the series.

3.4.2. Panel Data Estimation

In panel data analysis, three different panel models, namely the pooled ordinary least squares (POLS), fixed effect (FE), and random effect (RE) models are performed.

To decide which model is appropriate between POLS and FE, we run the F-test and the Wald test. The H_0 of F-test and Wald test is H_0: $\mu_1 = \mu_2 = \ldots = \mu$; where, μ_i denotes cross-sectional units. If we fail to reject H_0 then POLS is appropriate; otherwise, we run the FE model. Whereas to decide between POLS and RE models, we perform the Breusch-Pagan Lagrange Multiplier (LM) test (Breusch & Pagan, 1980). In the LM test, H_0 assumes the POLS model is appropriate, against H_a that the RE model is appropriate.

After running the LM test, if we fail to reject H_0, we are bound to run POLS. If, on the other hand, H_0 is rejected, then we decide to choose between the RE and FE models. To decide between FE and RE models, an appropriate test, popularly known as the Hausman test, is performed (Hausman, 1978). The H_0 in the Hausman test assumes that the RE model is suitable and H_a assumes that the FE model is suitable. If the p-value is found to be more than a 5% significance level, then we fail to reject H_0 and conclude that the RE model is appropriate. But if the p-value is below the 5% significance level, we accept H_a, i.e., the FE model is suitable.

3.4.3. Diagnostic Test

A diagnostic test has been performed to check the problem of heteroskedasticity and autocorrelation.

4. EMPIRICAL RESULTS AND INTERPRETATION

4.1. Panel Unit Root Test

The results of LLC presented in Table 3 show the mixed order of integration. In LIC, GDP and civil liberty index; in LMIC and UMIC, GDP, urbanization, and natural resource rent; and in HIC, civil liberties are not stationary at their level but become stationary after the first difference. While all other selected variables are stationary at the level.

Table 3. LLC unit-root test.

Variables	LIC		LMIC		UMIC		HIC	
	At level	1st difference	At level	1st difference	At level	1st difference	At level	1st difference
	t-statistics	t-statistics	t-statistics	t-statistics	t-statistics	t-statistics	t-statistics	t-statistics
lnGINI	-4.439***		-3.311***		-3.311***		-2.999***	
lnGDP	-0.981	-2.841***	0.742	-7.831***	0.742	-7.831***	-3.563***	
lnPOP	-15.379***		-7.683***		-7.683***		-8.697***	
lnUB	-10.207***		-0.7144	-5.439**	-0.714	-5.439***	-8.433***	
lnHDI	-3.978***		-8.900***		-8.900***		-8.099***	
lnINF	-2.162**		-6.057***		-6.057***		-7.134***	
lnUNE	-3.199***		-2.318**		-2.318**		-2.722***	
lnGE	-1.603*		-2.054**		-2.054**		-3.069***	
lnNRR	-1.422*		-1.247	-12.445***	-1.247	-12.445***	-3.030***	
lnCL	-0.375	-5.576***	-4.129***		-4.129***		2.923	-4.408***
lnGLOB	-5.572***		-8.137***		-8.137***		-9.549***	
lnGOV	-1.662**		-2.609***		-2.609***		-1.751***	

Note: ***, ** and * indicates significance level at 1%, 5% and 10% respectively.

4.2. F-test/Wald Test and LM Test

The F-test/Wald test and LM test presented in Table 4 reveal that the F-test/Wald test is significant at a 1 % level, indicating that POLS cannot be used and the FE model is suitable for all income-group countries. The LM test at a 1% significance level also indicated that for LMIC, UMIC, and HIC, the RE model is significant. The p-value of the LM test in LIC is not significant, which shows that RE is not appropriate. However, the F-test/Wald test at a 1% significance level indicates that the data is not poolable for LIC.

Table 4. F-test/Wald test and LM test.

Income group countries	F-test/Wald test	LM test
LIC	F = 9.44, Probability = 0.000 Wald χ^2= 66.66, Probability= 0.000	$\bar{\chi}^2$ = 0.00 Probability = 1.000
LMIC	F = 11.31, Probability = 0.000 Wald χ^2 = 121.29, Probability= 0.000	$\bar{\chi}^2$ = 34491.74 Probability = 0.000
UMIC	F = 12.34, Probability = 0.000 Wald χ^2= 95.12, Probability= 0.000	$\bar{\chi}^2$ = 1730.07 Probability = 0.000
HIC	F = 13.53, Probability = 0.000 Wald χ^2 =138.94, Probability = 0.000	$\bar{\chi}^2$ = 3817.87 Probability = 0.000

4.3. Hausman Test

Now, to select the appropriate model between the FE and RE, the Hausman test has been used. The p-value in Table 5 is significant at a 1% level for LIC, UMIC, and HIC and at a 5% level for LMIC. This means that FE can be used to look into the relationship between the dependent and independent variables. But before going to run the FE model, it is necessary to perform a diagnostic test.

Table 5. Hausman test.

Income group countries	Hausman test	Probability value
LIC	χ^2 = 210.86	Probability = 0.000
LMIC	χ^2 = 24.55	Probability = 0.011
UMIC	χ^2 = 93.01	Probability = 0.000
HIC	χ^2 = 57.63	Probability = 0.000

4.4. Robustness Check for Heteroskedasticity and Autocorrelation

The Modified Wald test for heteroskedasticity (H_0: homogeneous) proposed by Greene (2000) and the Wooldridge test for autocorrelation (H_0: no autocorrelation) proposed by Wooldridge (2010) presented in Table 6 show the existence of heteroskedasticity and autocorrelation as the p-value is significant at a 1% level.

