Bootstrap Causality Analysis for BRICST Countries: Globalization, Income Inequality, Gender Inequality, and Economic Complexity

BRICST Ülkeleri için Bootstrap Nedensellik Analizi: Küreselleşme, Gelir Eşitsizliği, Cinsiyet Eşitsizliği ve Ekonomik Karmaşıklık

ABSTRACT

Globalization serves as a driving force for developing countries to integrate into advanced economies while simultaneously posing a significant challenge by exacerbating income inequality. However, globalization is also known to positively influence economic complexity levels, which in turn contributes to reducing gender inequality a critical factor in mitigating income inequality indirectly. Within this framework, the present study explores the intricate relationships between income inequality, globalization, gender inequality, and economic complexity, focusing on BRICST (Brazil, Russia, India, China, South Africa, and Türkiye) countries. In this study, the Kónya Bootstrap Panel Causality analysis was employed as the analytical method for the period 2010-2023. The findings indicate that globalization has the most significant impact on income inequality in Brazil, China, South Africa, and Türkiye, while gender inequality is most pronounced in Brazil and South Africa, and economic complexity is most influential in Brazil, China, and Türkiye. On the other hand, no Granger causality relationship was found between globalization, gender inequality, and income inequality in India and Russia. Additionally, it was determined that gender inequality does not have a significant effect on income inequality in Türkiye and China, while economic complexity does not exhibit a meaningful impact on income inequality in Russia and South Africa. The study's findings reveal that the causal relationship between globalization, gender inequality, economic complexity indicators, and income inequality has different dimensions. Therefore, according to the study results, policies to reduce income inequality should be formulated in line with national needs, considering economic, cultural, and sociological differences.

Keywords: Income Inequality, Globalisation, Gender Inequality, Economic Complexity.

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ÖZET

Küreselleşme bir yandan gelişme sürecindeki ülkelerin gelişmiş ekonomilere adaptasyonuna itici bir güç oluştururken bir yandan da gelir eşitsizliğini artırıcı etkisiyle ciddi bir problem olarak görülmektedir. Bununla birlikte küreselleşmenin, ekonomik karmaşıklık seviyesini olumlu etkileyerek toplumsal cinsiyet eşitsizliğini azalttığı da bilinmektedir. Bu etki ise dolaylı olarak gelir eşitsizliğinin azaltılmasında önemli bir role sahiptir. Bu çerçevede bu çalışmada gelir eşitsizliği ile küreselleşme, toplumsal cinsiyet eşitsizliği ve ekonomik karmaşıklık arasındaki bu karmaşık ilişki BRICST (Brezilya, Çin, Güney Afrika ve Türkiye) ülkeleri özelinde araştırılmıştır. Çalışmada 2010-2023 verileri kullanılarak yapılan analizde metod olarak Kónya Bootstrap Panel Nedensellik analizi tercih edilmiştir. Bulgulara göre küreselleşmenin, gelir eşitsizliği üzerinde en etkili olduğu ülkeler Brezilya, Çin, Güney Afrika ve Türkiye, cinsiyet eşitsizliğinin Brezilya ve Güney Afrika ve ekonomik karmaşıklığın Brezilya, Çin ve Türkiye olarak belirlenmiştir. Diğer yandan küreselleşme ve toplumsal cinsiyet eşitsizliğinin gelir eşitsizliği üzerinde Grenger nedensellik ilişkisi bulunmayan ülkeler Hindistan ve Rusya iken yalnızca cinsiyet eşitsizliğinin Türkiye ve Çin'de, ekonomik karmaşıklığın ise Rusya ve Güney Afrika'da gelir eşitsizliği üzerinde anlamlı etkiye sahip olmadığı tespit edilmiştir. Çalışma bulguları, küreselleşme, cinsiyet eşitsizliği ve ekonomik karmaşıklık göstergeleri ile gelir eşitsizliği arasındaki nedensellik ilişkisinin farklı boyutlarda olduğunu ortaya koymaktadır. Bu nedenle sonuçlara göre gelir eşitsizliğinin azaltılmasına yönelik politikaların ekonomik, kültürel ve sosyolojik farklılıklar dikkate alınarak ülkesel gereksinimler doğrultusunda oluşturulması gerekmektedir.

