"A cross-country study of the direct and inverse relationship between economic globalization and growth"

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A CROSS-COUNTRY STUDY OF THE DIRECT AND INVERSE RELATIONSHIP BETWEEN ECONOMIC GLOBALIZATION AND GROWTH

Abstract

This study aims to explore the cross-country relationship between economic globalization and growth. It assesses the implications of globalization for the world economy and groups of countries with different income levels. The study employed panel data from the World Bank, the Fraser Institute, and the Swiss Federal Institute of Technology in Zürich for 122 countries from 1970 to 2018. Two-stage fixed effect model was used to assess the impact of globalization on growth. The reverse causality was estimated using the method of instrumental variables. The results showed that the world economy benefited from globalization. In turn, greater openness has reinforced economic growth. The study confirms that globalization benefits are distributed unequally. A significant positive impact of globalization on economic growth is confirmed for high and lower-middle-income economies with coefficients of 0.02 and 0.01, respectively. Economic growth of high-income countries is determined by financial globalization, while lower-middle-income countries rely on trade and financial openness. Negative implications of economic globalization took place in upper-middle-income countries with a coefficient of -0.02. In these countries, correlation between trade globalization and growth is -0.13. The effect of economic growth on globalization is found to be significantly positive for high-income (11.08) and upper-middle-income countries (9.62) and statistically insignificant for lower-middle-income economies.

Keywords	world economy, KOF index of globalization, financial and trade openness, reverse causality, high-income countries, developing economies
JEL Classification	F43, F63, O47, O57

INTRODUCTION

Modern economic literature interprets the concept of "economic globalization" mainly as a growing degree of the economic integration of national economies, which manifests itself through international trade in goods and services and the international movement of factors of production. Prior studies link globalization and growth to income convergence, technological advancement, and institutional development. Several empirical studies also confirm a positive association between the economic development of certain groups of countries and their participation in the globalization process (Gurgul & Lach, 2014; Didžgalvytė-Bujauskė et al., 2019). At the same time, the existing literature states that globalization can also cause certain hurdles in the economic development of low and middle-income economies (citation). Further, there is also evidence of the problem of reverse (Ali & Malik, 2021; Samimi & Jenat abadi, 2014) causality when the association between globalization and growth occurs because fast-growing economies choose to liberalize their economies at a faster pace (Dreher, 2006; Prasad et al., 2005).

Even though globalization-growth dynamics is a vastly researched area, a nuanced understanding of the relationship between economic globalization and growth is required. The reasons for this are changes in volatility and dynamics of globalization and GDP growth that occurred from the early 2000s. The global economy has displayed moderate economic growth and experienced negative GDP growth rates of -1.3 and -3.1% in 2009 and 2020, respectively, while maximum growth of 4.5% was recorded in the first decade between 2000–2010. In contrast, the GDP growth had never been negative in the 20th century. Further, KOF index of economic globalization, created by KOF Swiss Economic Institute and introduced into analysis by Dreher (2006), increased modestly only from 54 to 59 during 2000–2018 compared to more robust changes between 1960–2000. The current literature lacks studies that explain the changes that occurred in economic globalization and growth over the last two decades. The current disagreements in the literature on economic globalization require further studies to get a clear understanding of the phenomenon.

This study provides empirical evidence for the recent developments in economic globalization and growth nexus. An updated knowledge of globalization-growth interrelations would enable better and more targeted policymaking, especially for the countries that resist economic globalization and argue that protectionism of domestic markets of goods and financial services foster economic growth.

1. LITERATURE REVIEW

The extant literature elaborates on distinct forms of globalization responsible for economic growth and the avenues in which globalization impacted the economic well-being of nations (Villaverde & Maza, 2011; Ulucak, 2019; Aderemi et al., 2020; Fang et al., 2021). Various studies analyzed different groups of countries to capture the magnitude of globalization. To account for heterogeneity in country-wise data, countries are typically classified according to a predetermined set of criteria, such as geographic location, and level of economic development. For instance, geographic areas in Villaverde and Maza (2011) are divided into advanced, emerging and developing economies; Africa; developing Asia; and Western Hemisphere, adopted from the IMF Database. Their study showed that economic globalization started spreading in the 1970s. Furthermore, over the last three decades, globalization trend had been especially pronounced in developing Asia, Western Hemisphere, and emerging and developing economies. Gunter and Wilcher (2020) define globalization through its trade and investment openness by measuring two parameters: exports to GDP and net FDI to GDP ratios. According to their analysis, high-income countries and India and China experienced a 1.69 and 3.05-fold increase in export-to-GDP share growth between 1985–2015. Here, the World Bank country classification was adopted by the authors.

Multiple studies assert persistent economic growth disparity among countries depending on their trade and financial openness. Early cross-sectional studies of the globalization-growth nexus confirmed the positive impact of trade openness and trade volumes on growth (Dollar, 1992; Frankel & Romer, 1999). According to Frankel and Romer (1999) and Dollar and Kraay (2004), trade openness positively affects economic growth. Calderon et al. (2004) further prove that the positive association between openness and growth is significant for HIC and remains negligible for LIC countries. Trade openness was crucial to emerging economies' economic growth (Raghutla, 2020). Gries and Redlin (2012) comprehensively studied the trade openness-growth nexus of 158 countries from 1970 to 2009. They infer a significant positive association between variables in the long run. Interestingly, the short-run implications of openness on growth are adverse for low-income countries and tend to diminish once the income level grows. The effects of financial globalization on growth were positive for developed countries and negative for poor ones (Durham, 2000; Chanda, 2001; Garret, 2001). According to Heimberger (2020), financial globalization substantially impacted increasing income inequality among developed and developing countries.

Arguably, not all developing countries could quickly pick up and benefit economically from globalization due to the differences in market in-

stitutions. Precisely, recent empirical findings of Hammudeh et al. (2020) stipulate linear economic growth resulting from globalization for HIC countries and non-linear relationships for developing economies. In the latter scenario, counties need to reach a certain threshold level of institutional development (quality of governance and financial development) to accelerate growth from globalization. For instance, poor governance and weak institutions, along with high transportation costs, contribute to the slow growth of African countries. Additionally, the inability to reap trade liberalization benefits occurs due to exacerbated trade protectionism along with a non-diversified export portfolio enacted by African countries (Ng & Yeats, 1996).

