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Research Paper

Does Digitalization Have a Dampening Effect on Income Inequality? Evidence from OIC Countries

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ABSTRACT

The rapid advancement of digital technology has the capacity to create significant effects on income distribution by shaping the availability and quality of employment opportunities. As a result, it has the potential to either narrow or widen income inequality in society. In this paper, we attempt to test the effect of digitalization on income and wealth inequality. We use a multiproxy of digitalization from the International Telecommunication Union ICT database and comprehensive inequality proxy from the World Inequality Database consisting of 56 Organization of Islamic Cooperation member countries from 2010-2021 and estimate their relationship by performing a fixed-effect panel regression. Our finding reveals that digitalization can alleviate income and wealth inequality. Its narrowing effect also applies to income gender inequality. The decline in income inequality is associated with lower GDP per capita, higher net inflow of foreign direct investment, and greater political stability. Similarly, lower wealth inequality is linked to lower GDP per capita and improved political stability. In light of these results, we recommend that governments implement policies aimed at fostering technological advancements, such as infrastructure development to enhance internet and telecommunication coverage. Additionally, inclusive economic growth policies should be prioritized, along with efforts to attract foreign investment through business-friendly reforms and the promotion of political stability that is devoid of gender discrimination.

Introduction

Income inequality is an important economic indicator. It measures the disparity of incomes among different segments of the population. Income inequality interrupts long-run social and economic development, intrudes on poverty reduction, and devastates people's sense of fulfilment and self-regard. This, in turn, can lead to criminal acts and riots. Income inequality has also been found to decrease public health (Wang & Xu, 2023). Because of the negative impact of this issue, reducing inequality become goal number 10 of the Sustainable Development Goals. In the era of Industry 4.0 which is marked by the massive increase in digitalization in various aspects of life, assessing how digitalization affects income inequality is critical for addressing the inequality challenges through the use of digital technology tools (Yin & Choi, 2022).

The relationship between digitalization and income inequality can be understood through two contrasting perspectives, as discussed by Yin and Choi (2022). Proponents argue that digital technology has the potential to mitigate income inequality. Firstly, digital technology contributes to economic advancement by reducing transaction costs and improving productivity. Secondly, it facilitates job creation, particularly through the emergence of new digital-based opportunities. Lastly, digital technology enables more efficient resource allocation by granting the poor access to resources, information, and markets, thereby increasing their income. These viewpoints highlight the positive role that digitalization can play in addressing income inequality (Houngbonon & Liang, 2021).

On the other hand, there is an opposing perspective suggesting that digital technology has the potential to exacerbate income inequality. Firstly, the job opportunities created by digital technology often require higher levels of skills, placing a greater emphasis on highly skilled workers compared to those with lower skill levels. Secondly, digital technology tends to benefit workers engaged in non-routine cognitive tasks, such as financial analysis, while providing less support for medium-skilled workers whose routine jobs can be automated (Daron, 2002; Michaels et al., 2014). Lastly, the adoption of digital technology can contribute to income disparities between rural and urban residents due to disparities in infrastructure and digital skills availability.

Empirical literature investigating the effect of digitalization on income inequality has been expanding. The body of literature can be divided into two groups: cross-country evidence and single-country evidence. A cross-country evidence conducted by Michaels et al. (2014) examines the hypothesis saying that information and communication technologies contrast labor markets by increasing demand for highly educated workers by sacrificing middle-educated workers, with a small effect on low-educated workers in the United States, Japan, and nine European countries. Richmond and Triplett (2018) test the connection between ICT and income inequality in 109 countries. They find that the increases in fixed broadband subscriptions are associated with the increases in income inequality, while the increases in mobile subscriptions are associated with the decreases in income inequality.