Table 6. Wald test and Wooldridge test.

Income group countries	Wald test	Wooldridge test
LIC	χ^2= 3427.60 Probability = 0.000	F = 273.103 Probability = 0.000
LMIC	χ^2 = 1713.12 Probability = 0.000	F= 44.111 Probability = 0.000
UMIC	χ^2 = 2729.41 Probability = 0.000	F = 36.131 Probability = 0.000
HIC	χ^2 = 5365.55 Probability = 0.000	F= 33.859 Probability= 0.000

4.5. FGLS and PCSE Regression Results

The diagnostic test shown in Table 6 found problems with heteroskedasticity and autocorrelation. This means that the FE model result cannot be used, or it could give wrong results. When you use the POLS, RE, and FE models on panel data, they might not work well or give you fair results because of autocorrelation and differences between countries (Greene, 2000). Because of this, the FGLS method is the best way to deal with problems like heteroskedasticity, autocorrelation, and endogeneity in panel data (Hicks, 1994; Kmenta, 1986; Parks, 1967; Reed & Ye, 2011). This method is considered to be more efficient than any other OLS (ordinary least squares) estimate (Bai, Choi, & Liao, 2021). In addition to FGLS, the PCSE method is applied because it provides more reliable results (Zhang & Zhao, 2014). People think that the PCSE method can handle errors better when they are heteroscedastic, cross-sectionally correlated, and auto-correlated (Beck & Katz, 1995).

Table 7. FGLS and PCSE results (Dependent variable: lnGINI).

Independent variables	LIC		LMIC		UMIC		HIC	
	FGLS	PCSE	FGLS	PCSE	FGLS	PCSE	FGLS	PCSE
lnGDP	-0.024 (-0.21)	-0.024 (-0.21)	-0.015*** (-5.82)	-0.015*** (-5.89)	0.033*** (13.61)	0.033*** (10.13)	0.021*** (5.54)	0.021*** (6.84)
lnPOP	-0.116*** (-3.84)	-0.116*** (-3.13)	0.055*** (6.78)	0.055*** (7.43)	0.146*** (15.42)	0.146*** (19.63)	0.110*** (12.53)	0.110*** (10.39)
lnUB	0.002 (0.11)	0.002 (0.11)	-0.019** (-2.56)	-0.019*** (-2.84)	-0.046*** (-5.56)	-0.046*** (-7.62)	-0.069*** (-3.54)	-0.069*** (-3.31)
lnHDI	0.240*** (2.94)	0.240** (2.59)	-0.222*** (-5.19)	-0.222*** (-9.94)	-0.271*** (-4.24)	-0.271*** (-4.71)	-0.333** (-2.24)	-0.333*** (-2.61)
lnINF	0.002 (0.63)	0.002 (0.71)	-0.004 (-0.94)	-0.004 (-0.96)	0.002 (0.52)	0.002 (0.60)	-0.014*** (-2.73)	-0.014** (-2.28)
lnUNE	-0.009 (-1.09)	-0.009 (-1.19)	-0.004 (-0.89)	-0.004 (-1.29)	-0.017*** (-3.01)	-0.017*** (-4.24)	-0.003 (-0.37)	-0.003 (-0.37)
lnGE	-0.066*** (-2.64)	-0.066*** (-2.83)	-0.121*** (-4.65)	-0.121*** (-6.74)	0.015 (0.69)	0.015 (0.95)	0.128*** (4.97)	0.128*** (5.07)
lnNRR	0.014 (1.47)	0.014 (1.42)	0.0001 (0.01)	0.0001 (0.01)	0.0001 (0.02)	0.0001 (0.01)	0.005** (2.53)	0.005*** (4.46)
lnCL	0.059* (1.70)	0.058* (1.69)	-0.012 (-0.55)	-0.012 (-0.79)	0.275*** (12.25)	0.275*** (13.99)	-0.073** (-2.35)	-0.073*** (-2.60)
lnGLOB	-0.146** (-2.08)	-0.146** (-2.43)	0.089*** (2.77)	0.089*** (5.33)	-0.044 (-1.11)	-0.044 (-1.27)	-0.694*** (-9.33)	-0.694*** (-7.81)
lnGOV	0.068*** (2.85)	0.068*** (4.47)	0.146*** (5.97)	0.146*** (6.96)	0.073*** (2.96)	0.073*** (5.11)	-0.231*** (-5.05)	-0.231*** (-4.57)

Note: Z statistics in parentheses;***, ** and * indicates significance level at 1%, 5%, and 10% respectively.

The results of Table 7 show that in LIC, economic growth has an insignificant impact on income inequality. But in LMIC, economic growth has a statistically significant and negative impact on income inequality. This result is consistent with the findings of Ullah et al. (2021). This reveals that the benefits accruing from economic growth are distributed in favour of the bottom section of the population. In UMIC and HIC, GDP has a significantly positive impact on income inequality. This finding is similar to that of Odedokun and Round (2001). Since most of the countries in UMIC and HIC are capitalist countries, probably rich people have higher savings as compared to the bottom section of the people who have a higher inducement to invest and thus higher profit, resulting in income inequality (Bourguignon, 1981).

In LIC, population has a significantly negative effect on income inequality. This finding is in line with Butler et al. (2020). One of the possible reasons may be the low development of technology and adoption of labor-intensive techniques in such countries, and hence, a growing population is employed to produce labor-intensive products. In LMIC, UMIC, and HIC, a positive impact of the population can be observed on income inequality. This finding corroborates that of Kentor (2001), Ullah et al. (2021), and Marsh (2015), who argued that as the population increases, the allocation of resources towards the bottom section of the population diminishes, which results in a widening of income inequality.