Anahtar Kelimeler: Gelir Eşitsizliği, Küreselleşme, Toplumsal Cinsiyet Eşitsizliği, Ekonomik Karmaşıklık.

INTRODUCTION

The globalisation, which intensified rapidly in the late twentieth century and became one of the most important phenomena of our age (Kahai & Simmons, 2005), now affects the whole world. Globalisation influences countries in several ways with its economic, political, cultural, and humanitarian dimensions. These impacts are explained in the literature through two contrasting perspectives: positive and negative. From the perspective of positive effects, globalization accelerates economic growth by facilitating foreign investment, technological knowledge transfer, and capital inflows. In contrast, the negative effects perspective emphasizes that sectors in developing countries with limited production capacity and weak technology are often displaced by international corporations (Dollar, 2001). Proponents of globalization argue that it contributes to poverty reduction, while critics contend that the functioning of the global system condemns many to poverty. As a result, globalisation is often characterised by rising inequality and the entrenchment of persistent poverty (Kahai and Simmons, 2005; Heimberger, 2020; Tamasauskiene and Žičkienė, 2021). However, international financial institutions such as the World Bank (WB), the International

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Monetary Fund (IMF) and the World Trade Organisation (WTO) have consistently encouraged developing economies to integrate more deeply into global markets to help the poor escape the grip of poverty. These opposing views form the paradox of globalization, which, while facilitating adaptation to global markets, also directs developing economies to re-examine their economic and cultural dynamics. Transnational corporations, shaped by globalization, have become a legal basis for substituting skilled labour in developing economies with low wages. Consequently, the deepening income gap within the new social order dominated by insecure, low-paying jobs has continued to expand (Hurrell & Woods, 1995; Kaplinsky, 2013).

In the new world order established by globalization, highly integrated international markets serve as a positive stimulus for economic growth but function as a negative factor for gender inequality. From this perspective, the gender dimension of globalization is crucial for promoting "fair globalization," which enables women to fulfil their aspirations for democratic participation and material well-being (Kannan, 2004; Tandon, 2009; Jouannet, 2013; Baxi, 2024).

Globalization has created new strategic objectives for governments in terms of wages and working conditions by influencing the production structures of local economies and increasing employment, particularly for disadvantaged groups. However, the pursuit of cheaper labor and higher production has led to the increased exploitation of female labor in market mechanisms that lack social protection (Baliamoune-Lutz, 2007; Dejardin, 2008; Benería et al., 2015). At this juncture, Kabeer's "Economy for All" approach emphasizes that economies should not solely focus on productivity and growth but also aim to ensure decent living conditions and social justice. The need to ensure universal and basic working conditions, such as adequate and stable income, fair treatment, job security, and economic and social rights, is also emphasized in the International Labour Organization (ILO) 2000 slogan, "decent work". From this perspective, gender equality is not only morally necessary, but also a prerequisite for long-term economic growth. (Coche et al., 2006; Kabeer, 2008).

Economic complexity reflects the depth of embedded knowledge within productive economies (Stojkovski, Utkovski & Kocarev, 2016) and serves as a critical indicator for identifying both obstacles and opportunities for inclusive growth. Recent studies on economic complexity have shown that complexity and inequality have a negative correlation, and the most complex region stend to increase inequality (Hartmann & Pinheiro, 2024).

The rapid increase in income inequality worldwide has driven researchers to explore this issue and seek answers to questions aimed at resolving income inequality. Accordingly, this study investigates the impact of globalization, gender inequality, and the economic complexity index on income inequality in BRICST countries for the period 2010–2023 using panel causality analysis. In addition to the countries included in the study, the incorporation of gender inequality and economic complexity indicators as variables aims to introduce a new dimension to research in this field and to encourage the generation of ideas for diverse policy recommendations.

LITERATURE REVIEW

While various studies in the literature address globalization, income inequality, gender inequality, and economic complexity—the main topics of this study—none have simultaneously examined these variables in the specific manner adopted in our research. This unique approach underscores the originality of our study and positions it as an effort to build upon and advance existing research. Table 1 categorizes and provides an overview of the relevant literature.