Focusing on African countries, Asongu and Odhiambo (2019) examine whether the ICT advancement reduces inequality across 48 countries in Africa. They find that increasing internet penetration and fixed broadband subscriptions has a net effect on reducing income inequality. Tchamyou et al. (2019) investigate the role of ICT on income inequality in 48 African countries. They find that ICT reduces inequality through formal financial sector development and financial sector formalization as opposed to informal financial sector development and financial sector formalization. Adams and Akobeng (2021) investigate the

direct effect of transformation and communication technologies on inequality in 46 African countries. They found that the internet, fixed broadband, and mobile cellular subscription directly reduce inequality.

Using Group of Twenty (G20) as a unit analysis, Yin and Choi (2022) examine both the direct and moderating effect of digitalization on income inequality. They find that digitalization curbs income inequality. Behar (2011) uses developing countries to answer the question asking about why has schooling not countered the pervasive rises in wage inequality driven by a skill-biased technical change. They show that technological change is skill-biased in the South simply because it is in the North. This causes permanently rising wage inequality in the South.

The aforementioned cross-country studies are complemented by studies focusing on micro-level evidence. Daron (2002) discussed the relationship between technological change and the labor market emphasizing the changes in the U.S. wage structure. The evidence shows an acceleration in skill bias during the past few decades. The technological change benefits only those workers with higher skills.

In China's case, Zhang et al. (2017) gauge the effect of technological change on inequality based on provincial data. They find that technological change, mostly capital-biased, is negatively correlated with the labor share of income (increasing inequality). Li et al. (2021) aim to shed light on how e-commerce affects the income gap between urban and rural residents in Zhejiang. They find that the development of e-commerce plays a significant role in first enlarging and then narrowing urban–rural income gap (inverted-U curve). Qiu et al. (2023) study the effect of the digital divide on income equality and find that the digital divide widens the income divide.

Celbis and de Crombrugghe (2018) investigate the role of regional internet infrastructure in reducing regional per capita income disparities in Turkey. They find that internet infrastructure increases the speed of regional per capita convergence. Mönnig et al. (2019) discuss the impact of digital transformation on labor markets by analyzing its impact on wage inequality in Germany. They find that digital transformation increases wage inequality, however, to a low extent, but in the long run, wage inequality rises stronger. Houngbonon and Liang (2021) combine city-level income distribution and job data with broadband data from France to examine the effect of broadband internet access on income inequality. They find that broadband internet decreases income inequality through increased employment in manual jobs.

In short, the relationship is the subject of debate. Some studies found that an increase in digitalization reduces income inequality (see Adams & Akobeng, 2021; Asongu & Odhiambo, 2019; Celbis & de Crombrugghe, 2018; Houngbonon & Liang, 2021; Tchamyou et al., 2019; Yin & Choi, 2022), other studies found the opposite (see Behar, 2011; Daron, 2002; Michaels et al., 2014; Mönnig et al., 2019; Qiu et al., 2023; Zhang et al., 2017), and some studies found mixed relationship (see Li et al., 2021; Richmond & Triplett, 2018). We shed light on this debate by analyzing the effect of digitalization on income and wealth inequality. By using multi-country evidence (OIC countries) as a lesson learned, our research is a current study that discusses this topic within the context of the Islamic world. We control income and wealth inequality using GDP per capita, net inflow of foreign direct investments, and political stability and lack of violence. We employ a fixed effect panel regression with multiple proxies of digitalization, income and wealth inequality to provide convincing results on the validity of the estimation.

The subsequent sections of the paper are structured as follows: Section 2 presents an overview of the methods employed in this study. Section 3 presents the estimation results. In Section 4, we discuss the findings. Finally, in Section 5, we provide concluding remarks based on the outcomes.