In LIC, the impact of urbanization on income inequality is not significant. In LMIC, UMIC, and HIC, income inequality reduces with the increase in urbanization. This result is parallel to that of Adams and Klobodu (2019) and Ha, Le, and Trung-Kien (2019). One possible explanation is the migration of rural residents to urban areas, where they can find jobs in industries or manufacturing sectors that offer higher wages than their previous occupations (Ha et al., 2019).

In LIC, the effect of HDI on income inequality is significantly positive. This indicates that only a few sections of the population enjoy a good education, a high standard of living, and a healthy life. Since HDI can raise the productivity of the labor force and raise their income level (Behrman, 1993), only a few sections of the population tend to raise their income level. On the other hand, in LMIC, UMIC, and HIC, a percentage improvement in HDI reduces income inequality. This outcome or result is the same as in the study of Amiti and Cameron (2012). Grimm, Harttgen, Klasen, and Misselhorn (2008) showed that in some of the LMIC and UMIC, such as Vietnam, Colombia, and Indonesia, and in developed countries such as the USA and Finland, inequality in HDI between rich and poor is small. One possible interpretation of our result is that the skill- and labor-based earnings distribution is relatively narrow, which demonstrates that income inequality among the people who use their human capital is low.

Inflation does not show any significant effect on income inequality in LIC, LMIC, and UMIC. In HIC, a significant negative effect of inflation is observed. This result resembles that of Ullah et al. (2021). The possible statement may be the implementation of stronger tax policies and higher tax revenue in HIC, and additionally, during times of inflation, redistribution of resources in favour of the poor by taxing the rich at a higher rate may be the probable reason (Gustafsson, 1999; Kim, 2016).

The impact of unemployment on income inequality is not significant in LIC, LMIC, and HIC. But the coefficient of unemployment is negative and significant in UMIC. This result is the same as that of Muryani et al. (2021), who argue that instead of lowering the unemployment rate, improvement in labour productivity is required to create a favourable effect on income distribution.

The gender equality significantly reduces income inequality in LIC and LMIC. Baloch et al. (2018) and Grotti and Scherer (2016) reported that a rise in the participation of females in the job market reduces income inequality. The coefficient of gender equality is positive but not significant in UMIC. In HIC, gender equality has a significantly positive impact on income inequality. This result is in line with the findings of Maxwell (1990), who suggested that a rise in income inequality is because of the continuing increase in the participation of females in the job market or the dual-earning of husband and wife.

The impact of natural resources on income inequality is not significant in LIC, LMIC, and UMIC. However, a significantly positive impact of natural resources can be seen on income inequality in HIC. The result is in line with ElGindi (2017). Supporting the resource curse argument, this result postulates that rent generated from natural resources is captured by the elite group and hence increases income inequality between the top and bottom classes of the people as the resources are not allocated in favour of the bottom section of the population (Anyanwu, 2016). Another possible explanation is that an increase in rent from natural resources promotes corruption and generates greed among policymakers, which leads to more unequal income distribution (Grossman & Helpman, 1996).

The coefficient of civil liberty is positive and statistically significant in LIC and UMIC. This indicates that rich people can influence policy, which benefits them more and prevents the poor from such benefits as an imperfection in the credit market (Banerjee & Newman, 1991; Bertola, 1993). But in LMIC, civil liberty does not show any significant impact. On the other hand, in HIC, a significant negative impact of civil liberty is observed on income inequality. This result shows that people vote for a government that brings equal opportunities and redistributes income from people with high incomes to people with low incomes (Esarey, Salmon, & Barrilleaux, 2012).

In LIC and HIC, the effect of globalization on income inequality is both negative and significant. The result is consistent with that of Ullah et al. (2021). Their study confirms that globalization boosts digitalization, investment, and employment for both semi-skilled and unskilled workforces and helps in the reduction of income inequality. But in LMIC, an increase in globalization increases income inequality. Such similar results are found in Milanovic (2005) and Thalassinos et al. (2012). The reason could be the negative impact of globalization that hinders human development, which widens the income gap both in the micro and macro economies by creating a skill imbalance in corporate practices (Haseeb, Suryanto, Hartani, & Jermsittiparsert, 2020). In UMIC, the coefficient of globalization is negative but insignificant.

A positive and statistically significant impact of governance is observed on income inequality in LIC, LMIC, and UMIC. This result is parallel to that of Chaudhuri and Ravallion (2006). Chaudhuri and Ravallion (2006) distinguished two types of inequalities: good and bad inequality. Good inequalities refer to those that reflect and support the market-based incentives required to promote growth, entrepreneurship, and innovation. Bad inequalities are those that prevent people from accessing markets and restrict investment in physical and human capital. However, this may be the good income inequality that is likely to increase due to improvements in governance quality (Zhuang, Dios, & Lagman-Martin, 2010). On the other hand, an improvement in governance reduces income inequality in HIC. This result is in line with those of Law and Soon (2020), Sarkodie and Adams (2020), and Alesina and Perotti (1996). Supporting their results, a better governance system and greater political stability in these countries could be the main reasons for low-income inequality.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The main objective of this paper is to investigate the factors that determine income inequality among different income-group countries during the period 1996-2019. For empirical analysis, this study employed FGLS and PCSE regression methods to find the determinants of income inequality.