Mediating effect of economic freedom on globalization and growth has been widely studied by Heckelman (2019), Sturm and Haan, (2001), and Lawson et al. (2020). The economic freedom index comprehensively evaluates the overall level of rule of law, regulatory efficiency, government size, and market openness. The economic freedom index reflects the effectiveness of the market economy and its institutions. Greater freedom allows economic agents to allocate economic resources more profitably, thus, yielding greater economic output. High economic freedom among others is positively associated with rapid growth (Hall & Lawson, 2014; Lawson et al., 2020). On the contrary, Santiago et al. (2020) argue that the growth of 24 Latin American and Caribbean countries has been negatively impacted by economic freedom in the long run. At the same time, globalization is found to correlate positively with growth. Sturm and Haan (2001) discovered a positive association between changes in economic freedom and economic growth, although the initial high level of economic freedom does not ensure growth. The findings of Islam (1996) support the idea of a direct positive association between freedom and growth in all countries irrespectively of their income level.

A modified production function analysis of Central and Eastern European counties during 1990–2009 exhibited the same results: as economies in the region became more open, economic growth become prevalent (Gurgul & Lach, 2014). Empirical findings of Ali and Malik (2021), in line with Dreher (2006) and Samimi and Jenatabadi

(2014), confirm a positive effect of economic globalization on economic growth in HIC and UMC countries and the negative impact on LMC and LIC economies. A study of the Organization of Islamic Cooperation countries between 1980–2008 showed almost the same results: the impact of globalization on economic growth is highly associated with income level, human and financial development (Samimi & Jenatabadi, 2014). Appendix A provides a summary of variables that affect economic growth drawn from recent empirical studies. The most obvious inference from the empirical literature on the long-run globalization-growth interaction is that there is a clear pattern for a group of countries according to income or regional belongingness. However, this is not evident when it comes to country-wise analysis in the short run (Ying, et al., 2014).

Additionally, it is essential to understand the reverse causality between globalization and growth. Particularly whether the countries that grow faster can become more open economically. Up to date, limited literature highlights the issue of the reverse impact of growth on globalization. For instance, Singh (2010) summarized a strand of recent empirical research devoted to the reverse interlinkages between exports and growth. He argues that some countries' economic growth was export-driven, whereas, in others, an increase in exports was due to economic growth. Moreover, to establish the impact of growth on countries' exports, Konya (2006), Awokuse (2007), and Awokuse and Christopoulos (2009) used a mix of causality and cointegration tests as valid instruments for testing reverse causality. A two-way relationship between economic growth and economic globalization for ASEAN countries is established by Ying et al. (2014), whereby authors have applied Granger causality test.

To summarize, many researchers have successfully established globalization-growth patterns across various geographical regions and groups of countries. The impact of globalization on growth was studied considering variance in countries' physical and human capital, legal and economic environment. This paper contributes to the existing body of literature in several ways. It reveals the relationships between globalization and growth by extending the time framework of the dataset till

2018. It analyzes globalization-growth nexus for the world economy and separately for the countries with heterogeneous income levels. Finally, it establishes the reverse causality between economic globalization and growth using the method of instrumental variables.

2. METHODS

The empirical analysis employed panel data from the World Bank, the Fraser Institute, and the Swiss Federal Institute of Technology in Zürich (ETH Zürich) for 122 countries from 1970 to 2018. To assess the direct relationship between economic growth and economic globalization, the authors proceeded from the classical production function (Equation 1).

$$y = f(A, k), \qquad (1)$$

where y is GDP per capita, k is capital per capita, and A is factor productivity.

The gross capital formation per capita (*GCFC*) was used as an indicator of capital per capita. To measure factor productivity, the amount of spending on R&D (*RES*) was taken as a proxy. R&D expenditures in a concentrated form concurrently reflect the cost of resources and the level of technology. To capture the degree of institutional development, the economic freedom index (*FREE*) was used as a generalized indicator of countries' institutional systems that characterize the freedom of doing business, functioning of the trade and financial sectors, investment activity, the guarantee of property rights, the scope of the bureaucracy,

the degree of protection against corruption, monetary and fiscal freedom, as well as freedom in the labor market. KOF indices were taken as proxies of globalization. To test the hypothesis, a system of equations was modelled based on the forward and backward relationship of the independent variables under study (Equation 2, Figure 1).

It is presented as:

$$\begin{cases} \log(gdpc) = f\left(\log(gcfc), res, free, kofe, year\right) \\ kofe = f\left(\log(gdpc), kofs, kofp, year\right) \end{cases} \quad (2)$$

Further, to estimate the direct impact of economic globalization on GDP, the method of instrumental variables was used. Variables of social and political globalization, *KOFS* and *KOFP*, were used as instrumental variables. When constructing the regression of the feedback – the influence of the level of GDP on economic globalization – *GCFC, RES*, and *FREE* were used as instrumental variables. Since *GCFC* and *GDPC* are non-stationary time series, the variable *YEAR* containing the current year was included in the regression equations. Regression coefficients were obtained using a two-stage least-square fixed-effect estimator. A dummy variable was included in the calculation of the regressions for each country.