Method

This research aims to assess the effect of digitalization on income and wealth inequality using unbalanced panel data consisting of 56 OIC (Organization of Islamic Cooperation) member countries from 2010-2021. This study uses income dan wealth inequality data from World Inequality Database (https://wid.world) and digitalization measurement from the ITU-D ICT database (https://www.itu.int). We use GDP per capita and foreign direct investment obtained from World Development Indicators provided by Worldbank and Political Stability and Lack of Violence from Worldbank Worldwide Governance Indicators.

$$inequality_{it} = a_0 + b_1 digitalization_{it} + b_2\, x_{it} + v_{it} \quad (1)$$

The vector of *inequality* consists of the share of income and wealth of the top 10%, bottom 50%, and top 1% as well as the share of female income from the World Inequality Database (https://wid.world). The vector of *digitalization* consists of fixed broadband subscriptions per 100 inhabitants, fixed telephone subscriptions per 100 inhabitants, mobile cellular subscriptions per 100 inhabitants, internet user proportion, international bandwidth per Internet user (bit/s), and active mobile-broadband subscriptions per 100 inhabitants from ITU-D ICT database (https://www.itu.int). Country-specific characteristics consist of GDP per capita, the foreign inflow of direct investment obtained from Worldbank World Development Indicators provided by Worldbank, and Political Stability and Lack of Violence from Worldbank Worldwide Governance Indicators.

v_{it} the composite error consists of u_{it} and a_i. a_i is unobserved heterogeneity that varies between individuals (countries) but does not vary over time (time-invariant). In this study, it is the characteristics of each country that are unobserved. While u_{it} is idiosyncratic errors or shocks whose values vary between individuals (countries) and over time. The reason for using the fixed effect model is because a_i is correlated with the independent variable (explanatory variable) over time, therefore the within estimator is used in an effort to eliminate a_i so that the regression can produce a consistent estimate (Wooldridge, 2020). The form of within estimator is as follows:

$$inequality_{it} - \overline{inequality}_i = b_0 + b_1(digitalization_{it} - \overline{digitalization}_i) + \beta_2(x_{it} - \bar{x}_i) + (a_i - \bar{a}_i) + (u_{it} - \bar{u}_i) \quad (2)$$

$\overline{inequality}_i$ is the vector of inequality variables which is averaged over time (t) for each country (i). The above equation is also known as the time-demeaned equation because it uses the time average as a subtraction for each variable in an effort to eliminate a_i in the equation.

Result

Table 1 explains all variables used in this study as well as descriptive statistics. Inequality as a dependent variable is proxied by the share of income and wealth of the top

10%, bottom 50%, and top 1%, respectively, as well as the share of female income. On average, the top 10% of people in OIC countries make around 48% of total income, while the bottom 50% and top 1% of people in OIC countries make around 14% and 16% of total income, respectively. In terms of wealth, inequality is still the same as in the case of income. On average, the top 10% of people in OIC countries make around 64% of total wealth, while the bottom 50% and top 1% of people in OIC countries make around 4% and 31% of total wealth, respectively. In terms of female income inequality, on average, females in OIC countries only make 20% of total income compared to males.

We use 6 proxies of digitalization the measure the degree of digitalization in OIC countries. They are fixed broadband subscriptions per 100 inhabitants, fixed telephone subscriptions per 100 inhabitants, mobile cellular telephone subscriptions per 100 inhabitants, internet user proportion, international bandwidth per user, and active mobile broadband subscriptions per 100 inhabitants. All these variables are in percent of the population, except international bandwidth per user which is expressed in bit/s. We controlled the effect of digitalization on inequality using GDP per capita, net inflow of foreign direct investment, and political stability. GDP per capita is expressed in US$, while the net inflow of foreign direct investment is expressed in percent of GDP. Political stability is proxied by political stability and the absence of violence or terrorism that ranges from approximately -2.5 (weak) to 2.5 (strong).