5.1. Conclusion

The results suggest that LIC, HDI, civil liberty, and governance exacerbate income inequality, while population, gender equality, and globalization significantly reduce it. However, special attention should be focused on population growth because it may not be possible to employ a growing population in all productive services in the long run; rather, it may widen income inequality in the long-run. In LMIC, population, globalization, and governance increase inequality. On the other hand, GDP, urbanization, HDI, and gender equality significantly contribute to lowering income inequality. In UMIC, economic growth, population, civil liberty, and governance exacerbate income inequality, while urbanization, HDI, and unemployment have an income inequality-reducing effect. In HIC, economic

growth, population, gender equality, and natural resources worsen income distribution. But urbanization, HDI, inflation, civil liberty, globalization, and governance significantly reduce income inequality. Hence, to reduce income inequality, it is necessary to examine the role of these factors that exacerbate income inequality among different income-group countries.

5.2. Policy Recommendations

Based on these findings, a viable policy recommendation in LIC is to promote human development, gender equality, and good governance to further reduce income inequality. These factors may enhance the opportunities and capabilities of impoverished and marginalized groups, as well as improve the accountability and transparency of public institutions. Additionally, civil liberty should be balanced with social justice, as too much freedom may lead to exploitation and discrimination. Policies should enhance the quality of governance to improve the impact of the governance system on income inequality. In LMIC, policies that aim to reduce population growth, promote inclusive globalization, and improve governance quality may also help to reduce income inequality, but they should be accompanied by redistributive measures that guarantee that the fruits of growth and development are shared more fairly among all segments of society. A possible policy recommendation to mitigate income inequality in UMIC countries is to control population growth, and promote inclusive growth, which benefits all sections of society, especially the poor and marginalized sections. Investments in public services, infrastructure, social protection, and human capital can all help to achieve this goal while also creating more and better jobs. Moreover, enhancing civil liberty and governance quality can also help reduce income inequality by ensuring that people have equal access to opportunities, rights, and justice and that public resources are allocated fairly and transparently. In HIC, a possible policy recommendation is to adopt measures that share the benefits of economic growth, population control, gender equality for all sections, and investment from the rent of natural resources. For example, policies that can promote progressive taxation, social protection, redistribution, public investment, education, and health care can help reduce income disparities and ensure more inclusive and sustainable development. Additionally, policies that foster environmental sustainability, resource efficiency, and diversification of the economic structure can help reduce the reliance on natural resources and the associated hazards of volatility and rent-seeking.

5.3. Limitations and Future Scope

Although this study introduces novel aspects in terms of including more macroeconomic factors among different income group countries, due to data unavailability, some of the countries are excluded from the present study. Hence, future researchers could explore this study more deeply using country-specific data at a national or regional level.

Funding: This research is supported by the University Grants Commission of India for the Senior Research Fellowship (Grant number: F.15-9(JULY 2018)/2018(NET), UGC-Ref. No.: 1/ (NET-JULY 2018)).
Institutional Review Board Statement: Not applicable.
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: The corresponding author can provide the supporting data of this study upon a reasonable request.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Abbas, Q., Junqing, L., Ramzan, M., & Fatima, S. (2021). Role of governance in debt-growth relationship: Evidence from panel data estimations. *Sustainability, 13*(11), 5954. https://doi.org/10.3390/su13115954

Adams, S., & Klobodu, E. K. M. (2019). Urbanization, economic structure, political regime, and income inequality. *Social Indicators Research, 142*, 971-995. https://doi.org/10.1007/s11205-018-1959-3

Alesina, A., & Perotti, R. (1996). Income distribution, political instability, and investment. *European Economic Review*, *40*(6), 1203-1228. https://doi.org/10.1016/0014-2921(95)00030-5

Ali, I. M. A., Attiaoui, I., Khalfaoui, R., & Tiwari, A. K. (2021). The effect of urbanization and industrialization on income inequality: An analysis based on the method of moments quantile regression. *Social Indicators Research*, *161*(1), 29-50. https://doi.org/10.1007/s11205-021-02812-6

Alvarado, R., Tillaguango, B., López-Sánchez, M., Ponce, P., & Işık, C. (2021). Heterogeneous impact of natural resources on income inequality: The role of the shadow economy and human capital index. *Economic Analysis and Policy*, *69*, 690-704. https://doi.org/10.1016/j.eap.2021.01.015

Amate-Fortes, I., Guarnido-Rueda, A., Martínez-Navarro, D., & Oliver-Márquez, F. J. (2021). Measuring inequality in income distribution between men and women: What causes gender inequality in Europe? *Quality & Quantity*, *55*(2), 395-418. https://doi.org/10.1007/s11135-020-01009-2

Amiti, M., & Cameron, L. (2012). Trade liberalization and the wage skill premium: Evidence from Indonesia. *Journal of International Economics*, *87*(2), 277-287. https://doi.org/10.1016/j.jinteco.2012.01.009

Anyanwu, J. C. (2016). Empirical analysis of the main drivers of income inequality in Southern Africa. *Annals of Economics & Finance*, *17*(2), 337–364.

Bahmani-Oskooee, M., Hegerty, S. W., & Wilmeth, H. (2008). Short-run and long-run determinants of income inequality: Evidence from 16 countries. *Journal of Post Keynesian Economics*, *30*(3), 463-484. http://dx.doi.org/10.2753/PKE0160-3477300308

Bai, J., Choi, S. H., & Liao, Y. (2021). Feasible generalized least squares for panel data with cross-sectional and serial correlations. *Empirical Economics*, *60*, 309-326. https://doi.org/10.1007/s00181-020-01977-2

Baloch, A., Noor, Z. M., Habibullah, M. S., & Bani, N. (2018). The effect of the gender equality on income inequality: A dynamic panel approach. *Jurnal Ekonomi Malaysia*, *52*(2), 3-17. https://doi.org/10.17576/JEM-2018-5202-1

Banerjee, A. V., & Newman, A. F. (1991). Risk-bearing and the theory of income distribution. *The Review of Economic Studies*, *58*(2), 211-235. https://doi.org/10.2307/2297965

Batuo, M. E., Kararach, G., & Malki, I. (2022). The dynamics of income inequality in Africa: An empirical investigation on the role of macroeconomic and institutional forces. *World Development*, *157*, 105939. https://doi.org/10.1016/j.worlddev.2022.105939

Beck, N., & Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review*, *89*(3), 634-647. https://doi.org/10.2307/2082979

Behrman, J. R. (1993). The economic rationale for investing in nutrition in developing countries. *World Development*, *21*(11), 1749-1771.