The calculations were made both for the totality of countries (122 countries) and for each group of countries ranked by income level: high-income (HIC), upper-middle-income (UMC), middle-income (MI), lower-middle-income (LMC) and low-income (LIC) countries. When ranking countries, the 2019 World Bank classification was used. Table 1 presents a summary of the variables.
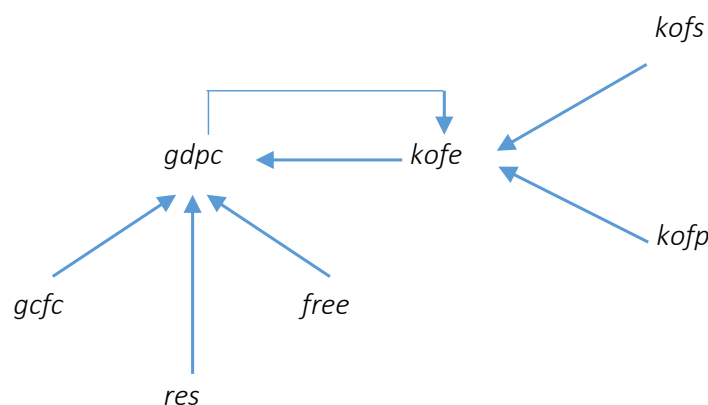

Figure 1. Direct and reverse relationship between growth and economic globalization

Table 1. Description of variables

Variable	Description	Source
GDPC	GDP per labor unit (constant 2010 US$)	World Bank
GCFC	Private investment per labor unit (constant 2010 US$)	
RES	R&D expenditure (constant 2010 US$)	
FREE	Summary economic freedom rating (10 – most free, 0 – not free)	Fraser Institute
KOF	KOF Globalization Index (100 – most globalized, 0 - least globalized)	ETH Zürich
KOFE	KOF Economic Globalization Index (100 – most globalized, 0 – least globalized)	
KOFS	KOF Social Globalization Index (100 – most globalized, 0 – least globalized)	
KOFT	KOF Trade Globalization Index (100 – most globalized, 0 – least globalized)	
KOFF	KOF Financial Globalization Index (100 – most globalized, 0 – least globalized)	
KOFP	KOF Political Globalization Index (100 – most globalized, 0 – least globalized)	

3. RESULTS AND DISCUSSION

Table 2 provides evidence on the 5-year mean GDP growth and KOF index of economic globalization across countries with different income groups. The index of economic globalization displayed steady growth across countries and income groups between 1970–2015 with a slight decline from 2015 for LMC and LIC. Countries with higher incomes experienced a higher level of economic globalization. ANOVA test confirmed that the indices of economic globalization are significantly different for countries across 4 income groups. However, all countries made a significant leap toward greater economic globalization. Unlike economic globalization, GDP growth does not display a particular pattern: average growth values fluctuate across years for income groups. Since 1970s, economic growth slowed down significantly for all countries. According to ANOVA results, from 1975 to early 2000s countries were homogeneous in terms of their growth rates, however since 2005 divergent trends started to occur due to a relative slowdown of HIC and the catch-up effect of the rest of the world.

Table 3 describes the patterns of economic growth for countries with different levels of economic globalization. In early 1970–80s highly globalized countries (KOFE index of economic globalization 100-70) enjoyed higher rates of economic growth. However, in the last 2 decades the trend has reversed. Currently, countries with medium (KOFE 69-51) and low (KOFE 69-0) levels of economic globalization outpace highly globalized economies in growth rates. Drastic differences in growth across groups initially occurred between 1986–1990 and became persistent from 2005 till 2018. Between 2015 and 2018, the average growth of the least globalized countries was 1.13 times greater than those with the highest level of globalization and 1.44 times higher than medium KOFE.

The ANOVA results in Table 3 show patterns similar to those presented by Dreher (2006) after analyzing 123 countries during 1970–2000.

Predominantly, papers on the impact of globalization on economic growth use the World Bank database as the most comprehensive reflection of

Table 2. Mean 5-year values of GDP growth and KOFE across income groups

Year	GDP growth, %				ANOVA	KOFE				ANOVA
	HIC	UMC	LMC	LIC	Ho: means (income) = 0, *P*-value	HIC	UMC	LMC	LIC	Ho: means (income) = 0, *P*-value
1970	5.54	7.69	5.14	3.21	0.0058	52.00	35.01	31.61	23.62	0.0000
1975	5.13	5.25	3.75	3.94	0.2248	53.96	36.14	34.97	26.22	0.0000
1980	2.46	2.87	3.11	1.34	0.1704	57.19	38.73	36.15	28.18	0.0000
1985	4.22	2.48	3.29	3.30	0.2413	58.71	41.30	37.01	30.05	0.0000
1990	3.42	1.91	1.43	0.79	0.3368	59.59	41.79	38.78	32.35	0.0000
1995	3.72	4.90	3.93	4.05	0.6954	64.33	47.80	44.30	35.31	0.0000
2000	3.76	4.81	4.10	4.20	0.2861	69.24	52.37	47.40	37.73	0.0000
2005	2.71	4.61	4.98	5.24	0.0000	72.98	55.69	49.61	39.10	0.0000
2010	2.36	3.60	5.14	4.18	0.0000	73.46	56.20	49.86	41.44	0.0000
2015	2.75	2.72	3.91	3.26	0.0338	74.39	57.32	49.84	40.43	0.0000
ANOVA	0.000	0.0002	0.000	0.001		0.000	0.000	0.000	0.000	

Table 3. Mean values of GDP growth with respect to economic globalization

GDP growth, %	1970–1974	1975–1979	1980–1984	1985–1989	1990–1994	1995–1999	2000–2004	2005–2009	2010–2014	2015–2018
KOFE 100-70	7.47	4.48	3.07	4.47	3.80	3.85	4.03	3.19	2.66	3.21
KOFE 69-51	7.04	6.05	3.27	2.31	4.75	4.30	4.45	4.04	3.47	2.53
KOFE 50-0	5.22	4.31	2.44	3.61	0.90	4.18	4.15	4.85	4.86	3.64
ANOVA	0.295	0.312	0.715	0.427	0.006	0.991	0.578	0.004	0.000	0.017

GDP movements, along with KOF indices of globalization. This study uses WB statistics on GDP per capita (in U.S. dollars at 2010 prices) from 1970 to 2018 for 122 countries and the Swiss Federal Institute of Technology in Zürich on the KOF globalization index for the corresponding periods. For the group of countries with low GDP per capita there is no information for 1970–1981. The review of the panel data presented in Appendix B confirms the presence of a long-term upward trend of real GDP per capita and KOF globalization indexes for all countries irrespectively of their income level. Such observation allows us to hypothesize about the dominance of a unidirectional movement of economic growth and globalization.