Table 1. Descriptive Statistics

Variable	Definition	Source	Unit	Obs	Mean	Std. Dev.	Min	Max
The Share of the Top 10% of Income	The share of income of the top 10% class	World Inequality Database	%	684	47.50249	6.14984	31.82000	64.63000
The Share of the Bottom 50% of Income	The share of income of the bottom 50% class	World Inequality Database	%	684	13.97041	2.94298	8.30000	21.10000
The Share of the Top 1% of Income	The share of income of the top 1% class	World Inequality Database	%	684	16.28118	4.00289	7.95000	31.11000
The Share of the Top 10% of Wealth	The share of the wealth of the top 10% class	World Inequality Database	%	684	63.76763	6.22034	55.89000	80.45000
The Share of the Bottom 50% of Wealth	The share of the wealth of the bottom 50% class	World Inequality Database	%	684	3.65541	1.51745	-1.11000	5.13000
The Share of the Top 1% of Wealth	The share of the wealth of the top 1% class	World Inequality Database	%	684	30.63237	6.75468	22.19000	49.15000
The Share of Female Income	The share of female income compared to male income	World Inequality Database	%	570	20.16832	9.54515	0.00000	42.12000
Fixed Broadband Subscriptions per 100 Inhabitants	Fixed broadband subscribers divided by population and multiplied by 100	ITU-D ICT Statistics	%	629	4.65162	6.06361	0.00000	38.15270

Variable	Definition	Source	Unit	Obs	Mean	Std. Dev.	Min	Max
Fixed Telephone Subscriptions per 100 Inhabitants	Fixed telephone subscribers divided by population and multiplied by 100	ITU-D ICT Statistics	%	656	8.06328	8.25308	0.00000	37.83962
Mobile Cellular Telephone Subscriptions per 100 Inhabitants	Mobile cellular subscribers divided by population and multiplied by 100	ITU-D ICT Statistics	%	668	97.64262	39.57886	5.38970	221.30880
Internet Users Proportion	Internet user proportion to population	ITU-D ICT Statistics	%	600	37.47726	29.23850	0.58000	100.00000
International Bandwidth per User	International bandwidth per Internet user	ITU-D ICT Statistics	bit/s	551	38836.10000	83405.40000	0.00000	902775.60000
Active Mobile Broadband Subscriptions per 100 Inhabitants	Active mobile broadband subscribers divided by population and multiplied by 100	ITU-D ICT Statistics	%	633	39.51142	42.45311	0.00000	263.46670
GDP per Capita	GDP per capita (constant 2015)	Worldbank Development Indicators	US$	656	6795.35500	10892.53000	330.41880	65129.38000
Net Inflow of Foreign Direct Investments	Foreign direct investment, net inflows (% of GDP)	Worldbank Development Indicators	%	601	3.73224	5.03661	-11.19898	39.45622
Political Stability	Measures of the likelihood of political instability/politically-motivated violence, including terrorism ranges from -2.5 to 2.5	World Governance Indicator	-	672	-0.77612	0.95405	-3.13097	1.27755

Table 2 reports regression results for Equation 1 estimated using the fixed effect model. The coefficient of the digitalization variable (except internet user proportion), measuring the digitalization degree in OIC countries, is negative and significant. The increase in digitalization results in reducing of the share of income for the top 10% income. GDP per capita has a positive sign, meaning that as income increases, the share of the top 10% of income also increases. The net inflow of foreign direct investment has a negative sign meaning that an increase in net capital inflow help spread income so that it reduces the concentration of the income in the top 10%. Our study also found that political stability has a negative effect on the share of the top 10% of income. Higher political stability lessens the share of the top 10% of income.

Table 3 concerns to disclose the effect of digitalization on the share of the bottom 50% of income. The coefficient of the digitalization variable (except internet user proportion) is positive and significant. It means that the increase of digitalization can increase the share of

the bottom 50% of income. In other words, it can also be said that the income class of the bottom 50% has increased due to digitalization. Control variables like GDP per capita negatively affect the share of the bottom 50% of income. The net inflow of foreign direct investment and political stability help the share of income of the bottom 50% to increase.

Table 4 explores the effect of digitalization on the share of the top 1% of income. The coefficient of digitalization variables (mobile cellular telephone subscriptions, international bandwidth per user, and active mobile broadband subscriptions) have a negative sign. The increase in digitalization can decrease the share of the total income of the top 1%. GDP per capita is beneficial to the top 1% as it increases the share of its class. The net inflow of foreign direct investment and political stability decreases the share of income of the top 1%.