Benoit, K. (2011). Linear regression models with logarithmic transformations. *London School of Economics, London*, *22*(1), 23-36.

Bertola, G. (1993). Factor shares and savings in endogenous growth. *American Economic Review*, *83*(5), 1184-1198.

Bourguignon, F. (1981). Pareto superiority of unegalitarian equilibria in Stiglitz'model of wealth distribution with convex saving function. *Econometrica: Journal of the Econometric Society*, *49*(6), 1469-1475. https://doi.org/10.2307/1911412

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239-253. https://doi.org/10.2307/2297111

Busse, M., & Hefeker, C. (2007). Political risk, institutions and foreign direct investment. *European Journal of Political Economy*, *23*(2), 397-415. https://doi.org/10.1016/j.ejpoleco.2006.02.003

Butler, J., Wildermuth, G. A., Thiede, B. C., & Brown, D. L. (2020). Population change and income inequality in rural America. *Population Research and Policy Review*, *39*(5), 889-911. https://doi.org/10.1007/s11113-020-09606-7

Castells-Quintana, D., & Royuela, V. (2012). Unemployment and long-run economic growth: The role of income inequality and urbanisation. *Investigaciones Regionales-Journal of Regional Research*, *24*, 153-173.

Chaudhuri, S., & Ravallion, M. (2006). *Partially awakened giants : Uneven growth in China and India*. Policy Research Working Paper Series No. 4069, The World Bank.

Dabla-Norris, E., Kochhar, K., Suphaphiphat, N., Ricka, F., & Tsounta, E. (2015). *Causes and consequences of income inequality: A global perspective (No. 2015/013)*. International Monetary Fund.

Deyshappriya, N. P. R. (2017). *Impact of macroeconomic factors on income inequality and income distribution in Asian countries*. ADBI Working Paper No. 696. Tokyo: Asian.

ElGindi, T. (2017). Natural resource dependency, neoliberal globalization, and income inequality: Are they related? A longitudinal study of developing countries (1980–2010). *Current Sociology, 65*(1), 21-53. https://doi.org/10.1177/0011392116632031

Esarey, J., Salmon, T. C., & Barrilleaux, C. (2012). What motivates political preferences? Self-interest, ideology, and fairness in a laboratory democracy. *Economic Inquiry, 50*(3), 604-624. https://doi.org/10.1111/j.1465-7295.2011.00394.x

Greene, W. H. (2000). *Econometric analysis* (4th ed.). Englewood Cliffs: Prentice Hall.

Grimm, M., Harttgen, K., Klasen, S., & Misselhorn, M. (2008). A human development index by income groups. *World Development, 36*(12), 2527-2546. https://doi.org/10.1016/j.worlddev.2007.12.001

Grossman, G. M., & Helpman, E. (1996). Electoral competition and special interest politics. *Economic Studies, 63*(2), 265-286. https://doi.org/10.2307/2297852

Grotti, R., & Scherer, S. (2016). Does gender equality increase economic inequality? Evidence from five countries. *Research in Social Stratification and Mobility, 45*, 13-26. https://doi.org/10.1016/j.rssm.2016.06.001

Gustafsson, B. A. (1999). In search of smoking guns: What makes income inequality vary over time in different countries? *American Sociological Review, 64*(4), 585-605. https://doi.org/10.2307/2657258

Ha, N. M., Le, N. D., & Trung-Kien, P. (2019). The impact of urbanization on income inequality: A study in Vietnam. *Journal of Risk and Financial Management, 12*(3), 1-14. https://doi.org/10.3390/jrfm12030146

Hamadeh, N., Rompaeyeric, C., & Metreau, E. (2022). *New world bank country classifications by income level: 2021-2022*. Retrieved from https://blogs.worldbank.org/opendata/new-world-bank-country-classifications-income-level-2021-2022

Hartwell, C. A., Horvath, R., Horvathova, E., & Popova, O. (2019). Democratic institutions, natural resources, and income inequality. *Comparative Economic Studies, 61*, 531-550. https://doi.org/10.1057/s41294-019-00102-2

Haseeb, M., Suryanto, T., Hartani, N. H., & Jermsittiparsert, K. (2020). Nexus between globalization, income inequality and human development in Indonesian economy: Evidence from application of partial and multiple wavelet coherence. *Social Indicators Research, 147*(3), 723-745. https://doi.org/10.1007/s11205-019-02178-w

Hausman, J. (1978). Specification tests in econometrics. *Econometrica: Journal of the Econometric Society, 46*(6), 1251-1271. https://doi.org/10.2307/1913827

Hicks, A. (1994). Introduction to Pooling. In T. Janoski, & A. Hicks (Eds.), The comparative political economy of the welfare state. In (pp. 189–217). Cambridge: Cambridge University Press.