The analysis of data on the relationship between real GDP growth and KOF index of globalization shows a clear unidirectional pattern both for the world economy as well as separate regions. The scatterplots display a positive correlation for all groups of countries (Figures 2 and 3). At the same time, in specific periods there is a tendency for a multidirectional movement of the variables. The global economy experienced major economic declines in 1975, 1982, 1991, and 2009, where the growth of real GDP per capita was negative. However, patterns of economic globalization were different. KOF index of economic globalization dropped only in 1991, 2009, and 2015.

Next, Appendix C features the correlation coefficient between economic globalization and GDP per capita growth. All coefficients confirm a medium-to-low degree of correlation between the variables. At 90% of statistical significance, the relationship between real GDP growth and KOF indices (economic, trade, and financial globalization) for the world is strong for the entire period between 1970–2018. Also, a high correlation was depicted for the three groups of countries (HIC, LMC, and LIC), during 1970–1974 and 1990–1994. In summary, the most significant relationships between variables are found for countries with high average GDP per capita, and the least significant for low-income countries.
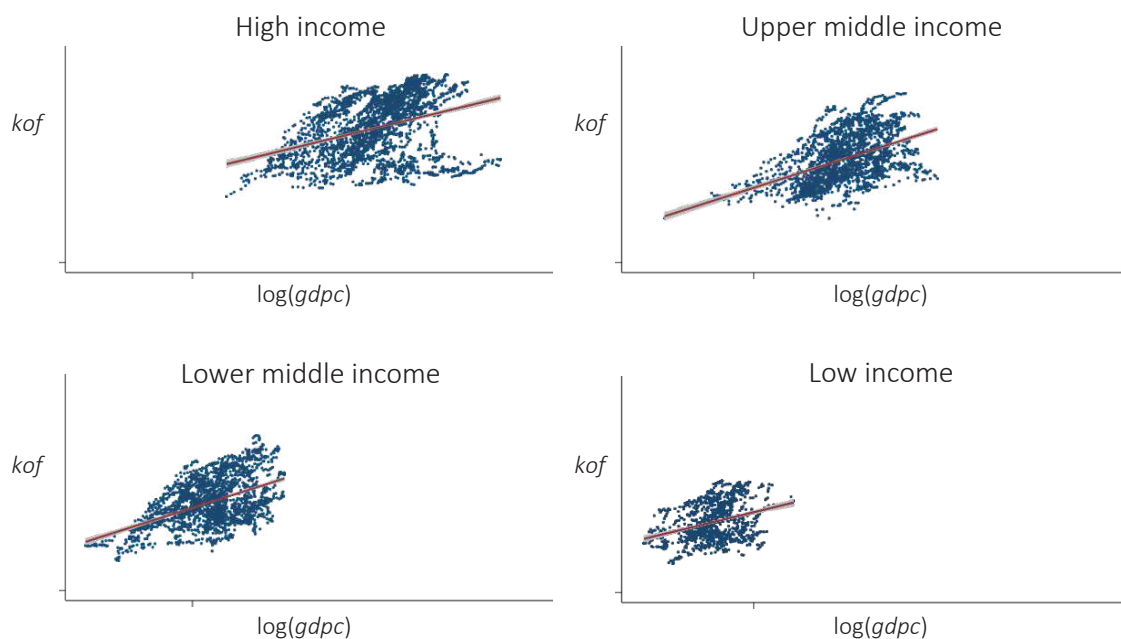
Note: Solid line shows fitted values with 95% confidence interval.

Figure 2. GDP per capita in the world and the KOF index
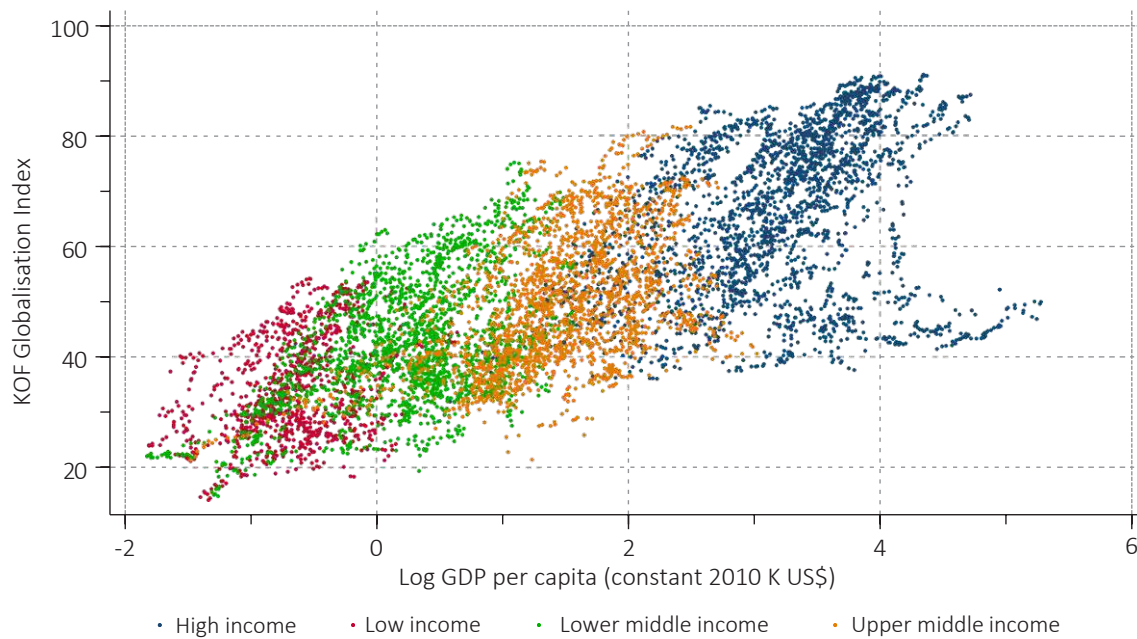
Figure 3. Scatter diagram of GDP per capita and globalization indices

Further, the degree of association between globalization and economic growth started to decline at the beginning of the 2000s. For instance, in the early 1970s, correlation was 0.63, whereas in 2015–2018 it was only 0.47. However, the correlation between economic globalization and growth has not changed dramatically since the 1970s. Data also present a growing role of financial globalization in economic growth with increased coefficients of 0.68 compared to 0.6. Financial globalization was found to be more important to economic growth for HIC and LIC countries, whereas trade globalization, is more essential for LMC economies. UMC nations did not demonstrate any tight correlation between economic, financial globalization, and growth while trade globalization showed a negative relationship with growth.