Tablo 1: Literature Review

Studies on Globalisation, Income Inequality and Gender Inequality				
Year	Author(s)	Dataset	Methods	Results
1995	Hurrell, A., & Woods, N.	The theoretical framework of globalisation and different examples of globalisation and income inequality.	Conceptual Analysis and Literature Review	The study's findings indicate that while national policies might lessen the consequences of globalization, it still has the potential to exacerbate social and economic inequality.
2003	Cornia, G. A.	The data for 73 countries, income inequality indicators for the periods 1870-1914 and 1980-2000.	Empirical Analysis	Income inequality is shown to rise as a result of globalization and liberalization processes; however, the consequences vary depending on a number of factors, including national policies, beginning inequality, and institutional structure.
2007	Baliamoune-Lutz	African Countries	Cross-sectional data, Ordinary and Three Stage Least Squares Methods.	The study indicates that globalization and growth do not influence gender equality in emerging nations.
2015	Jaffri, A. A., Sana, M., & Asjed, R.	Globalisation and gender inequality data on Pakistan labour market (1990-2010).	Time Series and Regression Analysis.	Globalization appears to have raised female labor force participation in Pakistan but has not totally eradicated gender disparity.
2015	Potrafke, N.	KOF indices of globalization are used in more than 100 studies.	Literature Review and Situation Analysis.	Despite globalization has many positive effects, like increased economic growth, gender equality, and human rights, the study found that it also

Year	Author(s)	Dataset	Methods	Results
				increases disparities in income within nations.
2016	Stehlíková, B., & Zúbková, M.	Comprehensive globalisation indicators and income inequality data (KOF Globalisation Index and Gini coefficient).	Panel Data Analysis and Statistical Correlation Methods.	The study exhibited that income inequality and globalization (economic, social, and political aspects) have a beneficial association, but the impacts differ depending on structural and geographical variables.
2017	Talam, E.	Various international data on globalisation and gender equality.	Literature Review and Comparative Analysis.	It is proposed that globalization attempts to, in some instances, enhance gender equality; nonetheless, the nature of this relationship is contingent upon the political and cultural settings in which it occurs.
2019	Ara, S.	Gender inequality and globalisation data on the Indian labour market.	Panel Data Analysis.	The globalization has been a catalyst for gender inequality in the Indian labor market, but its effects are pendant upon regional factors.
2020	Ifeakachukwu, N. P.	Economic growth, income inequality (Gini coefficient) and globalisation indicators for Nigeria (1981-2018).	Johansen Co-Integration Test and Error Correction Model (ECM).	As indicated by the report, globalisation has boosted Nigeria's economic growth; nevertheless, it has also led to unequal growth distribution by increasing income disparity.
2024	Lark, O.	Globalisation, gender inequality and innovation indicators for international firms.	Regression Analysis	The study found that gender disparity has a detrimental impact on corporate innovation, and globalisation alters the parameters of this effect.
Studies on Globalisation, Economic Complexity and Income Inequality				
Year	Author(s)	Dataset	Methods	Results
2016	Stojkoski, V., vd.	For 130 countries, indicators of global economic activity and economic complexity (GDP per capita, exports, population) and services sector data (value added of the services sector) are used.	Economic Complexity Analysis,	The research showed that the technological sophistication of this service sector enhances economic complexity and fosters economic growth, with knowledge-intensive services playing a particularly crucial role.
2017	Hartmann, D., vd.,	The relationship between economic complexity, structural transformation, and income inequality in more than 150 countries between 1963 and 2008.	Multivariate Regression Analysis.	The study revealed that economic complexity reveals information about the level of economic development associated with how the economy generates and distributes income. In addition, the study showed that the productive structure of a country can limits the extent of inequality of income.
2020	Chu, L. K., & Hoang, D. P.	Indicators of economic complexity, education level, public expenditure, trade openness and income inequality for eighty-eight countries from 2002 to 2017.	Panel Data Analysis.	They discovered that complexity in the economy is highly related to increased income disparity. Furthermore, the economic complexity is unsuccessful to alleviate income disparity in a context of poor educational attainment, inadequate governmental expenditure, and limited economic openness.
2021	Lee, C. C., & Wang, E. Z.	Economic complexity, income inequality and country risk data for 43 developed and developing countries from 1991 to 2016.	Panel Data Analysis.	The analysis concludes that while enhancing the productivity structure lowers the income inequality gap in Group B nations, strengthening complexity of economics has no effect on income inequality in Group A countries.
2021	Bandeira Morais., vd.	Economic complexity, GDP per capita and GINI coefficient values for 27 federative units (26 states and one federal district) in Brazilian states with annual data from 2002-2014.	Panel Data Analysis.	The study's findings indicate that the relationship throughout economic complexity and income disparities manifests as an inverted U-shape, whereby rising degrees of complexity mainly exacerbate and subsequently ameliorate the distribution of income in Brazilian states.
2022	Sepehrdoust, H., vd.	The state of income distribution, per capita income, national savings, welfare of society in developing countries between 2000-2019.	Panel-VAR Method.	According to the study's findings, disparity in wealth in a middle-income nation developing countries is improving as scientific output increases and economic, financial, and political risks decrease.
2022	Khanzadi, A., vd.	Economic complexity, growth in public expenditures, growth in real per capita income, inflation, poverty rate and GINI index data in Iran for the period 1995-2020.	ARDL Method.	In Iran, the economic complexity index was shown to have a considerable and negative impact on income inequality, as a consequence of the findings of the study presented here.
2024	Nguea, S. M.	Demographic structure, economic complexity, human capital, information and	Panel Data Analysis and Structural Equation Modelling (SEM).	They discovered that the demographic structure of the population directly contributes to the development in economic complexity as well. and

