240

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ECONOMIC GROWTH AND INCOME INEQUALITY IN SUB-SAHARAN AFRICAN COUNTRIES: A TEST OF KUZNETS' HYPOTHESIS

ABSTRACT: *In this study, the influence of economic growth on income disparities in 29 sub-Saharan African (SSA) countries is investigated for the period 2005–2015. The primary objective of the study is to empirically test Kuznets' hypothesis, which holds that there is an inverted U-shaped relationship between economic growth and income inequality. The study examined this relationship using four proxies for income inequality: the composite inequality index, the Atkinson index, the Gini coefficient, and the Palma ratio. Using a modified version of a difference generalised method of moments (GMM) estimation technique, it was found that regardless of the proxy used to measure income inequality, there is a consistently significant negative relationship between income per capita (y) and*

income inequality in the countries under study. A consistent positive relationship was also found between the square of income per capita (y2) and income inequality across all the proxies used in the study. The study found that the relationship between economic growth and income inequality follows a U-curve. The result suggests that while economic growth initially lowers income inequality, inequality eventually rises in tandem with growth. This suggests that the bulk of the studied economies in the SSA region are situated on the downward portion of the U-curve. The policy implications are discussed.

KEY WORDS: *Economic growth, income inequality, Kuznets' hypothesis, sub-Saharan Africa, GMM approach*

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1. INTRODUCTION

Sub-Saharan Africa (SSA) is regarded as the world's poorest region, with the most unequal society within and across countries (Sembene, 2015). Country Gini indices ranged from 0.29 (Guinea) to 0.63 (South Africa) in 2018 (World Bank, 2022). Ongoing civil wars, unfavourable weather patterns, sluggish investments, and deteriorating trade terms and conditions limit opportunities and efforts to diversify the SSA economy and spur economic growth (see also Fuje & Yao, 2022). Economic, social, and political factors have continued to expose these countries to local and foreign catastrophes. Despite some upturn in economic growth rates in the majority of countries since 1995, poverty is still pervasive and severely acute in many countries in the SSA region (World Bank, 2022). The adverse spillover impact of the COVID-19 pandemic and weak commodity export demand from emerging markets and developing countries, rising inflation (particularly from food and energy prices), and escalating public debt levels have the potential to slow down regional and global economic growth and eventually widen economic disparities (International Monetary Fund [IMF], 2022; Shen & Zhao 2022).

According to Rossouw and Greyling (2021), high income inequality is divisive and exacerbates social frictions with regard to social–capital and health-related problems. In general, economic decline tends to expand income gaps, resulting in civil unrest that jeopardises society's well-being. Therefore, reducing inequality is crucial as it fosters social cohesion and confidence, public health, and the eradication of poverty. Additionally, as the affluent commit a smaller proportion of their earnings than low- and middle-income groups, an increase in income concentration could also potentially reduce aggregate demand and impede growth (Dabla-Norris et al., 2015). Moreover, income inequality can also lead to a backlash against growth-enhancing policies (Claessens & Perotti, 2007).

The economy of SSA has expanded extraordinarily quickly in the past 21 years, with annual growth averaging 4.4% between 2000 and 2021 (World Bank, 2022). In 2021, all the countries in this region, except Sudan, which recorded -0.3%, reported positive growth rates of between 2% and 7% (World Bank, 2022). However, growth has been concentrated in a few key economic industries, including agriculture, telecommunications, finance, infrastructure, and oil and gas, as well as in certain confined regions within countries (IMF, 2022). The gains

of this growth have not been evenly distributed and have excluded significant portions of the population (IMF, 2022). Income inequality has remained high, and poverty has not decreased significantly as hoped, varying considerably among the countries in the region (IMF, 2022). Among the causes of income disparities in the decades after 1980 were economic liberalisation, deregulation and other neoliberal trade, financial and social policies (Adesina, 2016). The improvement in trade terms and strong economic growth during the 2000s are likely factors in the rise in GDP per capita that was observed during that period. However, not all countries with rapid economic growth have witnessed a decline in inequality, for example, South Africa, Botswana, and Ghana (World Bank, 2022). It is difficult to imagine how income redistribution alone could remedy poverty in the long term without a sizable increase in output.

Through the Poverty Reduction Strategy Paper (PRSP) initiative, the IMF and the World Bank have outlined a number of policy steps to enhance growth in the SSA region, with a focus on improving competitiveness, fostering economic diversification, and fostering growth of the private sector. The focus on poverty reduction was further reinforced by the adoption of the United Nations' Millennium Development Goals and the Sustainable Development Goals in 2000 and 2015, respectively. Poverty reduction and income redistribution strategies in SSA included (i) strengthening macroeconomic frameworks; (ii) developing efficient human capital and environmental management systems; (iii) enhancing good governance and institutional capacity; (iv) generating employment possibilities and improving the capacity of the poor and marginalised groups to participate in decision-making and production processes; and (v) combating the HIV/AIDS pandemic (African Development Bank Group, 2016; Sembene, 2015).

The local economic and socio-political conditions in many countries in the SSA region continue to be exceptionally difficult, and the region's growth potential is directly tied to changes in the world economy. However, sustainable economic growth, eradication of endemic poverty, and the reduction of rising income inequality should remain the primary goals of development policy in the region. Thus, policymakers in the region need to deal with impending internal and external crises when they arise and must foster economic resilience and self-sufficiency in all critical economic, financial, and welfare aspects. In light of the foregoing, the aim of the current study is to analyse how economic growth and

income inequality are related in 29 SSA countries, thereby adding to the ongoing debate about whether economic growth can be viewed as a lasting solution to poverty and skewed income distribution in this region. More explicitly, the study is focused on empirically testing Kuznets' hypothesis, which contends that the income gap in the majority of global economies initially increases before decreasing, creating an inverted U-shaped link between economic growth and income inequality.