Empirical findings provided in Table 4 suggest that for all the countries in the sample of 122 countries, a one-unit increase in the economic globalization index leads to a 3% increase in the world GDP per capita of the economically active population. For groups of countries, the growth of real GDP per capita due to economic globalization differs significantly. While the impact is positive for HIC and LMC countries, with a 2% increase in the former and a 1% increase in the latter, it is negative for middle-income countries, with a 2% decline due to 1% globalization expansion. The impact of capital on economic growth is found

to be the most significant for all groups of countries. The ballpark coefficient ranges from 19% for lower-middle-income countries to 31% for high-income countries. Overall, the impact of gross capital per capita on world GDP was estimated at 29%. The impact of R&D expenditures is statistically significant for HIC and MI countries, while economic freedom is important for UMC and LMC countries.

The effect of GDP per capita growth on economic globalization is the most pronounced for HIC and UMC countries. Namely, a 1% increase in GDP per capita yields 11.08 and 9.62-point growth in the index of economic globalization for respective groups of countries. The results are statistically insignificant for countries with income below the middle (Table 5).

The regression results in Tables 4 and 5 confirm the visual findings. No statistically significant direct and inverse relationships could be established for low-income countries. For the rest of the countries, growth in per capita income induces greater economic openness and involvement in globalization. In addition to previous studies by Dreher (2006), Samimi and Jenatabadi (2014), and Ali and Malik (2021) that posit a negative impact of globalization on the growth of LMC countries, a significant positive relationship was found. Additionally, it was discovered that UMC countries experience nega-

Table 4. GDP and globalization: a direct link (1970–2018)

GDP (dependent variable)	World	High	Upper Middle	Lower Middle	Middle	Low
KOFE	0.03***	0.02***	−0.02**	0.01*	0.01	−0.04
	(3.42)	(6.23)	(−2.90)	(2.08)	(0.70)	(−0.72)
LOG(*GCFC*)	0.29***	0.31***	0.30***	0.19***	0.25***	0.24
	(18.08)	(19.36)	(12.22)	(7.30)	(14.00)	(1.88)
RES	0.07***	0.08***	0.02	−0.01	0.03*	0.05
	(6.63)	(5.48)	(1.57)	(−0.34)	(2.47)	(1.66)
FREE	−0.10*	−0.14***	0.12***	0.09**	0.02	−0.32
	(−2.04)	(−4.08)	(3.60)	(2.76)	(0.62)	(−0.77)
YEAR	0.01***	0.00**	0.02***	0.02***	0.02***	0.03
	(3.68)	(2.82)	(10.75)	(13.69)	(12.12)	(0.92)
Number of observations	1376	757	384	179	563	56
Number of countries	122	49	32	30	62	11
R2 (within)	0.56	0.69	0.78	0.83	0.82	–
Hausman test (Prob > Chi2)	0.00	0.00	0.00	0.00	0.00	0.00

Note: t statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5. GDP and globalization: feedback (1970–2018)

KOFE (dependent variable)	World	High	Upper Middle	Lower Middle	Middle	Low
LOG(*GDPC*)	8.33***	11.08***	9.62**	−7.36	6.49*	17.65
	(5.37)	(6.34)	(3.20)	(−1.32)	(2.37)	(1.80)
KOFS	−0.04	0.29***	−0.37***	0.60***	−0.07	−0.53
	(−0.72)	(4.37)	(−3.97)	(5.63)	(−0.95)	(−1.70)
KOFP	0.17***	0.18***	0.18**	0.04	0.17**	0.08
	(5.03)	(4.25)	(3.15)	(0.21)	(3.12)	(0.56)
YEAR	0.07	−0.09*	0.20	−0.38*	−0.02	0.67*
	(1.89)	(−2.16)	(1.92)	(−2.36)	(−0.24)	(2.50)
Number of observations	1376	757	384	179	563	56
Number of countries	122	49	32	30	62	11
R2 (within)	0.21	0.40	0.12	0.23	0.08	0.22
Hausman test (Prob > Chi2)	0.00	0.00	0.00	0.00	0.00	0.00

Note: t statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

tive effects of globalization on economic growth, which is contrasting with earlier studies. This outcome is important in shaping appropriate foreign trade policies for UMC countries, which display a negative correlation between growth and trade globalization. They need to pursue with caution further liberalization of goods and services markets. A higher emphasis on economic freedom and capital accumulation will prompt greater economic growth. LMC economies can benefit from trade and financial liberalization, greater economic freedom and capital accumulation, thus giving more instruments for policymakers. The results of the current study are different due to larger panel data covering 1970–2018. KOF index of economic globalization was also used instead of the overall KOF index, and a different mix of control variables and research methods.

CONCLUSIONS

The aim of this study was to clarify the relationship between globalization and growth using a two-stage fixed effect model and method of instrumental variables. The study attempted to identify the direct and reverse relationships for the world economy, as well as groups of countries with different income levels, classified according to the World Bank methodology. This paper provides a scientific background for incorporating globalization agenda into growth models of countries with respect to their income level.

The regression results show a statistically significant relationship between the level of GDP per capita and the level of economic globalization in the aggregate for all countries of the world and high-income countries both in the direct (the level of globalization has a significant effect on the level of GDP per capita) and the opposite direction (a high level of income per capita leads to a higher degree of globalization).