Table 5, Table 6, and Table 7 show the effect of digitalization on the share of wealth of the top 10%, bottom 50%, and top 1%. The effect of digitalization on wealth inequality is still the same as what happened to income inequality. It reduces the share of the wealth of the top 10% and the top 1% and increases the share of the wealth of the bottom 50%. However, there is one digitalization proxy whose effect is different from the others, namely fixed telephone subscriptions. It has the opposite effect – the increases in fixed telephone subscriptions elevate the share of the wealth of the top 10% and the top 1%.

Control variables – GDP per capita reduces the share of wealth made by the bottom 50% (widens wealth inequality). On the other hand, political stability enhances wealth equality (reducing wealth inequality) – reducing the share of the top 10% of wealth and increasing the share of the bottom 50% of wealth.

In addition, Table 8 shows that digitalization increases the share of income made by the female. GDP per capita and the net inflow of foreign investment increase females' income share, while political stability and lack of violence decrease females' income share.

Table 2. The Share of the Top 10% of Income Estimation

The Share of the Top 10% of Income	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Fixed Broadband Subscriptions per 100 Inhabitants	-0.04668*** [0.01797]					
Fixed Telephone Subscriptions per 100 Inhabitants		-0.08246*** [0.02769]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			-0.01681*** [0.00297]			
Internet Users Proportion				-0.00986 [0.01005]		
Log (International Bandwidth per User)					-0.10785** [0.05078]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						-0.00759*** [0.00179]
log (GDP per Capita)	0.20281 [0.50452]	-0.29225 [0.49306]	1.08870** [0.51053]	0.33885 [0.90752]	0.41409 [0.59383]	0.51435 [0.54502]
Net Inflow of Foreign Direct Investments	-0.01425 [0.01598]	-0.02992** [0.01488]	-0.03259** [0.01439]	-0.02996 [0.02783]	-0.00377 [0.01876]	-0.02179 [0.01610]
Political Stability and Lack of Violence	-0.36881** [0.17703]	-0.33741* [0.17510]	-0.37729** [0.16969]	-0.40030 [0.40820]	-0.42027** [0.18840]	-0.38637** [0.18871]
Constant	45.65160*** [4.04779]	50.16974*** [3.98888]	40.13292*** [3.98785]	44.84371*** [7.36251]	44.87846*** [4.66289]	43.40183*** [4.35378]

The Share of the Top 10% of Income	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Observations	562	585	595	564	520	565
F-Statistics	2.98622	4.20601	10.09877	1.01848	2.17226	5.75645
R-Squared	0.02320	0.03105	0.07020	0.02430	0.01854	0.04361

Table 3. The Share of the Bottom 50% of Income Estimation

The Share of the Bottom 50% of Income	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Fixed Broadband Subscriptions per 100 Inhabitants	0.04035*** [0.00865]					
Fixed Telephone Subscriptions per 100 Inhabitants		0.05198*** [0.01325]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			0.00859*** [0.00142]			
Internet Users Proportion				0.00661 [0.00462]		
Log (International Bandwidth per User)					0.07559*** [0.02474]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						0.00475*** [0.00086]
log (GDP per Capita)	-0.11269 [0.24279]	0.25108 [0.23597]	-0.48037* [0.24517]	-0.00499 [0.44351]	0.00035 [0.28933]	-0.20647 [0.26052]
Net Inflow of Foreign Direct Investments	0.00760 [0.00769]	0.01206* [0.00712]	0.01357* [0.00691]	0.01391 [0.01087]	0.00509 [0.00914]	0.01230 [0.00770]
Political Stability and Lack of Violence	0.15994* [0.08519]	0.13751 [0.08380]	0.15583* [0.08149]	0.14181 [0.17548]	0.14622 [0.09179]	0.17939** [0.09020]
Constant	14.90804*** [1.94793]	11.71302*** [1.90901]	17.12503*** [1.91505]	13.90916*** [3.61115]	13.38913*** [2.27187]	15.58325*** [2.08114]
Observations	562	585	595	564	520	565
F-Statistics	6.69820	5.34729	10.62984	1.08744	3.08860	9.17105
R-Squared	0.05057	0.03915	0.07362	0.03041	0.02615	0.06772