Hirschman, A. O., & Rothschild, M. (1973). The changing tolerance for income inequality in the course of economic development: With a mathematical appendix. *The Quarterly Journal of Economics, 87*(4), 544-566. https://doi.org/10.2307/1882024

Huang, B., Morgan, P., & Yoshino, N. (2019). *Demystifying rising inequality in Asia*. Tokyo: Asian Development Bank Institute.

Jäntti, M., & Jenkins, S. P. (2010). The impact of macroeconomic conditions on income inequality. *The Journal of Economic Inequality, 8*, 221-240. https://doi.org/10.1007/s10888-009-9113-8

Kanbur, R., & Zhuang, J. (2013). Urbanization and inequality in Asia. *Asian Development Review, 31*(1), 131–147. http://dx.doi.org/10.2139/ssrn.2260109

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2006). *Governance matters V: Governance indicators for 1996–2005*. World Bank Policy Research Working Paper No. 4012, World Bank, Washington.

Kentor, J. (2001). The long term effects of globalization on income inequality, population growth, and economic development. *Social Problems, 48*(4), 435-455. https://doi.org/10.1525/sp.2001.48.4.435

Kim, J.-H. (2016). A study on the effect of financial inclusion on the relationship between income inequality and economic growth. *Emerging Markets Finance and Trade, 52*(2), 498-512. https://doi.org/10.1080/1540496X.2016.1110467

Kmenta, J. (1986). *Elements of econometrics* (2nd ed.). London: Collier Macmillan.

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review, 45*(1), 1-28.

Law, C.-H., & Soon, S.-V. (2020). The impact of inflation on income inequality: The role of institutional quality. *Applied Economics Letters, 27*(21), 1735-1738. https://doi.org/10.1080/13504851.2020.1717425

Levin, A., Lin, C.-F., & Chu, C.-S. J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics, 108*(1), 1-24. https://doi.org/10.1016/S0304-4076(01)00098-7

Li, H., & Zou, H. f. (1998). Income inequality is not harmful for growth: Theory and evidence. *Review of Development Economics, 2*(3), 318-334. https://doi.org/10.1111/1467-9361.00045

Marsh, R. M. (2015). Determinants of income inequality in the early twenty-first century: A cross-national study. *Comparative Sociology, 14*(2), 219-251. https://doi.org/10.1163/15691330-12341344

Martínez, R., Ayala, L., & Ruiz-Huerta, J. (2001). The impact of unemployment on inequality and poverty in OECD countries. *Economics of Transition, 9*(2), 417-447. https://doi.org/10.1111/1468-0351.00082

Maxwell, N. L. (1990). Changing female labor force participation: Influences on income inequality and distribution. *Social Forces, 68*(4), 1251-1266. https://doi.org/10.1093/sf/68.4.1251

Milanovic, B. (2005). Can we discern the effect of globalization on income distribution? Evidence from household surveys. *The World Bank Economic Review, 19*(1), 21-44. https://doi.org/10.1596/1813-9450-2876

Mishchuk, H., Samoliuk, N., Bilan, Y., & Streimikiene, D. (2018). Income inequality and its consequences within the framework of social justice. *Problems of Sustainable Development, 13*(2), 131-138.

Munir, K., & Bukhari, M. (2020). Impact of globalization on income inequality in Asian emerging economies. *International Journal of Sociology and Social Policy, 40*(1/2), 44-57. https://doi.org/10.1108/IJSSP-08-2019-0167

Muryani, E. M. A., Sethi, N., & Iswanti, H. (2021). Dynamics of income inequality, investment, and unemployment in Indonesia. *Journal of Population and Social Studies, 29*, 660-678. http://doi.org/10.25133/JPSSv292021.040

Odedokun, M. O., & Round, J. I. (2001). *Determinants of income inequality and its effects on economic growth: Evidence from African countries (No. 2001/103)*. WIDER Discussion Paper.

OECD. (2015). *In it together: Why less inequality benefits all*. Paris: OECD Publishing. https://doi.org/10.1787/9789264235120-en.

Parks, R. W. (1967). Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated. *Journal of the American Statistical Association, 62*(318), 500-509. https://doi.org/10.1080/01621459.1967.10482923

Perugini, C., & Tekin, İ. (2022). Financial development, income inequality and governance institutions. *Panoeconomicus, 69*(3), 353-379. https://doi.org/10.2298/PAN191022004P

Prawoto, N., & Cahyani, R. (2020). Analysis of unequal distribution of population income in Indonesia. *Journal of Asian Finance, Economics and Business, 7*(7), 489 – 495. https://doi.org/10.13106/jafeb.2020.vol7.no7.489

Reed, W. R., & Ye, H. (2011). Which panel data estimator should I use? *Applied Economics, 43*(8), 985-1000. https://doi.org/10.1080/00036840802600087

Saha, S., Beladi, H., & Kar, S. (2021). Corruption control, shadow economy and income inequality: Evidence from Asia. *Economic Systems, 45*(2), 100774. https://doi.org/10.1016/j.ecosys.2020.100774

Sarkodie, S. A., & Adams, S. (2020). Electricity access, human development index, governance and income inequality in Sub-Saharan Africa. *Energy Reports, 6*, 455-466. https://doi.org/10.1016/j.egyr.2020.02.009

Sebri, M., & Dachraoui, H. (2021). Natural resources and income inequality: A meta-analytic review. *Resources Policy, 74*, 102315. https://doi.org/10.1016/j.resourpol.2021.102315

Sulemana, I., Nketiah-Amponsah, E., Codjoe, E. A., & Andoh, J. A. N. (2019). Urbanization and income inequality in Sub-Saharan Africa. *Sustainable Cities and Society, 48*, 101544. https://doi.org/10.1016/j.scs.2019.101544