The study departs from previous studies on the subject and, therefore, contributes to the literature on two main fronts. First, by using four proxies of income inequality, explicitly the composite inequality index, the Atkinson index, the Gini coefficient, and the Palma ratio, resulting in four distinct specifications with four interaction variables, namely inflation, government expenditure, trade openness, and population growth, a comprehensive analysis of the subject is provided. The use of a range of diverse indicators of income inequality assists in the development of a more comprehensive knowledge of the distribution of income and the examination of the impact of inequalities in different areas of the income spectrum. Second, the study adopted a modified version of difference GMM based on Roodman (2009a, 2009b), which is an extension of the work of Arellano and Bover (1995). The adopted GMM technique has a number of advantageous characteristics, such as (i) correcting for endogeneity of the lagged dependent variable in a dynamic panel model; (ii) correcting for unobserved panel heterogeneity; (iii) controlling for bias from omitted variables as well as measurement errors; (iv) restricting the proliferation of instruments, resulting in reliable estimates; and (v) producing robust estimates if there are significantly more cross-sections than time periods (Odhiambo, 2022; Roodman, 2009b). Therefore, the findings of this study will not only help the governments of the SSA region revisit their current welfare and economic policies, which may result in the realisation of a more inclusive economic growth, but will also assist in the upscaling of national economies.

The rest of the paper is set out as follows: a synopsis of the theories and some past research on the linkage between economic growth and income inequality in industrialised and developing countries is provided in the literature review segment, following which estimation techniques and the empirical model specification are presented in the methodology section. The results of the study

are then presented and discussed in the empirical analysis section. The final part of the paper outlines the conclusion and policy suggestions.

2. LITERATURE REVIEW

Early scholars studied the connection between income inequality and economic growth from the perspective of the stages of development. Firstly, Kuznets (1955) depicted an evolution of income inequality based on a nation's level of economic development. The connection between the two parameters is hypothesised to be positive during the early stage of economic development and negative at a later stage. At a later stage of economic development, inequality decreases as countries implement redistributive measures that combine progressive taxes and welfare expenditure (Kuznets, 1955). Figure 1 displays the Kuznets' curve.

Figure 1. Kuznets' curve of income inequality
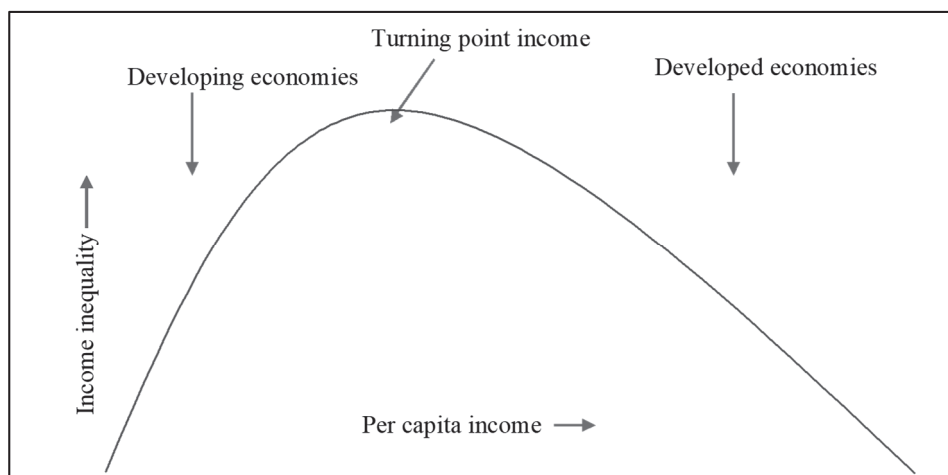
Source: *Authors' compilation*

The left side of Figure 1 depicts the early stages of development, which are characterised by low income per capita and substantial income gaps and poverty – a characteristic of developing countries. The right side of Figure 1 illustrates a long-term drop in inequality that is linked to industrial progress, a feature shared by the majority of industrialised nations. The Kuznets' curve shown in Figure 1 describes how the economy changes, moving away from extractive and

agricultural-based sectors and toward manufacturing and service-led growth. Considering the experience of the six Asian tiger economies, this structural, political-institutional, and economic transformation may take 25 years or longer to complete (see World Bank, 1993a; 1993b). This claim is supported by the work of Lindert and Williamson (1985), who proposed a comprehensive economic theory of the genesis and growth of income inequality during development in accordance with the historical experiences of Britain and the United States of America from the 19th century to the mid-1980s. They determined that there are three primary reasons for income inequality, namely (i) differences in total factor productivity rates by sector; (ii) fluctuating labour force growth, especially due to demographic change or immigration; and (iii) lagging acceleration of skills development (Lindert & Williamson, 1985). Nielsen and Alderson (1995) modified the model of Lindert and Williamson (1985) by incorporating the main mechanism of sector dualism discussed by Kuznets (1955) and developing a new model that explains the relationship between income inequality, development, and sector dualism.

Secondly, the relationship between income inequality and the technological development stage was examined by Helpman (1998) and Aghion et al. (1999). The authors contend that income inequality rises when technological advancements are still in their infancy stages and that innovative ideas in economic sectors result in an increase in income inequality. This is due to the fact that modern technology involves highly trained manpower, which raises salaries in these sectors compared to those in sectors that rely on older technology (Aghion et al., 1999). Krueger (1993) and others delved deeper into the role of technology by studying the impact of the Fourth Industrial Revolution (4IR). The adoption of contemporary technology through 4IR has resulted in the continued automation of conventional industrial and manufacturing processes. Improvements in technology, according to Krueger (1993), expand the wage difference between highly skilled and lowly skilled employees in the labour market as the wages of the former rise, while those of the latter remain stagnant.

Thirdly, the political economy models show how significant income inequality might be a growth inhibitor (Barro, 2000; Alesina & Rodrik, 1994). These models propose that people are in favour of shifting wealth from the wealthy to the poor when the average income is higher compared to the median voter. Studies by

Barro (2000) and Benhabib and Rustichini (1996) further support the claim that the increase in socio-political discontent brought on by extreme wealth inequality may have a dampening effect on growth.

Fourthly, several studies support the notion that income inequality limits growth through institutions (Chong & Gradstein, 2007; Hoff & Stiglitz, 2004; Sonin, 2003). It is assumed that distribution and growth prospects depend on the calibre of institutions. Long-term growth rates are lowered because high income inequalities stimulate the growth of dysfunctional institutions, which then intensifies inequality, and increases inefficiency (Chong & Gradstein, 2007). According to this line of reasoning, bad institutions are more likely to be linked to high inequality, inefficiency, and slow economic growth, whereas good institutions are more likely to be linked to low inequality, productivity, and growth.