Table 4. The Share of the Top 1% of Income Estimation

The Share of the Top 1% of Income	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Fixed Broadband Subscriptions per 100 Inhabitants	-0.01676 [0.01514]					
Fixed Telephone Subscriptions per 100 Inhabitants		-0.02099 [0.02355]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			-0.01031*** [0.00254]			
Internet Users Proportion				-0.00704 [0.00858]		
Log (International Bandwidth per User)					-0.07167* [0.04154]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						-0.00379** [0.00153]
log (GDP per Capita)	0.60486 [0.42511]	0.40067 [0.41938]	1.20903*** [0.43691]	0.84302 [0.76282]	1.00487** [0.48578]	0.97014** [0.46569]
Net Inflow of Foreign Direct Investments	-0.01537 [0.01347]	-0.03047** [0.01266]	-0.03201*** [0.01232]	-0.03447 [0.02527]	-0.00827 [0.01535]	-0.01969 [0.01376]
	-0.21334	-0.18873	-0.21540	-0.25598	-0.28136*	-0.15594

The Share of the Top 1% of Income	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Political Stability and Lack of Violence	[0.14917]	[0.14893]	[0.14522]	[0.33706]	[0.15412]	[0.16124]
Constant	11.31089***	13.13500***	7.51050**	9.68337	8.75197**	8.58506**
	[3.41069]	[3.39279]	[3.41279]	[6.09460]	[3.81444]	[3.72011]
Observations	562	585	595	564	520	565
F-Statistics	1.49616	2.38177	6.44418	1.20702	2.09501	2.69030
R-Squared	0.01176	0.01782	0.04597	0.02755	0.01789	0.02086

Table 5. The Share of the Top 10% of Wealth Estimation

The Share of the Top 10% of Wealth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Fixed Broadband Subscriptions per 100 Inhabitants	-0.05091*** [0.01928]					
Fixed Telephone Subscriptions per 100 Inhabitants		0.04870* [0.02943]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			-0.01779*** [0.00313]			
Internet Users Proportion				-0.01878** [0.00797]		
Log (International Bandwidth per User)					-0.18944*** [0.05245]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						-0.00816*** [0.00192]
log (GDP per Capita)	-0.13141 [0.54124]	-0.46226 [0.52412]	0.75144 [0.53921]	0.60911 [0.90560]	0.47062 [0.61343]	0.01416 [0.58308]
Net Inflow of Foreign Direct Investments	-0.00248 [0.01714]	-0.01154 [0.01582]	-0.01487 [0.01520]	0.00336 [0.02434]	0.01630 [0.01938]	-0.01121 [0.01723]
Political Stability and Lack of Violence	-0.24724 [0.18992]	-0.22284 [0.18613]	-0.28588 [0.17922]	-0.31756 [0.34205]	-0.27784 [0.19462]	-0.33699* [0.20189]
Constant	64.76235*** [4.34239]	66.94415*** [4.24015]	59.36949*** [4.21186]	59.49507*** [7.18356]	61.79270*** [4.81677]	63.87348*** [4.65782]
Observations	562	585	595	564	520	565
F-Statistics	2.34227	1.55455	8.95185	1.93669	3.94233	5.61852
R-Squared	0.01829	0.01171	0.06273	0.04226	0.03314	0.04261