Next, the results for middle-income countries are heterogeneous: economic globalization has a negative (contrary to the expected positive effect) effect on GDP in upper-middle-income countries and a positive effect in lower-middle-income countries. The effect of GDP on globalization is found to be positive for high and middle-income countries and statistically insignificant for lower-middle-income countries. Lastly, no correlation could be established for low-income countries, most likely due to insufficient observations.

This study contributes to the theory of economic growth by uncovering the impact of economic globalization (both trade and financial), gross capital formation, research expenditures, and economic freedom. All factors proved to be statistically significant for the growth of the world economy, particularly, in high- and upper-middle-income countries. For poor countries, the importance of globalization deteriorates, confirming the inability of the economic system to reap globalization benefits. The regression output for the inverse relationship shows that a 1% increase in GDP per capita leads to an 8.33-point increase in the economic globalization index. The results suggest that the prolonged economic growth of high- and middle-income counties has triggered globalization in those countries, while in lower-middle-income countries, GDP growth does not lead to greater openness.

The results of this study can be used by policymakers to decide on the necessary reforms aimed at economic growth concerning the level of a country's level of income. The questions include whether a more open economy can yield desired economic growth and whether the growth will lead to more economic globalization. This study was unable to provide satisfactory results for low-income countries due to poor quality and data availability. Furthermore, the data were aggregated into 5-year observations due to the unavailability of annual economic freedom indexes. Going forward, the interrelation of economic globalization and growth can be studied by various economic groups, such as the European Union, NATFA, and ASEAN, to design growth-inducing policies that cater to the needs of an individual country-member. Furthermore, extensive research on the interrelation between financial and trade globalization and economic growth, as well as its reverse relationship, can be conducted to specify an adequate policy instrument for various groups of countries.

AUTHOR CONTRIBUTIONS

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Supervision: Vira Rokocha, Sanjeev Kumar.
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APPENDIX A

Table A1. Summary of variables in empirical studies on globalization-growth relationships

Dreher (2006)	Didžgalvytė-Bujauskė et. al (2019)	Samimi and Jenatabadi (2014)	Hammudeh et al. (2020)	Gurgul and Lach (2014)	Gunter and Wilcher (2020)
Life expectancy (log)	Labor force		Labor Force	Labor Force	
Fertility rate (log)					Adult fertility
Secondary school enrolment		Secondary School enrolment		Average years of schooling over age 25	Education
Investment, % of GDP	Gross capital formation, % GDP	Gross capital formation, % GDP	Fixed capital formation	Gross capital formation, % GDP	
Govt consumption, % of GDP	Govt expenditure, % of GDP	Govt consumption, % of GDP		Govt consumption, % of GDP	
Rule of law index	Political and civil rights	Institutional quality	Quality of governance (anti-corruption activities, law and order, bureaucracy)		Instability
Inflation	Foreign aid	Inflation (CPI)		Inflation (CPI)	
Liquid liabilities		Liquid liabilities	Financial development	Money and quazi money (M2), % of GDP	
Stock market capitalization				FDI, net inflow, % of GDP	
	Landlockedness				Infrastructure

APPENDIX B

Table B1. GDP per capita, growth and KOF indices of globalization by income groups