Lastly, the imperfect credit market theory contends that credit markets play a role in the negative correlation between income inequality and economic development (Panizza, 2002; Aghion & Bolton, 1997). According to Panizza (2002), the ability to extend credit to the poor is hampered by a high level of income inequalities, particularly in a credit market with imperfections. The ability to make informed judgments is impacted by the imbalanced information between the lender and borrower, which undermines both the borrower's ability to borrow and the investor's return on investment. Figure 2 shows a theoretical framework on the linkage between economic growth and income inequality.

In general, two major explanations can be used to describe the theoretical framework outlining the influence of economic growth models on inequality. First, a high economic inequality can limit investment growth, which, in turn, negatively impacts capital accumulation. Second, poverty-related inequality might impede human capital development by raising fertility rates and lowering average educational attainment among the poor, both of which have a negative effect on innovation and technological advancement.

Figure 2. Summary of the theoretical growth-inequality linkage
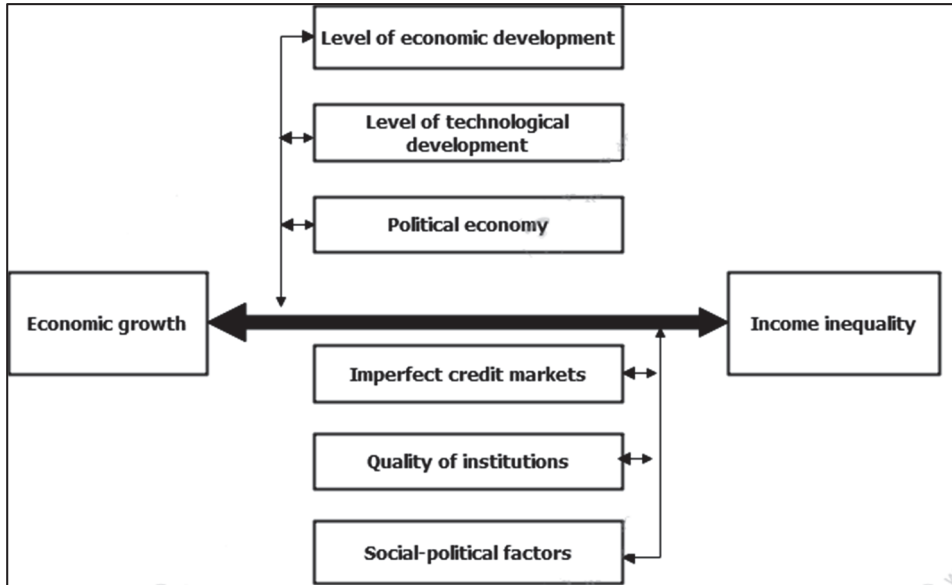
Source: *Authors' compilation*

The income inequality-growth nexus was first empirically studied in the 1990s, primarily using the ordinary least squares and two-stage least squares estimation methodologies (Alesina & Rodrik, 1994; Persson & Tabellini, 1994). Alesina and Rodrik (1994) looked at the connection between distributive politics and economic growth over the years 1960–1985 in 46 different nations. They concluded that the rate of taxation and economic growth were inversely correlated with wealth and income inequality. Persson and Tabellini (1994) formulated and estimated a model that relates equilibrium growth to income inequality and political institutions in nine developed economies – eight European economies and the United States of America. The authors employed two datasets, namely 1830–1850 and 1970–1985. The findings indicate that income disparity is detrimental to growth because it encourages the adoption of laws that do not uphold property rights and do not let private investors fully appropriate investment returns.

Recent research on the relationship between inequality and growth has yielded mixed results. For instance, Odusanya (2023) examined the impact of economic

growth on income distribution in 31 sub-Saharan African countries using data spanning from 1995 to 2015. The study applied the generalised method of moments system, and, contrary to Kuznets' hypothesis, the findings found evidence consistent with an S-shaped curve in the growth-inequality nexus. In addition, Mhaka and Sahdev (2023) tested the growth-inequality relationship among middle- and southern-African countries using the fixed effects panel regression model. The results are consistent with a U-shaped growth-inequality relationship.

Topuz (2022) examined how income inequality affected economic growth in 143 different countries. The study was conducted utilising the pooled ordinary least squares (OLS), fixed or random effect, two-stage least squares (2SLS), and system generalised method of moments (GMM), employing five-year averages of the data for the period 1980–2017. The findings of the study show that inequality has a detrimental effect on economic growth, with this effect being more prominent in low-income countries.

Shen and Zhao (2022) explored the nature of the relationship between inequality and growth using a comparable dataset of 167 economies from 1950 to 2020. First, the impact of income inequality on economic growth was examined using a two-step system GMM technique. Second, the authors also tested whether the impact of inequality on growth varies with income level by using dynamic panel threshold regressions. The authors also analysed the channels in which inequality impacts growth. The estimation results show that inequality has a negative impact on growth, with growth rates falling by 0.7% for every unit rise in inequality. Dynamic panel threshold analysis indicates that the relationship between inequality and economic growth varies with income level and that the tipping point occurs at US$5263.

Martínez-Navarro et al. (2022) tested Kuznets' hypothesis on inequality and development using a panel of data from 45 African countries for the period 1975–2019. The dataset was analysed using the pooled mean group estimation technique. The results provide evidence in favour of Kuznets' hypothesis. Similarly, Gimba et al. (2021) investigated the relationship between economic growth and income inequality in SSA countries using an autoregressive distributed lag (ARDL) model. The ARDL findings indicate that economic

growth lowers income disparities in the long run, but in the short run, it increases them, supporting Kuznets' hypothesis.

Ifeakachukwu (2020) used annual secondary data covering the years 1981–2018 to investigate the relationship between globalisation, economic growth, and income inequality in Nigeria. The direction of causation was tested on three variables, namely the influence of globalisation and economic development on inequality, as well as whether trade globalisation and financial globalisation have different effects on inequality in Nigeria. The results of applying both vector error correction modelling and an ARDL approach showed a unidirectional causality from inequality and globalisation to economic growth in the long run, whilst a unidirectional causality from inequality to economic growth was detected in the short run. According to the ARDL findings, economic growth and financial and trade globalisation have a negative impact on inequality in Nigeria.