Taresh, A. A., Sari, D. W., & Purwono, R. (2021). Analysis of the relationship between income inequality and social variables: Evidence from Indonesia. *Economics and Sociology, 14*(1), 103-119. https://doi.org/10.14254/2071-789X.2021/14-1/7

Thalassinos, E., Uğurlu, E., & Muratoğlu, Y. (2012). Income inequality and inflation in the EU. *European Research Studies, 15*(1), 127-140. https://doi.org/10.35808/ersj/347

Theyson, K. C., & Heller, L. R. (2015). Development and income inequality: A new specification of the Kuznets hypothesis. *The Journal of Developing Areas, 49*(3), 103-118. https://doi.org/10.1353/jda.2015.0153

Ullah, A., Kui, Z., Ullah, S., Pinglu, C., & Khan, S. (2021). Sustainable utilization of financial and institutional resources in reducing income inequality and poverty. *Sustainability, 13*(3), 1038. https://doi.org/10.3390/su13031038

UNDP. (2023). *165 million people fell into poverty between 2020 to 2023 as debt servicing crowded out social protection, health and education expenditures.* Retrieved from https://www.undp.org/press-releases/165-million-people-fell-poverty-between-2020-2023-debt-servicing-crowded-out-social-protection-health-and-education-expenditures

United Nations. (2020). *Inequality–bridging the divide.* Retrieved from https://www.un.org/en/un75/inequality-bridging-divide

Wolde, M., Sera, L., & Merra, T. M. (2022). Causal relationship between income inequality and economic growth in Ethiopia. *Cogent Economics & Finance, 10*(1), 2087299. https://doi.org/10.1080/23322039.2022.2087299

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data.* Cambridge: MIT Press.

World Inequality Report. (2022). *World inequality report.* Retrieved from https://wir2022.wid.world/wwwsite/uploads/2021/12/WorldInequalityReport2022_Full_Report.pdf

Xu, C., Han, M., Dossou, T. A. M., & Bekun, F. V. (2021). Trade openness, FDI, and income inequality: Evidence from Sub-Saharan Africa. *African Development Review, 33*(1), 193-203. https://doi.org/10.1111/1467-8268.12511

Zhang, C., & Zhao, W. (2014). Panel estimation for income inequality and CO2 emissions: A regional analysis in China. *Applied Energy, 136*, 382-392. https://doi.org/10.1016/j.apenergy.2014.09.048

Zhuang, J., Dios, E. D., & Lagman-Martin, A. (2010). *Governance and institutional quality and the links with economic growth and income inequality: With Special Reference to Developing Asia.* ADB Economics Working Paper Series No. 193.

BIBLIOGPAPHY

KOF Swiss Economic Institute. Data. Retrieved from https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html

UNDP. Data. Retrieved from https://hdr.undp.org/data-center/human-development-index#/indicies/HDI

World Bank. Data. Retrieved from https://data.worldbank.org/

World Bank. Data. Retrieved from https://tcdata360.worldbank.org/indicators/h20daa762?country=BRA&indicator=41794&viz=line_chart&years=1975,2021

World Bank, Worldwide Governance Indicators. Data. Retrieved from https://databank.worldbank.org/source/worldwide-governance-indicators

World Inequality Database. Data. Retrieved from https://wid.world/

Annexure1. List of countries.

LIC	Central African Republic, Zambia, Malawi, Rwanda, DR Congo, Yemen, Sudan, Mali, Burundi, Niger, Togo, Uganda
LMIC	Lesotho, Republic of the Congo, Cambodia, Haiti, Bolivia, Honduras, El Salvador, Cameroon, Kenya, Iran, Benin, Philippines, Ukraine, Algeria, Kyrgyzstan, Pakistan, Nepal, Bangladesh, Mauritania, Indonesia, Tunisia, Mongolia, India, Vietnam
UMIC	Botswana, Mexico, South Africa, Peru, Brazil, Colombia, Paraguay, Guatemala, Jamaica, Dominican Republic, Thailand, Costa Rica, Albania, Belarus, Bulgaria, Moldova, Serbia, Azerbaijan, Armenia, China, Malaysia, Mauritius, Russia, Gabon
HIC	Chile, Qatar, Bahrain, Saudi Arabia, Kuwait, Panama, Trinidad and Tobago, Israel, Uruguay, USA, Japan, Estonia, Canada, Singapore, Romania, Czech Republic, Slovakia, Norway, Hungary, Sweden, Netherland, Slovenia, Denmark, Finland, Switzerland, Italy, France, Austria, Belgium, Poland

Issue No.KGC/IS/2024/.~~13~~6

INTERNATIONAL SEMINAR
ON
SUSTAINABLE DEVELOPMENT:
SOCIO-ECONOMIC, POLITICAL AND TECHNOLOGICAL ASPECTS

Organised by the Department of Economics, Computer Science and Political Science
in collaboration with IQAC, Kokrajhar Govt. College, Kokrajhar, Assam, India

Certificate

This is to certify that

Prof./Dr./Mr./Ms. Iragdao Raja Basumatary

of Bodoland University (Research Scholar)

participated / presented a paper

entitled Nexus between Sustainable Development, Income Inequality and Corruption in South Asian Countries: An Empirical Analysis.

in the International Seminar on ***Sustainable Development : Socio-Economic, Political and Technological Aspects*** *held on 25th May, 2024*

(Dr. Dimacha D. Mwchahary)
Principal
Kokrajhar Govt. College

Bodosa 25/05/24

(Dr. Kamal Bodosa)
Convenor
Seminar Organising Committee

CERTIFICATE

58th Annual Conference of The Indian Econometric Society

This is to certify that Prof./Dr./Mr./Ms. Iragdao Raja Basumatary

has presented a paper titled Income inequality, governance quality and environmental degradation in Asian Countries : Does interaction of governance quality matter? Evidence from Panel Data

at the **58th Annual Conference of The Indian Econometric Society (TIES)**

organised by **Tripura University (A Central University)**

during February 22–24, 2024.