Table 6. The Share of the Bottom 50% of Wealth Estimation

The Share of the Bottom 50% of Wealth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Fixed Broadband Subscriptions per 100 Inhabitants	0.01068** [0.00473]					
Fixed Telephone Subscriptions per 100 Inhabitants		-0.00984 [0.00719]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			0.00440*** [0.00076]			
Internet Users Proportion				0.00343** [0.00164]		
Log (International Bandwidth per User)					0.03930*** [0.01287]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						0.00172*** [0.00047]
log (GDP per Capita)	-0.00572 [0.13295]	0.06507 [0.12807]	-0.23823* [0.13152]	-0.15120 [0.20454]	-0.13885 [0.15056]	-0.03764 [0.14358]

The Share of the Bottom 50% of Wealth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Net Inflow of Foreign Direct Investments	0.00043	0.00193	0.00275	-0.00163	-0.00447	0.00225
	[0.00421]	[0.00387]	[0.00371]	[0.00547]	[0.00476]	[0.00424]
Political Stability and Lack of Violence	0.10748**	0.10180**	0.11705***	0.12457	0.11770**	0.13342***
	[0.04665]	[0.04548]	[0.04371]	[0.08935]	[0.04777]	[0.04971]
Constant	3.75008***	3.27958***	5.19276***	4.78912***	4.42995***	3.94703***
	[1.06662]	[1.03608]	[1.02733]	[1.63878]	[1.18226]	[1.14694]
Observations	562	585	595	564	520	565
F-Statistics	2.59960	2.02846	9.94589	1.88750	3.83960	5.17530
R-Squared	0.02025	0.01522	0.06921	0.03382	0.03231	0.03938

Table 7. The Share of the Top 1% of Wealth Estimation

The Share of the Top 1% of Wealth	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Fixed Broadband Subscriptions per 100 Inhabitants	-0.06444*** [0.02169]					
Fixed Telephone Subscriptions per 100 Inhabitants		0.06617** [0.03318]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			-0.01760*** [0.00356]			
Internet Users Proportion				-0.02344** [0.01067]		
Log (International Bandwidth per User)					-0.23003*** [0.05958]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						-0.00923*** [0.00215]
log (GDP per Capita)	-0.12863 [0.60910]	-0.51573 [0.59083]	0.65470 [0.61282]	0.75083 [1.13413]	0.57155 [0.69672]	-0.03818 [0.65424]
Net Inflow of Foreign Direct Investments	0.00146 [0.01929]	-0.00921 [0.01783]	-0.01257 [0.01727]	0.00643 [0.02669]	0.02195 [0.02201]	-0.00916 [0.01933]
Political Stability and Lack of Violence	-0.17845 [0.21373]	-0.14696 [0.20982]	-0.21117 [0.20369]	-0.25018 [0.37253]	-0.20400 [0.22104]	-0.26694 [0.22653]
Constant	31.70917*** [4.88682]	34.16768*** [4.77987]	27.05502*** [4.78688]	25.47696*** [8.91078]	28.34374*** [5.47081]	31.27580*** [5.22629]
Observations	562	585	595	564	520	565
F-Statistics	2.55813	1.53784	6.64555	1.74252	4.31642	5.42172
R-Squared	0.01994	0.01158	0.04733	0.04858	0.03618	0.04118

Table 8. The Share of Female Income Estimation

Dependent Variable: The Share of Female Income	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Fixed Broadband Subscriptions per 100 Inhabitants	0.08114*** [0.02867]					
Fixed Telephone Subscriptions per 100 Inhabitants		0.01664 [0.04084]				
Mobile Cellular Telephone Subscriptions per 100 Inhabitants			0.00638 [0.00450]			
Internet Users Proportion				0.00755 [0.00988]		
Log (International Bandwidth per User)					0.14571* [0.07607]	
Active Mobile Broadband Subscriptions per 100 Inhabitants						0.00960*** [0.00265]
log (GDP per Capita)	3.45134***	4.16489***	3.53142***	4.40992**	4.01942***	3.42646***