Baymul and Sen (2019) tested Kuznets' hypothesis once more by examining the link between structural change and inequality using comparable data for 32 developing and emerging countries over the period 1950–2010. It was discovered that economies follow various routes of structural development that straddle geographical boundaries, falling into one of three categories, namely "structurally underdeveloped, structurally developing, or structurally developed". The findings indicate that workers from agriculture shifted to the services sector, rather than to manufacturing, as a result of structural restructuring in the majority of 32 economies. On the whole, it was discovered that structural transformation undoubtedly causes inequality to rise when workers migrate from agriculture to the service sector. An inverted U-shaped relationship between inequality and manufacturing employment share could not be established.

Braun et al. (2019) used data from 150 countries averaging seven five-year periods between 1978 and 2012 to explore the empirical linkages between income inequality, financial development, and economic growth. GMM dynamic panel models, fixed effects panel regressions, and panel data pooled OLS regressions were employed. The study's regression analyses confirm that income inequality and economic growth are negatively correlated, with financial development acting as a moderator in this relationship.

Jovanovic (2018) used a sample of 26 former socialist nations to test Kuznets' theory. Four variables that could have an impact on the relationship were included in the study, namely the institutions governing the labour market, company market dominance, social benefits, and taxation. According to the findings, the Kuznets' curve is only visible when the market power of companies is controlled effectively and when taxes are high.

Brueckner and Lederman (2018) analysed the relationships between growth, inequality, and poverty using panel data drawn from 158 countries covering the years 1960–2010. The correlation between growth and inequality was either positive or negative when using the pooled OLS and system GMM specifications, whereas the relationship between growth and poverty was consistently negative. Additionally, it was discovered that the connection between poverty and inequality had a considerable negative effect on growth.

Similarly, Berg et al. (2018) examined the link between growth, redistribution, and inequality in OECD and non-OECD countries. The results of the study highlighted that inequality remains a strong and significant factor in determining the rate of medium-term growth and the extent of growth spurts, even after accounting for the quantity of redistributive transfers.

Additionally, Gründler and Scheuermeyer (2018) concluded that less equal societies typically have populations that are less educated, have greater fertility rates, and have smaller investment shares. These impacts were shown to be more pronounced when credit was restricted, but public education spending lessened the detrimental consequences of inequality.

Madsen et al. (2018) examined the four primary mechanisms via which inequality transmits to growth, namely savings, investment, education, and knowledge production, using panel data for 21 OECD countries covering 142 years, in other words, for the period 1870–2011. A two-stage least squares regression analysis was used, and it was discovered that inequality considerably lowers growth in countries with less developed financial systems. At advanced stages of financial development, inequality had little impact on growth.

Castells-Quintana and Royuela (2017) tested the relationship between income inequality and economic growth in a sample of 51 countries using data spanning

from 1970 to 2007. The study employed OLS estimation with bootstrap standard errors, and the results show that inequality has a deleterious impact on economic growth. These results were confirmed by Babu et al. (2016), who analysed the growth–inequality relationship in selected 29 emerging economies. Theyson and Heller (2015) use data from 147 countries for the period 1992 to 2007 to examine the relationship between economic development, as proxied by the multidimensional human development index, and income inequality, as measured by the Gini coefficient. The authors found that, starting from the early phases of a country's development, an increase in human development causes income inequality to decline, followed by a brief spike and then another fall in inequality. This complex inequality-growth relationship displayed an S-curve. This finding implies that an increase in income inequality may not always follow a country's economic growth.

Castello-Climent (2010) studied the impact of income and human capital inequality on economic growth in different regions of the world, focusing primarily on OECD countries. A system GMM was applied to estimate a dynamic panel data model. The results of the study indicate that the impact of income inequality on economic growth varies depending on the degree of development of the regions under investigation. In particular, the authors discovered that income and human capital inequality had a negative impact on economic growth in a sample of 56 low- and middle-income economies countries for the period 1965–2000, and a positive impact in higher-income countries.

Based on the analysis of the theories and empirical studies, the relationship between income inequality and economic growth is mixed and varies with income levels. According to the theoretical literature review, there are several transmission mechanisms by which income inequality and economic growth are related. These mechanisms include the level of economic development, the state of technology, political economy, socio-political factors, the flaws in the credit markets, and the calibre of institutions. In most of the previously analysed studies, it was found that there is a negative linkage between income inequality and economic growth (see, among others, Topuz, 2022; Ifeakachukwa, 2020; Braun et al., 2019; Berg et al., 2018; Brueckner & Lederman, 2018). In studies conducted by Shen and Zhao (2022), Gimba et al. (2021) and Martínez-Navarro et al. (2022), Kuznets' hypothesis was validated. Contrarily, in studies conducted by Odusanya

(2023), Mhaka and Sahdev (2023), Baymul and Sen (2019), and Theyson and Heller (2015), among others, evidence in favour of Kuznets' theory was not found. In a few other studies, inconclusive results were found on the inequality–growth relationship (see, for instance, Jovanovic, 2018). A few of the commonly utilised techniques were GMM, ARDL, pooled ordinary least squares, and two-stage least squares. In the current study, an improved understanding of the inequality–growth relationship in SSA countries is predicted to result from the adoption of the GMM technique, as well as four income inequality proxies.

3. METHODOLOGY

GMM specification

The study adopted a modified version of difference GMM based on Roodman (2009a, 2009b) (see also Odhiambo, 2022; Asongu & Odhiambo, 2020):

Variables in levels

$$INEQUAL_{i,t} = \sigma_0 + \sigma_1 INEQUAL_{i,t-\tau} + \sigma_2 y_{i,t} + \sigma_3 y_{i,t}^2 + \sum_{h=1}^{4} \delta_j CV_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

Variables in First Difference

$$INEQUAL_{i,t} - INEQUAL_{i,t-\tau} = \sigma_1(INEQUAL_{i,t-\tau} - INEQUAL_{i,t-2\tau}) + \sigma_2(y_{i,t-\tau} - y_{i,t-2\tau}) +$$

$$\sigma_2(y_{i,t-\tau}^2 - y_{i,t-2\tau}^2) + \sum_{h=1}^{4} \delta_j(CV_{h,i,t-\tau} - CV_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} + \varepsilon_{i,t-\tau}) \quad (2)$$

where $INEQUAL_{i,t}$ represent the four inequality proxies, namely composite inequality (Model 1), the Atkinson ratio (Model 2), the Gini coefficient (Model 3), and the Palma ratio (Model 4); y denotes income per capita; y^2 denotes the square of income per capita; and CV refers to a vector of control variables, namely inflation, government expenditure, trade, and population.