		communication technologies (ICT) and foreign direct investment (FDI) data from various countries.		that human capital plays a significant role in mitigating this impact.

MATERIAL AND METHOD

This study investigates the proposed hypothesis of a relationship between globalisation, income distribution, gender inequality, and economic complexity in the case of the BRICST countries (Brazil, Russia, India, China, South Africa and Türkiye). The empirical methodology used is structured as follows: first, the instrument used in the analyses is described and contextualised with reference to the relevant literature. Subsequently, cross-sectional dependency tests and coefficient homogeneity tests are conducted to assess the robustness and suitability of the data for the analysis. Following these preliminary evaluations, causality tests are applied to empirically examine the proposed hypothesis.

Dataset and Model Specification

This study examines the relationship among globalization, income distribution, societal violence, and economic complexity within the BRICST countries (Brazil, Russia, India, China, South Africa, and Türkiye) using annual data spanning the 2010–2023 period. The Kónya (2006) panel causality test is used for the study. It is based on Granger causality and uses the cross-sectional dependency bootstrap method. The model formulated in accordance with the research hypothesis is as follows.

$$GINI_{Nt} = \alpha_{1N} + \sum_{I=1}^{P1} \beta_{1NI} GINI_{Nt-I} + \sum_{I=1}^{P1} \delta_{1NI} GLOB_{Nt-I} + \sum_{I=1}^{P1} Y_{1NI} GEN_{Nt-I} + \sum_{I=1}^{P1} \varphi_{1NI} ECI_{Nt-I} + \varepsilon_t \quad (1)$$

The model uses dependent variables, income inequality (GINI), from the World Bank's World Development Indicators online database. Independent variables of the study include the KOF Swiss Economic Institute Globalization Index (GLOB), the European Environment Agency (EEA)statistics on gender inequality (GEN), and the Economic Complexity Observatory (OEC)economic complexity data. The dataset is made up of secondary data from official sources such as the OECD and the World Bank, which ensures credibility. Logarithmic transformations (ln) for data variables have been used when appropriate to improve interpretability and allow for percentage comparisons. Cross-Sectional Dependence (CSD) analyses were chosen based on the appearance of correlations between components. Cross-sectional dependency, which is especially significant in panel data analysis, represents the interdependence of units (such as nations, sectors, or enterprises). Testing for such reliance is crucial for ensuring the accuracy of analytical data.