	High income						Low income						Lower middle income						Upper middle income						World					
	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth
1970	52	49	52	46	17,464		24	24	25	24			30	31	31	30	0,710		36	36	38	34	1,883		38	37	39	35	5,204	
1971	52	51	54	47	17,964	2,8%	24	24	25	24			30	30	31	30	0,719	1,3%	37	36	39	34	1,970	4,5%	39	38	40	36	5,318	2,2%
1972	52	51	54	47	18,778	4,4%	24	25	26	25			30	31	31	30	0,724	0,7%	37	36	39	34	2,070	4,9%	39	38	40	36	5,511	3,6%
1973	53	52	55	48	19,787	5,2%	25	25	26	25			31	31	32	30	0,739	2,0%	38	37	39	35	2,194	5,8%	40	39	41	37	5,756	4,4%
1974	53	52	56	48	19,822	0,2%	25	26	27	25			32	32	34	30	0,758	2,5%	38	37	40	34	2,286	4,1%	40	39	42	36	5,759	0,0%
1975	54	53	56	48	19,614	−1,1%	25	26	27	26			31	32	34	31	0,769	1,5%	38	37	40	35	2,335	2,1%	40	39	42	37	5,687	−1,2%
1976	54	53	57	49	20,422	4,0%	25	26	27	26			32	33	34	31	0,792	3,0%	39	37	39	35	2,457	5,1%	40	40	42	37	5,882	3,4%
1977	55	54	57	50	21,040	3,0%	26	27	28	27			32	34	35	32	0,819	3,4%	39	38	40	36	2,508	2,1%	41	40	42	38	6,009	2,1%
1978	55	54	57	51	21,726	3,2%	27	28	28	28			33	34	35	33	0,832	1,6%	40	38	40	37	2,533	1,0%	41	41	42	39	6,135	2,1%
1979	56	55	58	51	22,433	3,2%	27	28	29	28			33	34	35	34	0,824	−1,0%	40	39	41	37	2,612	3,1%	42	41	43	39	6,278	2,3%
1980	56	56	58	53	22,582	0,7%	27	29	29	29			33	35	36	35	0,841	2,1%	40	39	41	37	2,665	2,0%	42	42	43	40	6,287	0,2%
1981	56	57	58	55	22,841	1,1%	27	29	29	29			34	36	36	36	0,836	−0,6%	40	40	41	39	2,664	0,0%	42	43	43	41	6,297	0,2%
1982	56	57	58	55	22,655	−0,8%	27	29	28	30	0,634		34	36	35	37	0,836	0,0%	40	40	41	39	2,690	1,0%	42	43	43	42	6,212	−1,4%
1983	57	57	57	56	23,104	2,0%	28	29	28	31	0,630	−0,7%	34	36	35	38	0,838	0,3%	40	40	40	39	2,663	−1,0%	42	43	42	43	6,251	0,6%
1984	56	57	58	56	23,993	3,8%	28	30	28	31	0,613	−2,7%	34	36	35	38	0,842	0,4%	40	40	40	40	2,746	3,1%	42	43	43	43	6,420	2,7%
1985	57	58	58	58	24,687	2,9%	28	30	28	31	0,598	−2,4%	34	37	35	39	0,855	1,5%	41	40	40	41	2,822	2,7%	43	44	43	44	6,544	1,9%
1986	57	58	57	58	25,311	2,5%	29	30	28	32	0,605	1,1%	34	36	35	39	0,864	1,1%	41	41	40	42	2,893	2,5%	43	44	42	45	6,648	1,6%
1987	56	57	57	58	26,020	2,8%	29	31	28	34	0,617	1,9%	34	37	35	39	0,872	0,8%	41	41	40	42	2,985	3,1%	43	44	42	45	6,774	1,9%
1988	56	58	57	58	27,085	4,0%	29	31	28	34	0,620	0,5%	34	37	35	40	0,901	3,3%	41	42	41	43	3,028	1,5%	43	44	43	45	6,964	2,8%
1989	56	58	57	59	27,936	3,1%	29	32	29	35	0,615	−0,8%	35	38	36	40	0,919	2,0%	42	43	42	44	3,048	0,6%	43	45	43	46	7,097	1,9%
1990	56	58	57	59	28,596	2,3%	29	32	30	35	0,589	−4,4%	35	38	36	40	0,926	0,8%	42	42	41	44	3,059	0,4%	43	45	44	46	7,179	1,2%
1991	57	58	57	59	28,785	0,7%	29	31	29	34	0,575	−2,3%	35	37	35	39	0,908	−2,0%	41	41	41	41	3,063	0,1%	43	44	43	45	7,162	−0,2%
1992	58	59	58	59	29,200	1,4%	30	32	29	35	0,545	−5,3%	37	39	37	40	0,907	−0,2%	42	41	42	42	3,040	−0,7%	44	45	44	46	7,176	0,2%
1993	60	60	59	61	29,326	0,4%	30	33	31	34	0,528	−3,2%	38	41	39	42	0,891	−1,7%	43	43	43	43	3,102	2,0%	46	46	46	47	7,174	0,0%
1994	60	61	60	62	30,044	2,4%	32	36	34	38	0,511	−3,2%	39	42	40	44	0,887	−0,5%	44	44	43	44	3,143	1,3%	47	48	46	49	7,278	1,4%
1995	61	62	60	63	30,650	2,0%	33	37	34	39	0,521	1,8%	40	43	41	45	0,904	1,9%	46	46	44	47	3,212	2,2%	48	49	47	51	7,387	1,5%
1996	62	62	62	63	31,351	2,3%	32	35	34	37	0,531	2,0%	40	43	42	45	0,934	3,3%	46	46	45	46	3,326	3,5%	48	49	48	50	7,528	1,9%
1997	63	64	63	66	32,185	2,6%	32	36	34	37	0,541	1,9%	41	44	43	46	0,948	1,4%	48	47	46	48	3,460	4,0%	49	50	49	52	7,694	2,2%
1998	64	66	65	68	32,852	2,1%	33	36	34	39	0,545	0,7%	42	45	44	47	0,970	2,4%	48	49	47	50	3,473	0,4%	50	52	50	53	7,783	1,1%
1999	65	67	65	69	33,712	2,6%	34	37	34	39	0,548	0,5%	43	46	44	48	1,003	3,3%	50	50	48	51	3,532	1,7%	51	53	51	54	7,928	1,9%

Table B1 (cont.). GDP per capita, growth and KOF indices of globalization by income groups

	High income						Low income						Lower middle income						Upper middle income						World					
	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth	KOFGI	KOFEcGI	KOFTrGI	KOFFiGI	GDP_cap	Growth
2000	66	69	67	71	34,858	3,3%	34	37	35	40	0,549	0,1%	44	47	46	48	1,026	2,3%	51	51	50	52	3,708	4,9%	52	54	52	55	8,168	3,0%
2001	67	70	67	72	35,173	0,9%	35	38	35	40	0,561	2,3%	45	47	46	49	1,054	2,7%	52	52	50	53	3,789	2,2%	53	54	53	56	8,221	0,7%
2002	66	68	67	70	35,493	0,9%	35	38	35	40	0,569	1,4%	45	47	46	48	1,084	2,8%	52	52	51	52	3,914	3,2%	53	54	53	55	8,295	0,9%
2003	67	69	67	71	36,045	1,5%	37	38	35	41	0,581	2,2%	46	48	47	48	1,134	4,5%	54	53	52	53	4,082	4,2%	54	55	53	56	8,434	1,7%
2004	68	71	69	73	37,004	2,6%	38	38	36	41	0,597	2,7%	47	48	47	49	1,195	5,3%	55	54	53	54	4,367	6,7%	55	56	54	57	8,697	3,1%
2005	69	72	70	75	37,811	2,2%	39	39	37	41	0,621	3,9%	48	49	49	49	1,253	4,7%	55	55	53	56	4,639	6,1%	56	57	55	58	8,926	2,6%
2006	70	73	69	77	38,718	2,4%	40	39	37	41	0,644	3,7%	49	50	50	50	1,318	5,0%	57	56	54	57	4,978	7,1%	57	57	56	59	9,203	3,1%
2007	71	74	70	78	39,511	2,0%	41	39	38	41	0,674	4,5%	50	51	51	51	1,385	5,0%	58	57	55	58	5,377	7,7%	58	58	57	60	9,483	3,0%
2008	72	73	70	76	39,364	−0,4%	42	39	39	40	0,698	3,5%	51	50	52	48	1,421	2,5%	59	56	56	56	5,648	4,9%	59	58	57	58	9,541	0,6%
2009	72	73	69	76	37,785	−4,1%	42	38	37	40	0,713	2,1%	51	49	50	49	1,467	3,2%	59	56	54	56	5,702	0,9%	59	57	56	58	9,268	−2,9%
2010	72	73	70	76	38,650	2,3%	43	40	39	41	0,734	3,0%	52	50	50	50	1,543	5,0%	60	56	55	56	6,089	6,6%	60	58	56	59	9,551	3,0%
2011	72	73	71	76	39,192	1,4%	44	42	41	42	0,739	0,6%	52	50	51	49	1,592	3,2%	60	56	56	56	6,422	5,3%	60	58	57	59	9,737	1,9%
2012	73	73	71	76	39,471	0,7%	45	42	41	42	0,737	−0,2%	53	50	51	49	1,648	3,4%	61	56	56	56	6,702	4,3%	61	58	57	59	9,866	1,3%
2013	73	73	71	76	39,817	0,9%	45	42	41	43	0,759	3,0%	53	50	51	49	1,713	3,9%	61	56	57	56	6,982	4,1%	61	58	58	59	10,010	1,5%
2014	73	75	72	77	40,387	1,4%	45	42	40	43	0,778	2,4%	54	50	50	50	1,785	4,1%	62	57	57	58	7,212	3,2%	61	59	57	60	10,175	1,6%
2015	73	74	71	77	41,098	1,7%	45	41	39	42	0,774	−0,5%	54	49	49	49	1,858	4,0%	62	56	56	57	7,409	2,7%	61	58	57	59	10,347	1,7%
2016	73	74	71	77	41,569	1,1%	45	40	37	43	0,784	1,3%	54	49	49	50	1,934	4,0%	62	57	56	58	7,643	3,1%	61	58	56	60	10,493	1,4%
2017	73	75	72	77	42,350	1,9%	46	40	38	44	0,798	1,7%	55	50	50	51	2,010	3,9%	62	57	56	58	7,948	3,9%	62	58	57	60	10,713	2,1%
2018	74	75	72	77	43,125	1,8%	46	41	39	44	0,805	1,0%	55	51	51	51	2,084	3,6%	62	57	57	58	8,248	3,7%	62	59	58	60	10,924	2,0%