The use of lagged income inequality proxies is critical because the study uses a dynamic GMM system, and these assist in modelling the growth-inequality behaviour over time. The benefits of utilising the modified version of difference GMM technique have been thoroughly covered in the literature (see Odhiambo. 2020, 2022; Roodman, 2009a, 2009b). Additionally, the requirements for employing the GMM technique (i.e., N > T) have been met because the current study comprises 29 cross-sections and 11 time periods for each cross-section.

Table 1. Definitions of Variables

Variables	Definitions of variables (Measurements)	Sources
Economic Growth	Annual GDP per capita	World Bank development indicators (online database)
Gini Coefficient (Gini)	Measures the income distribution of a country's residents.	The Global Consumption and Income Project (online database)
Atkinson Index (Atkin)	Measures inequality by determining which end of the distribution contributed most to the observed inequality.	The Global Consumption and Income Project (online database)
Palma Ratio (Palma)	Defined as the ratio of the share of the gross national income of the richest 10% of the population to that of the poorest 40%.	The Global Consumption and Income Project (online database)
Composite inequality	Computed in a stepwise fashion using the principal component analysis (PCA) method.	Authors' own computation based on data obtained from The Global Consumption and Income Project (online database)
Trade openness	Exports +Imports (% of GDP)	World Bank development indicators (online database)
Government spending	Government expenditure (% of GDP)	World Bank development indicators (online database)
Inflation	CPI inflation	World Bank development indicators (online database)
Population	Annual population growth rate	World Bank development indicators (online database)

Note: *GDP = Gross domestic product.*

According to Kuznets' hypothesis, an inverted U-shaped relationship exists between economic growth and income inequality. This implies that income

inequality is likely to rise until a certain point as economic growth increases, after which the level of income inequality will start to decrease. Consequently, we expect y to be positive and statistically significant and y^2 to be negative and statistically significant.

Data Sources

The annual data used in this study spans from 2005 to 2015 and were obtained from 29 SSA countries, namely Angola, Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Comoros, Democratic Republic of the Congo, Republic of the Congo, Cote d'Ivoire, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Tanzania, Togo, and Uganda. The period under study was determined by the availability of the inequality data for all the countries. The definitions of variables, measurements, and data sources are presented in Table 1.

4. EMPIRICAL ANALYSIS

In this study, five criteria were employed to evaluate the adequacy and reliability of the estimated GMM models. First, to check for the absence of serial autocorrelation in the errors, the second-order Arellano and Bond autocorrelation test (AR(2)) in difference was utilised due to its superior features over the first-order (see Labra & Torrecillas, 2018). Second, the Sargan and Hansen tests were used to evaluate the overall validity of the instruments of the analysis (see Odhiambo, 2022). Third, the validity of the results from the Hansen OIR test was examined using the Difference in Hansen Test (DHT) for instrument exogeneity (see Asongu & Odhiambo, 2020). The DHT test was also used to examine whether years are strictly exogenous with forward orthogonal deviations (see Asongu & Nwachukwu, 2016). Last, the joint validity of the estimated coefficients was examined using the Fisher test (see Odhiambo, 2022; Tchamyou et al., 2019). The empirical findings are presented in Table 2 as four primary sets of specifications, each of which corresponds to a different proxy for income inequality and four control variables (see Table 3 in the Appendix for descriptive statistics of the variables used in the analysis).

Table 2. Economic growth and income inequality

	Composite inequality index Model 1	Atkinson Index Model 2	Gini Coefficient Model 3	Palma Ratio Model 4
Constant	0.40845***	0.02211*	-0.00282*	0.30460***
	(0.001)	(0.078)	(0.078)	(0.000)
Composite inequality (-1)	0.98216***	-	-	-
	(0.000)			
Atkinson (-1)	-	0.97690***	-	-
		(0.000)		
Gini (-1)	-	-	0.99375***	-
			(0.000)	
Palma (-1)	-	-	-	0.99430***
				(0.000)
y	-0.00013***	-7.24e-06***	-3.44e-06*	-0.00020***
	(0.000)	(0.000)	(0.070)	(0.000)
y2	2.19e-08***	1.30e-09***	5.09e-10*	2.65e-08***
	(0.000)	(0.000)	(0.091)	(0.000)
Inf	-0.00391*	-0.00009	-0.00004	-0.00460**
	(0.080)	(0.512)	(0.298)	(0.025)
Gov	-0.00734***	-0.00014	-0.00016*	-0.02016***
	(0.000)	(0.100)	(0.068)	(0.000)
Trade	-0.00267***	-0.00019***	-0.00008***	-0.00284***
	(0.000)	(0.000)	(0.006)	(0.000)
Pop	-0.02326	0.00104	-0.00302	-0.22503***
	(0.582)	(0.600)	(0.137)	(0.000)
Time Effects	Yes	Yes	Yes	Yes
AR(1)	(0.099)	(0.107)	(0.126)	(0.102)
AR(2)	(0.343)	(0.685)	(0.720)	(0. 454)
Sargan OIR	(0.625)	(0.990)	(0.997)	(0.996)
Hansen OIR	(0. 338)	(0.321)	(0. 643)	(0. 556)
DHT for instrument				
(a) Instruments in levels				
Hansen test excluding group	(0. 527)	(0.198)	(0.426)	(0.450)
Difference (null H = exogenous)	(0. 262)	(0.426)	(0. 645)	(0. 538)
(b) IV (years, eq(diff))				
H excluding group	(0. 561)	(0.310)	(0.676)	(0.458)
Dif(null, H= exogenous)	(0. 157)	(0.374)	(0. 328)	(0. 691)
Fisher	38132.88***	20130.62***	7915.01***	9279.66***
Instruments	28	28	25	25
Countries	29	29	29	29
Observations	271	271	271	271

*, **, and ***: significance levels at 10%, 5%, and 1%, respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. AR(1): First-order autoregression; AR(2): Second-order autoregression. The numbers in parentheses refer to p-values. pop: population growth. trade: trade openness. gov: government expenditure. inf: annual inflation. y: annual GDP per capita.