Three main methods, the Pasaran CD, Friedman, and Frees tests, were used to detect cross-sectional dependence. Null and alternative hypotheses for the cross-sectional dependency test are as follows:

$H_0: Cov(u_{it}, u_{ij}) = 0$ (No Cross-Sectional Dependence).

$H_1: Cov(u_{it}, u_{ij}) \neq 0$ (Cross-Sectional Dependence Exists).

The Pesaran CD test, suitable for panel datasets with large time (T) and cross-sectional (N) dimensions, assesses cross-sectional dependence using the average pairwise correlation coefficient (Pesaran, 2004):

$$CD = \sqrt{\frac{2}{N(N-1)}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \hat{\rho}_{ij} \quad (2)$$

The Friedman test, an older method, identifies cross-sectional dependence by summing pairwise correlation coefficients (Friedman, 1937):

$$F = \frac{1}{N} \sum_{i=1}^{N} \sum_{j=1}^{N} \hat{\rho}^2_{ij} \quad (3)$$

For the Pesaran CD Test and Friedman Test;

$\hat{\rho}_{ij}$, Correlation coefficient between units i and j,

N, Number of cross-sectional units.

The Frees test evaluates cross-sectional dependence based on the squared standardized correlation coefficients (Frees, 1995):

$$F = \frac{1}{N(N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} \left| \frac{\hat{\rho}_{ij} - \overline{\rho}}{\sigma_\rho} \right| \quad (4)$$

Here;

$\overline{\rho}$, Average correlation coefficient,

σ_ρ, Standard deviation of correlation coefficients.

By employing these robust methodologies, the study ensures a comprehensive and reliable examination of cross-sectional dependencies, enhancing the validity of the econometric analysis.

FINDINGS

In this study, the selection of the appropriate Cross-Sectional Dependence (CD) test was determined based on the presence of correlations among the panel units. The results of these tests are presented in Table 2.

Tablo 2: Cross-Sectional Dependence Test Results

Test	Score
Pesaran CD	12.205 $(p = 0.0000)$ ***
Friedman	87.154 $(p = 0.0000)$***
Fress	$\alpha = 0.10$: 0.1553 $\alpha = 0.05$: 0.2462 $\alpha = 0.01$: 0.3127

Notes: *** $p \le 0,01$, ** $0,01 < p \le 0,05$ ve * $0,05 < p \le 0,1$.

According to Table 2, the results of the Pesaran CD test ($p \le 0.01$) are statistically significant. This points out a substantial cross-sectional dependency between each variable and no evidence of independence among observations. Similarly, the Friedman test reveals a high level of statistical significance for cross-sectional dependence ($p \le 0.01$) across the analysed variables. For all these reasons, the deliberate storage for the Friedman test is significantly validated.

Furthermore, the Frees test findings in Table 2 show that the model has a cross-sectional dependency. As a result, the model built for the study is cross-sectionally dependent, necessitating the use of approaches that account for cross-sectional dependency. To address this, the Kónya (2006) panel causality analysis was used, and the following null hypotheses were evaluated in Table 3:

H_0 : GLOB ↛ GINI (Globalisation is not the Granger cause of income inequality).

H_0 : GEN ↛ GINI (Gender inequality are not the Granger causes of income inequality).

Both hypotheses include Wald statistics, bootstrap p-values, and critical values for various degrees of significance.

Table 3: Kónya Panel Causality Test Results

	$H_0 : GLOB ↛ GINI$					$H_0 : GEN ↛ GINI$				
	Wald test	**Bootstrap**	**1%**	**5%**	**10%**	**Wald test**	**Bootstrap**	**1%**	**5%**	**10%**
Brazil	5.746*	0.002	5.140	3.328	2.693	9.016**	0.205	4.501	4.230	3.246
Russia	3.467	0.248	4.510	3.190	2.200	3.008	0.200	3.600	2.298	1.310
India	2.660	0.345	3.496	3.001	2.900	0.101	0.236	4.810	4.162	3.201
China	8.526**	0.000	6.482	5.642	3.925	2.605	0.040	4.219	3.963	3.010
South Africa	11.115*	0.000	4.289	3.789	3.205	7.801**	0.000	5.864	2.099	2.798
Türkiye	3.345**	0.098	4.146	2.996	2.108	3.105	0.400	4.287	2.087	1.300

Notes: *, ** and *** denote significance level at 1%, 5% and 10%, respectively. ↛ is not a Granger cause. Critical values are obtained with 10,000 bootstrap cycles.