DR. K. SHANMUGAN
Secretary,
The Indian Econometric Society

PROF. SUBHRABARAN DAS
Organising Secretary &
Head, Department of Economics, TU

THE ICFAI UNIVERSITY TRIPURA

Faculty of Management & Commerce
ICFAI University Tripura, India
&
Kettering University, USA

Jointly Organises

A

International Conference

on

Managing Sustainable Growth and Development: Issues and Challenges of the Global Economy

Dated: 5th – 6th October, 2023

Certificate of Participation

This is to certify that Mr. /Mrs. /Ms. /Dr. / Prof. Iragdao Raja Basumatary

of Department of Economics, Bodoland University, Kokrajhar, Assam

has participated in the International Conference on ***"Managing Sustainable Growth and Development: Issues and Challenges of the Global Economy"*** *jointly organized by the Faculty of Management & Commerce, The ICFAI University Tripura, and Kettering University, USA, on October 5 – 6, 2023.*

He / She have presented a paper titled: Income Inequality, Democracy, and Governance in BRICS Countries: FGLS and PCSE Regression

Prof. John Grether Professor of Practice, School of Management Kettering University, USA	Prof. (Dr.) Sujit Deb Dean, Faculty of Management and Commerce ICFAI University, Tripura	Dr. A. Ranganath Registrar ICFAI University, Tripura	Prof. Dr. Biplab Halder Vice Chancellor ICFAI University, Tripura

INTERNATIONAL SEMINAR

INDIGENOUS KNOWLEGE AND INTELLECTUAL PROPERTY RIGHTS : EVIDENCE FROM THE DEVELOPING ECONOMIES

Date: 11th & 12th August 2023

Organised by:

The Department of Management, North-Eastern Hill University, Tura Campus, Tura, Meghalaya (India)
In Association with the Department of Management Studies, NIT Silchar, Assam (India)

Certificate

This is to certify that *Iragdao Raja Basumatary*

Has participated/presented a paper during the Technical Session -IV(A), titled

Factors Affecting Income Inequality in India: Evidence from Autoregressive Distributed Lag (ARDL) Bounds Testing Approach

At the International seminar on "INDIGENOUS KNOWLEDGE AND INTELLECTUAL PROPERTY RIGHTS: EVIDENCE FROM DEVELOPING ECONOMIES" held at the Department of Management, North-Eastern University, Tura Campus, Tura, Meghalaya (India), during August - 11 and 12, 2023.

Prof. A. Bhattacharjee
Head & Seminar Convener

Prof. Sujata Gurudev
Campus-in-Charge, NEHU, Tura Campus

BODOLAND INTERNATIONAL KNOWLEDGE FESTIVAL, 2023, INDIA

(27th February to 2nd March, 2023)

Bodoland Territorial Region (BTR), Government
&
Bodoland University, Kokrajhar, India

CERTIFICATE

Certified that Prof./Dr./**Sri**/Smt./Km..... **Iragdao Raja Basumatary**..... of..... **Department of Economics, Bodoland University, Kokrajhar**.... attended the Bodoland International Knowledge Festival, 2023 held under the auspices of Bodoland University, Kokrahjar. He/ She presented Research Paper(s) in the technical session, under the theme **Good governance**.

Title of the paper: **Nexus between Income Inequality and Governance**

Mode of Presentation: **Oral**

Theme Coordinator
BIKF, 2023

Conference Chair
BIKF, 2023

Registrar
Bodoland University

Vice-Chancellor
Bodoland University

Indapur Taluka Shikshan Prasarak Mandal's

College of Arts, Bhigwan, Maharashtra

NAAC Accredited

Ap-Bhigwan, Tal: Indapur, Dist: Pune-413130 Maharashtra, India

Web- http://coabhigwan.edu.in

&

ESTD : 1979

Rangapara College, Amaribari, Assam

Amaribari, Rangapara

Balipara-Rangapara Road, Amaribari, Rangapara, Assam, India

Web- http://rangaparacollege.com

Jointly Organized by

One Day Multidisciplinary International e-Conference

On

Changing Perspectives of Language, Literature, Science and Social Science

CERTIFICATE

This is to certify that Prof./Dr./Mr./Ms. Iragdao Raja Basumatary has participated in One Day Multidisciplinary International e-Conference on ***'Changing Perspectives of Language, Literature, Science and Social Science'*** Jointly Organized by the **College of Arts, Bhigwan, Maharashtra and, Rangapara College, Amaribari, Assam** on Friday, 25th June 2021.

He/She has Participated, Published, Presented a research paper entitled Reducing Income Inequality in India and Sustainable Development Goals (SDGs): A Theoretical Approach

Convener **Dr. Prashant Chavare** IQAC Co-ordinator College of Arts, Bhigwan, Maharashtra	Convener **Rakesh Ch. Sarkar** HOD Department of Bengali Rangapara College, Amaribari, Rangapara, Assam	*Chief Organizing Secretary* **Dr. Mahadeo Walunj** Principal College of Arts, Bhigwan, Indapur, Dist. Pune Maharashtra	*Chief Organizing Secretary* **Dr. Ranjan Kalita** Principal Rangapara College, Amaribari, Rangapara, Assam