According to the findings shown in Table 2, in all four income inequality equations, the coefficient of economic growth (y) is consistently negative and statistically significant, whereas the coefficient of the square of economic growth (y^2) is consistently positive and statistically significant. This suggests that economic growth in the countries under study is associated with a decrease in income inequality in the early stages of economic development up to a certain threshold, beyond which further increases in economic growth lead to an increase, rather than a decrease, in income inequality. These findings, therefore, contradict the Kuznets' hypothesis, which posits that at early stages of development, an increase in economic growth is associated with an increase in income inequality up to a certain level, beyond which further increases lead to a decrease, rather than an increase, in income inequality. In other words, the findings of this study support the U-curve in the relationship between economic growth and income inequality in the studied SSA countries. These findings have two implications. First, the U-curve suggests that higher initial increase in economic growth can trickle down to the poor and substantially reduce income inequality in the countries under study. Second, the findings imply that, while economic growth initially reduces income disparity, after a certain point, growth is accompanied by a rise in inequality. This finding suggests that most of the countries in the SSA region under investigation are situated on the downward slope of the U-curve and that, over time, high levels of economic growth will be accompanied by rising inequality. This conclusion is not unique to this study as it aligns with the findings of Mhaka and Sahdev (2023).

It was also found that there is a strong negative relationship between trade openness and inequality in the cross-section of SSA countries, suggesting that inequality decreases as trade openness rises. This suggests that trade openness has improved the number and quality of jobs, especially for formerly marginalised groups, thereby reducing income inequality.

Furthermore, it was found that the corresponding income inequality proxies, consisting of composite inequality, the Atkinson ratio, the Gini coefficient, and the Palma ratio, were positively and statistically significantly influenced by their lagged values. The results imply that past income inequalities in the African economies under study have a direct impact on and exacerbate present wealth

gaps. The inference points to a perpetuation of income disparities across the examined period of time, which is indicative of a poverty trap.

Contrary to study expectations, Models 1 and 4 show that inflation negatively affects income inequality in a statistically significant way, implying that a rise in inflation is associated with reduced income inequality. This result may be explained if rising inflation is linked to falling real interest rates and more money spent on humanitarian initiatives by governments, development partners, and civil society organisations, especially those serving marginalised groups.

The findings also indicate that government spending has a negative effect on income inequality in Models 1, 3, and 4. This outcome indicates that most of the increases in government spending in the studied African countries have been pro-poverty reduction, thereby reducing the gap between the rich and the poor in these three models. Stated differently, the findings indicate a correlation between decreased income inequality and government spending reallocated to social security and infrastructure development (also see Doumbia & Kinda, 2019). The growth rate of population in SSA countries was, however, found to have no direct effect on income inequality in all the models, except in the palm ratio model, where it was found to be negative and statistically significant. This implies that an increase in population growth rate is associated with a decrease in income inequality in the palm ratio model.

5. CONCLUSION AND POLICY SUGGESTIONS

This study examined the dynamic nonlinear relationship between economic growth and income inequality using panel data from 29 SSA countries covering the period 2005–2015.

The study tested the applicability of the Kuznets' inverted U-curve in African countries. The findings of the current study demonstrate that, regardless of the proxy for income inequality employed, there is a consistently significant negative relationship between economic growth and income inequality in all four income inequality equations used in this study. These findings show that the relationship between economic growth and income inequality follows a U-curve. This conclusion suggests that while economic growth initially reduces income inequality in the SSA countries studied, after some point, growth is accompanied

by a rise in inequality. That is, the majority of the economies in the SSA region under study may be on the downward slope of the U-curve and that, over time, economic growth will lead to a rise in income inequality. It is, therefore, recommended that SSA countries consider implementing desirable policies, such as boosting their social welfare as their economies expand. This study acknowledges the importance of performing threshold analysis and, therefore, recommends future studies to take this direction in order to establish the optimal growth limit that minimises income inequality.

Authors' contributions
All authors contributed to the study conception and design. Sections 1 and 2 were performed by Dr. T. Saungweme, while Sections 3 and 4 were performed by Professor N.M. Odhiambo. We jointly worked on the conclusion and first draft as well as the revised version. All authors read and approved the final manuscript.

Data availability
The datasets generated during and/or analysed during the current study are available in the World Bank and United Nations repositories, https://databank.worldbank.org/source/world-development-indicators; https://digitallibrary.un.org/record/3859039?ln=en

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APPENDIX

Descriptive statistics (2005–2015)

Variable	Observations	Mean	SD	Minimum	Maximum
atkin	319	0.7075758	0.061735	0.5098044	0.8326834
gini	319	0.5900604	0.0382567	0.4882732	0.8516453
palma	319	6.588153	1.595274	3.015978	14.43498
comp	319	-0.410624	1.140184	-3.695359	4.768772
y	319	1554.805	1527.344	310.4826	6895.574
inf	319	6.821669	6.098345	-4.294873	44.35669
gov	319	14.27024	6.375578	4.544547	43.48379
trade	319	67.17503	28.59995	21.33265	165.0594
pop	319	2.542375	0.7346491	-0.4916468	3.907317

Note: pop = population growth. Trade = trade openness; gov = government expenditure; inf = annual inflation; y: annual GDP per capita; atkin = Atkinson index; gini =Gini coefficient; palma = Palma ratio; comp = composite inequality, SD = standard deviation.

Oluseyi Omosuyi*

PUBLIC AND PUBLICLY GUARANTEED EXTERNAL DEBT, DEBT SERVICING AND INVESTMENT IN EMERGING ECONOMIES

ABSTRACT: *The global financial crisis of 2007 gave a major boost to the debt-investment nexus debate given the astronomical growth in external debt and its associated debt servicing burdens, which constrain the fiscal space of many developed and emerging economies. Hence, this study examined the effect of external debt and debt servicing on investment in MINT countries for the period, 1990–2021 using the FMOLS estimation technique. The results show that external debt adversely affects investment in Indonesia but stimulates investment in Türkiye while debt servicing has a cata-strophic effect on investment in Indonesia and Türkiye but enhances investment in Nigeria. Overall, the effect of external debt and debt servicing on investment in MINT countries are mixed. Hence, the policymakers in each country need to put measures in place to foster debt sustainability, ensure effective domestic resource mobilisation for investment purposes and promote debt transparency by adopting effective debt management practices.*

KEY WORDS: *external debt, debt servicing, investment, FMOLS, MINT*

JEL CLASSIFICATION: C22, E22, F34, H63

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1. INTRODUCTION

The huge growth in government size and the increasing scope of fiscal responsibilities in recent times have continued to broaden governance, especially with regard to the financial resources required to effectively meet these budding needs (Fasanya et al., 2021; Kasal, 2023). Given the limited resources of government, the increasing rate of global interdependence and the dynamic modern financial sector, governments resort to borrowing as one of the means of funding their budgets (Ogunjimi, 2019; Irshad, 2020). Unfortunately, the rising spate of debt in developing and emerging economies has led to debt vulnerabilities, as many low-income countries are confronted with debt servicing problems and are at high risk of debt distress (UNECA, 2019). The increase in debt vulnerabilities, especially in low-income countries, implies that interest payments absorb a rising share of government revenue, crowd out investment and prevent the government from embarking on developmental projects (Aminu & Ogunjimi, 2019; Essl et al., 2019).