According to Table 3, a causality relationship is observed at the 1% significance level from globalization to income inequality and at the 5% significance level from gender inequality to income inequality in Brazil and South Africa. Additionally, in Brazil, a causality relationship at the 1% significance level is found from economic complexity to income inequality. For at the China and Türkiye, globalization is identified as a Granger cause of income inequality at the 5% significance level. On the other hand, in Russia, no causality is observed from globalization, gender inequality, or economic complexity to income inequality. Similarly, for India, neither globalization nor gender inequality exhibits Granger causality on income inequality.

Table 4: Kónya Panel Causality Test Results

	$H_0 : ECI ↛ GINI$					$H_0 : GLOB-GEN ↛ GINI$				
	Wald test	**Bootstrap**	**1%**	**5%**	**10%**	**Wald test**	**Bootstrap**	**1%**	**5%**	**10%**
Brazil	8.216*	0.099	6.001	4.550	3.299	14.010***	0.805	25.108	22.330	17.602
Russia	4.625	0.569	3.552	3.036	2.369	1.455*	0.963	34.120	33.360	31.696
India	1.087**	0.799	2.641	1.889	1.264	0.465	0.190	9.296	9.001	7.200
China	15.040**	0.655	3.390	2.265	1.496	7.250	0044	16.100	12.273	10.600
South Africa	0.049	0.090	5.008	3.102	3.000	6.265**	0.908	2.396	1.101	0.077
Türkiye	1.209*	0.801	6.078	4.400	4.001	3.369*	0.809	11.121	8.363	8.025

Notes: *, ** and *** denote significance level at 1%, 5% and 10%, respectively. ↛is not a Granger cause. Critical values are obtained with 10,000 bootstrap cycles.

The following hypotheses were tested for Table 4:

H_0 : ECI ↛ GINI (Economic complexity is not the Granger cause of income inequality).

H_0 : GLOB-GEN ↛ GINI (Globalisation and gender inequality are not the Granger causes of income inequality).

As shown in Table 4, in Brazil, economical complexity has a 1% causation link with income inequality, but globalization and gender disparities have consequences at the 10% level. Economic complexity has a 10% causation association with income inequality in India; however, neither globalization nor gender disparity have a substantial influence on income inequality. At the 5% threshold of relevance, economic complexity, globalization, and gender inequality are all found to have a substantial impact on income disparity in China. Globalization and gender disparities are recognized as major determinants impacting income inequality in South Africa at the 5% level, while the economic complexity fails to show Granger causation for income disparity. Income disparity in Russia is unaffected by economic complexity. On the other hand, the globalization and gender disparities have been identified as key contributors to income disparity. In Türkiye, economic complexity, globalization, and gender disparity were all identified as Granger drivers of income inequality, with relevance at the 1% level.

Table 5: Kónya Panel Causality Test Results

	H_0 : GLOB-ECI ↛ GINI					H_0 : GEN-ECI ↛ GINI				
	Wald test	Bootstrap	1%	5%	10%	Wald test	Bootstrap	1%	5%	10%
Brazil	12.596***	0.102	7.005	5.369	3.654	4.639	0.089	7.747	4.335	3.565
Russia	5.158	0.310	7.503	6.001	5.104	8.525**	0.415	13.574	12.900	11.321
India	6.213*	0.468	6.258	5.000	3.699	0.698	0.566	26.250	21.565	20.040
China	12.120	0.001	14.180	11.272	10.132	2.080	0.353	8.485	6.302	4.114
South Africa	4.056	0.102	8.100	7.300	5.501	6.235	0.905	8.252	7.406	7.001
Türkiye	17.840**	0.049	12.199	10.090	9.220	2.758	0.828	18.062	17.100	15.105

Notes: *, ** and *** denote significance level at 1%, 5% and 10%, respectively. ↛is not a Granger cause. Critical values are obtained with 10,000 bootstrap cycles.