APPENDIX C

Table C1. Correlation coefficients between real GDP growth and KOF indices of globalization

GDP growth	World	HIC	LIC	LMC	UMC
1970–1974					
KOFGI	0,6290*	0,1961*	0,2550*	0,5234*	0,5766*
KOFEcGI	0,6421*	0,3463*	−0,2399*	0,4856*	0,1522
KOFFiGI	0,6056*	0,4105*	−0,2494*	0,5353*	0,2627*
KOFTrGI	0,5739*	0,2048*	−0,1837	0,2625*	−0,0121
1975–1979					
KOFGI	0,5347*	0,0566	0,5104*	0,5281*	0,4401*
KOFEcGI	0,5634*	0,2589*	−0,0067	0,5284*	0,1681*
KOFFiGI	0,4302*	0,1344*	−0,054	0,5151*	0,1963*
KOFTrGI	0,5895*	0,3391*	0,0274	0,3600*	0,0621
1980–1984					
KOFGI	0,5713*	0,1305*	0,4836*	0,3512*	0,4280*
KOFEcGI	0,5916*	0,3175*	0,0788	0,3703*	0,0606
KOFFiGI	0,4900*	0,2167*	0,0859	0,3407*	0,2037*
KOFTrGI	0,5736*	0,3504*	0,0671	0,2596*	−0,1128
1985–1989					
KOFGI	0,6260*	0,2319*	0,4706*	0,3341*	0,3902*
KOFEcGI	0,6458*	0,4194*	0,0719	0,3490*	−0,0709
KOFFiGI	0,5634*	0,3604*	0,0927	0,3243*	0,0927
KOFTrGI	0,6016*	0,3700*	0,0419	0,2501*	−0,1963*
1990–1994					
KOFGI	0,6143*	0,2533*	0,3352*	0,3439*	0,4380*
KOFEcGI	0,6731*	0,5497*	0,1231	0,3313*	−0,0119
KOFFiGI	0,6058*	0,5023*	0,1394	0,2868*	0,1723*
KOFTrGI	0,6074*	0,4469*	0,0726	0,2693*	−0,2187*
1995–1999					
KOFGI	0,5748*	0,1892*	0,4152*	0,2933*	0,4202*
KOFEcGI	0,6579*	0,5069*	0,3851*	0,3952*	−0,0082
KOFFiGI	0,6135*	0,5041*	0,2675*	0,3831*	0,2256*
KOFTrGI	0,5646*	0,3638*	0,3544*	0,2361*	−0,2335*
2000–2004					
KOFGI	0,5294*	0,1172*	0,4569*	0,3346*	0,1369*
KOFEcGI	0,6531*	0,4643*	0,4336*	0,3474*	−0,1299*
KOFFiGI	0,6416*	0,4939*	0,4415*	0,2777*	0,0806
KOFTrGI	0,5466*	0,3155*	0,3095*	0,3059*	−0,2342*
2005–2009					
KOFGI	0,4704*	−0,0131	0,4038*	0,3526*	−0,013
KOFEcGI	0,6213*	0,3088*	0,3553*	0,3917*	−0,1864*
KOFFiGI	0,6544*	0,4397*	0,4113*	0,2703*	−0,0881
KOFTrGI	0,4893*	0,1238*	0,1963*	0,4218*	−0,1868*
2010–2014					
KOFGI	0,4458*	−0,044	0,2268*	0,2757*	0,0034
KOFEcGI	0,6133*	0,2615*	0,1578*	0,2485*	−0,2281*
KOFFiGI	0,6656*	0,4533*	0,3220*	0,1697*	−0,1704*
KOFTrGI	0,4781*	0,0671	−0,0639	0,2731*	−0,2131*
2015–2018					
KOFGI	0,4720*	0,0117	0,1949*	0,2990*	0,1896*
KOFEcGI	0,6468*	0,3689*	0,1727*	0,2371*	−0,0946
KOFFiGI	0,6824*	0,5116*	0,3507*	0,1571*	−0,0167
KOFTrGI	0,5276*	0,1941*	−0,0609	0,2539*	−0,1324*