The debate on the debt-investment nexus has been underway in recent decades but became more intense following the global financial crisis in 2007, when external debt grew to extremely high levels and debt servicing burdens constrained the fiscal space of many developed and emerging economies (OECD, 2018). The high interest rates charged on external debt (cost of debt servicing) not only induce the diversion of development funds to debt servicing but also worsen growth imperatives in developing and emerging countries (IMF, 2018). Between 1990 and 2000, several internal donors (such as the World Bank, the International Monetary Fund and the Paris Club) developed different debt relief and forgiveness initiatives to reduce debt burdens and stimulate economic growth in debtor nations (Clements et al., 2003; Saungweme & Odhiambo, 2020). The initiatives yielded positive outcomes as debt burdens reduced drastically and economic upturns occurred in most of the countries who benefited from the initiatives (Essl et al., 2019).

Notwithstanding this, the debt burdens in some emerging economies are worrisome as they were further exacerbated by the COVID-19 pandemic, which not only increased the risk of plunging into debt distress but also aggravated the already precarious fiscal situation in the countries (Bolaji et al., 2021; Olanrewaju & Afolabi, 2022; Omosuyi, 2023). The shutdown of global economies during the

pandemic worsened trade positions as countries who were highly reliant on proceeds from international trade were badly hit through their inability to source revenue and foreign exchange to finance their budgets. Countries were compelled to divert extant resources to curtail the spread of the coronavirus, which further worsened their debt positions and hampered budget implementation, forcing national governments to renege on their promises of budget implementation (Adeoti, 2020). The effects of this highly problematic situation can only be mitigated if creditors grant debt relief or forgiveness to their debtors, which is highly unlikely due to the universal nature of the pandemic, which affected virtually everyone in the global economy.

External debts make investible funds available to finance fiscal deficit and unfavourable balance of payments position (Fasanya et al., 2021; Onyele & Nwadike, 2021). They could be induced by a saving-investment gap and a foreign exchange gap, which are mostly prevalent in resource-poor countries (World Bank, 2020; Adeniyi et al., 2022). These dual gaps indicate that external debts are arguably inexorable, particularly in developing and emerging economies, in the light of the economic concept of scarcity, which states that resources are limited in supply and relatively scarce. The prevalence of poor management of public funds together with the rising costs of debt servicing in emerging countries has further exacerbated financial distress. Rising debt overhang signals debt burden as well as economic instability (Csaba & Gabriella, 2017). Onyele and Nwadike (2021) argued that spending borrowed funds on recurrent expenditure rather than capital expenditure will make debt repayment together with its interest highly problematic. Unfortunately, this is the case in many developing and emerging economies including MINT (Mexico, Indonesia, Nigeria and Türkiye) countries. In addition, the relatively weak institutional quality in MINT countries continues to undermine their debt management, leading to growing levels of debt unsustainability (Sánchez-Juárez & García-Almada, 2016; Bulus, 2020; Fagge & Ibrahim, 2020; Iba et al., 2021).

MINT countries are emerging countries grouped on the basis of the large youthful population, rapid economic growth and growing middle class (Morakinyo & Sibanda, 2016). Given the great potential of these countries to record massive economic growth and the impending danger high external debt and debt servicing pose to stalling this potential, this study contributes to the

extant literature by examining the investment effects of external debt and debt servicing in MINT countries. Studies examining these three macroeconomic variables in a trivariate framework are particularly rare for MINT countries. In addition, this study deviates from previous studies by employing the fully modified ordinary least square (FMOLS) technique to examine the impact of external debt and debt servicing on investment in MINT countries. This study is important because it presents an opportunity for restructuring resource mobilisation in MINT countries and redefining and reinventing their roles and positions in the international space. Following this section, this paper is structured as follows: Section 2 reviews the theoretical and empirical literature. Section 3 presents the methodology while Section 4 presents and discusses the empirical findings. Section 5 concludes the study with policy implications.

2. REVIEW OF RELEVANT LITERATURE

The theoretical links between external debt, debt servicing and investment are anchored in different theories, including debt overhang, liquidity crisis, crowding-out effect and dependency theories. The debt overhang theory posits that the ability of a country to pay its debt could be hampered in the face of an extremely large debt stock (Anone et al., 2005). This compels the government to raise the tax rate to generate more income to offset the debt, a situation which lowers investment spending with debt overhang exerting a distortionary effect on investment decisions and having growth-reducing effects (Krugman, 1988). Similarly, the liquidity crisis theory posits that investment decisions are influenced by debt repayment and debt servicing. A large debt stock requires huge resources to repay the debts as well as its interest (debt servicing) while hampering the domestic resource mobilisation for investment purposes. The theory advocates that external debts be paid through export earnings and exchange rate depreciation (Khan & Knight, 1988). On the other hand, the crowding-out effect theory posits that public debt undermines economic stability if the cost of servicing debts encumbers public spending (Zaheer et al., 2019) while the dependency theory states that developed economies employ various debt agreements to subjugate and control the affairs of their debtor countries, especially low-income countries (Claessens et al, 1996).