The following hypotheses were tested for Table 5:

H_0 : GLOB-ECI ↛ GINI (Globalisation and economic complexity are not the Granger causes of income inequality).

H_0 : GEN-ECI ↛ GINI (Gender inequality and economic complexity are not the Granger causes of income inequality).

According to Table 5, in Brazil, globalization and economic complexity are identified as Granger causes of income inequality, significant at the 10% level. For Russia, China, and South Africa, no significant causality relationship is found between globalization, economic complexity, and income inequality at any significance level. However, for India, the relationship is significant at the 1% level, and for Türkiye, it is significant at the 5% level. When examining the effects of gender inequality and economic complexity on income inequality, no significant relationships are observed for Brazil, India, China, or Türkiye at any significance level. Conversely, Russia demonstrates a significant relationship at the 5% level, and South Africa at the 10% level, highlighting the influence of gender inequality and economic complexity on income inequality in these countries.

CONCLUSION

The investigation examines data from 2010 to 2023 to analysed the causal linkages between income inequality, the spread of globalization gender disparity, and economic complexity in BRICT countries. The Kónya Panel Causality Evaluate, a method to account overall cross-sectional dependence, was utilized in the present study. The outcomes of the research can be summarized as follows:

Globalization has a significant impact on the GINI, which is particularly pronounced in Brazil, China, South Africa, and Türkiye. Gender disparity (GEN) is acknowledged as a Granger cause of income disparities only in Brazil and South Africa. Nevertheless, no substantial causal relationship is found for both of these indicators in India and Russia. Furthermore, there is no substantial relationship between gender disparity and economic inequality in China and Türkiye. This evidence suggests that the consequences of economic complexity and gender disparity on globalization differ from country to country and that socio-cultural and socio-economic institutions have a prominent influence. Economic complexity and globalization are critical Granger factors of income inequality in Brazil, China, and Türkiye.

As a consequence, measures aimed at increasing economic complexity have the potential to significantly reduce income inequality in these countries. Additionally, measures to address gender disparities are pressingly needed in Russia and Türkiye. In India, neither globalization nor gender disparities would appear to be significant catalysts,

while economic complexity has a modest impact on income inequality. In South Africa and Russia, in contradistinction to India, economic complexity has little impact on income inequality. To mitigate the adverse effects of globalization on income inequality, policies encouraging equitable globalization must be prioritized, particularly in developing countries. Strategies such as fostering global market integration through international trade agreements and strengthening domestic industries should be implemented. To lessen income gaps between urban and rural areas, wealthy countries should transfer foreign direct investments (FDIs) to regions that are underdeveloped. More importantly, technical, educational in nature, and healthcare endeavours should focus on low-income regions and countries. In order to address gender disparities, efforts must be made to boost female career opportunities and business ownership, particularly in emerging nations. Strengthened legal systems meant to eradicate disparities in gender should be started right away. Measures to solve the gender pay discrepancies and upgrades in women's employment and educational access should take the stage. Manufacturing policies in Brazil, China, and Türkiye should shift from supporting conventional low-income industries to supporting high technology-intensive sectors that also produce high goods with high value-added. Regarding India, long-term strategies are recommended, emphasizing rural development through industrial and educational reforms. In South Africa, enhancing investment in human capital can play a fundamental role in decreasing income inequality. On the other hand, for Russia and South Africa, reforms targeting gender inequality and promoting women's participation in economic activities should be prioritized.

According to the findings, it is essential to strengthen local governments and implement programs to address regional development disparities. This emphasizes that structural differences between countries require the adaptation of policy designs to address regional development disparities.

The investigation's quantitative assessment and constructive suggestions for policy are projected to have a substantial impact on the equitable economic growth strategies of BRICT countries. In the present setting, the current study aims to address a significant gap in past research and serve as a valuable reference for future research.

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