Dependent Variable: The Share of Female Income	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	[0.79980]	[0.76715]	[0.80803]	[1.81230]	[0.86851]	[0.84572]
Net Inflow of Foreign Direct Investments	0.05815**	0.05251**	0.05354**	0.05368	0.07254***	0.06332***
	[0.02361]	[0.02180]	[0.02153]	[0.04311]	[0.02548]	[0.02290]
Political Stability and Lack of Violence	-0.70477***	-0.75851***	-0.75254***	-0.85605**	-0.86787***	-0.59995**
	[0.26350]	[0.25842]	[0.25569]	[0.33645]	[0.26563]	[0.27161]
Constant	-8.16920	-13.76970**	-9.19528	-15.82984	-14.12075**	-7.89912
	[6.42273]	[6.20724]	[6.32614]	[14.42437]	[6.77449]	[6.76348]
Observations	511	535	543	520	485	513
F-Statistics	11.44554	9.71018	10.23340	6.73737	12.17466	14.00669
R-Squared	0.09197	0.07559	0.07813	0.09332	0.10281	0.11007

Discussion

Comparing the effect of digitalization on the share of the top 10%, bottom 50%, and top 1% income, provides some interesting insights. The increase in digitalization decreases the share of the top 10% and top 1% of income and increases the share of the bottom 50% of income. To sum up, it can be said that digitalization consistently has a reducing effect on income inequality. It corroborates similar empirical found in the literature (Adams & Akobeng, 2021; Asongu & Odhiambo, 2019; Celbis & de Crombrugghe, 2018; Houngbonon & Liang, 2021; Tchamyou et al., 2019; Yin & Choi, 2022). This further indicates that the problem of inequality can be reduced by accelerating digitalization in OIC countries because it is not only reducing the portion of income controlled by the rich class (top 10% and top 1% income) but it can also increase the portion of income made by the lower and middle classes (bottom 50%).

The digitalization effect also appears to attenuate wealth inequality. Despite one proxy of digitalization, namely fixed telephone subscriptions, having an opposing effect, causing an increase in the share of the top 10% and the top 1% of the wealth. The variable of fixed telephone subscriptions tends to be a limited indicator in depicting the overall level of adoption and utilization of digital technology compared to other variables employed in this study. This limitation may arise because fixed telephone subscriptions fail to account for advancements in mobile technology and internet usage.

In terms of control variables, this study can provide evidence that the decreasing income is related to a lower GDP per capita, higher net inflow of foreign direct investment, and higher political stability. While decreasing wealth inequality is related to a lower GDP per capita and higher political stability. These findings demonstrate that economic growth in OIC countries is predominantly enjoyed by the high-income and wealthy classes. Inclusive growth policies need to be pursued, including enhancing access to education, improving financial inclusion, expanding access to healthcare and social protection, reducing infrastructure disparities, as well as implementing income and wealth redistribution measures. Governments must strive to improve the ease of doing business to attract foreign investment and enhance political stability, in order to comprehensively reduce income and wealth inequality. Lastly, digitalization has been proven to reduce income inequality between women and men. Digitalization serves as a solution to address the gender disparities in treatment and opportunities for work in OIC countries.

Conclusion

This study examined the effect of digitalization on income and wealth inequality in OIC countries. Unbalanced panel data consisting of 56 OIC countries from 2010 to 2021 were used in this study. To uncover this effect, we use multi proxies of inequality that comprise the share of income and wealth of the top 10%, bottom 50%, and top 1% as well as the share of female income. We also use multi proxies of digitalization that encompass fixed broadband subscriptions, fixed telephone subscriptions, mobile cellular subscriptions, internet user proportion, international bandwidth, and active mobile-broadband subscriptions and estimate their effect on inequality using the fixed effect model.

Overall, our results confirmed that digitalization contributes to narrowing income and wealth inequality as well as gender income inequality. To alleviate income and wealth inequality, this research suggests governments adopt policies to promote the development of technologies through infrastructure development that increases internet and telecommunication coverage. The government also needs to induce inclusive economic growth policies, increase foreign investment by improving the ease of doing business, and enhance political stability that is free from gender discrimination.

Authors' Declaration

The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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