Following these theoretical perspectives, there is a copious number of extant studies on the nexus between external debt and debt servicing on macroeconomic

variables (such as economic growth and investment) in the literature but with mixed findings. For example, on the debt-growth nexus, most studies reported a positive relationship between public debt and economic growth (Yusuf & Mohd, 2021; Omesi et al., 2021; Olusegun et al., 2021). Specifically, Yusuf and Mohd (2021) adopted the autoregressive distributed lag (ARDL) technique to investigate the growth effect of government debt in Nigeria between 1980 and 2018, showing that external debt is growth-enhancing in the short run but growth-impeding in the long run. Furthermore, domestic debt enhances growth in the long run but stifles growth in the short run. The study also confirms the validity of the debt overhang theory in Nigeria as debt servicing was found to retard growth. Olusegun et al. (2021) also adopted the ARDL technique to evaluate the growth effect of debt servicing and its mediating role on public sector financial management between 1990 and 2020. Their findings revealed that debt servicing is growth-enhancing across all time horizons in Nigeria, suggesting the non-existence of the debt overhang theory. Omesi et al. (2021) analysed the growth effect of debt and debt service in Nigeria between 2012 and 2019. Their empirical results showed that debt and debt servicing have a positive but insignificant impact on Nigeria's economic growth.

On the other hand, some studies found that public debt impedes growth. For example, Edeminam (2021) analysed the growth effect of public debt in Nigeria between 1990 and 2019 using the vector error correction model (VECM) framework. The results showed that public debt and debt servicing have growth-stifling effects in Nigeria and there was no causal dependence between public debt and economic growth. Similarly, Onyele and Nwadike (2021) analysed the economic effect of Nigeria's growing debt burden. The ARDL result revealed that Nigeria's debt burden engenders economic instability in the short run and long run. However, Saungweme and Odhiambo (2020), who adopted the ARDL framework to examine the growth effect of public debt servicing in South Africa between 1970 and 2017, found that public debt servicing has no significant impact on growth imperatives in South Africa. Iba et al. (2021) used the ARDL framework to investigate the growth effect of government debt and foreign investment in Indonesia. Their findings revealed that while government debt retards growth, foreign investment is growth-enhancing in Indonesia.

Sánchez-Juárez and García-Almada (2016) employed the generalised method of moments (GMM) framework to evaluate the growth and investment effects of public debts in 32 Mexican states. Their result showed that an increase in public debt spurs public investment, which, in turn, stimulates economic growth. Bulus (2020) evaluated the growth-maximising public debt in Türkiye and found that diverting public debt to investment purposes will not only enhance growth but also ensure debt sustainability. Similarly, Balikcioglu and Iyidogan (2016) found evidence in support of debt sustainability in Türkiye although domestic debt differed across regimes. With regard to causality, Saungweme and Odhiambo (2019) examined public debt, public debt servicing and economic growth in Zambia between 1970 and 2017. The result revealed that causality runs from economic growth to public debt while neither debt servicing nor economic growth cause each other.

In a panel study comprising 43 African countries, Ehikioya et al. (2020) employed the system GMM technique to analyse the growth effect of external debt between 2001 and 2018. The result showed that external debt is growth-enhancing in the short run, beyond which it starts stifling the growth of African economies. Senadza et al. (2018) also adopted the system GMM technique to examine the growth effect of external debt in 39 sub-Saharan African (SSA) countries between 1990 and 2013, revealing that external debt stifles growth in SSA. Clements et al. (2003) explored the transmission mechanisms of external debt to economic growth of low-income economies and found that a decline in external debt stock has a direct growth-enhancing effect while external debt servicing boosts growth through the investment channel. Overall, Saungweme and Odhiambo (2018) argued that the nature and direction of the debt servicing-economic growth nexus depends on several factors, including the composition, structure and size of public debt.

With respect to empirical evidence on the external debt-debt servicing-investment nexus, Omodero (2019) tested the validity of the crowding-effect of external debt on private investment in Nigeria between 1996 and 2018 employing the ordinary least square technique, finding that while external debt crowds out private investment in Nigeria, debt servicing is directly related to private investment. On the other hand, Ogunjimi (2019) and Chukwu et al. (2021) adopted the ARDL technique to investigate the effect of public debt on

investment in Nigeria. Ogunjimi (2019) found that domestic debt stimulates public and private investment but external debt crowds out public investment, while Chukwu et al. (2021) found that public debt does not influence public investment in Nigeria. Adopting the seemingly unrelated regression technique in the analysis of the impact of external debt servicing constraint on sectoral expenditure of the government in 35 African countries, Fosu (2007) found that debt servicing has a deleterious effect on public investment and government expenditure in the health and education sector. Afolabi and Oji (2021) found the benefits that could have accrued from China's investment in Nigeria is eroded by Nigeria's huge public debt and debt service payment, while Oji and Afolabi (2022) alluded that terrorism drains the country of the funds needed for investment purposes.

Mabula and Mutasa (2019) examined the influence public debt exerts on private investment in Tanzania between 1970 and 2016 employing the autoregressive distributed lag ramework and a threshold regression. The ARDL estimates revealed that debt servicing does not exert a significant influence on private investment in Tanzania, but both external and domestic debts are significant drivers of private investment. The result of the threshold regression suggested a nonlinear relationship between private investment and external debt. In a panel study, Kengdo et al. (2020) adopted the GMM technique to examine the impact of external debt on domestic investment in four economic regions in SSA. Their findings revealed that external debt stimulates domestic investment in two economic regions but adversely affects domestic investment in the other two economic regions. The extent of the effect of external debt on domestic investment depends on the debt thresholds in each region. In addition, Afolabi (2022), Babatunde and Afolabi (2023), Afolabi (2023a), and Omosuyi and Afolabi (2024) showed that illicit financial flow, which raises the prospect of external borrowing, lowers domestic resource mobilisation and ultimately crowds out investment in Nigeria and the four economic regions in sub-Saharan Africa. Afolabi (2023b) argued that the governments in sub-Saharan Africa need to limit their volume of public debt to avert slow investment and growth reversal in the region. Similarly, Kasal (2023) showed that government expenditure in Türkiye, which is largely driven by external debt, should not exceed 18.5% of GDP, otherwise growth reversal will become inevitable and investment prospects could be dampened. In a study with the specific focus on six Western Balkan economies,

Bartlett and Prica (2018) found a significant increase in public debt, which subsequently led to an increase in unemployment and inequality as well as a widespread practice of clientelism.

The foregoing indicates that the empirical findings on the external debt-debt servicing-investment nexus are not yet harmonised. Apparently, these mixed findings could be explained by the differences in estimation techniques, the country/region under study, the timeframe of the analysis as well as the adopted measures of debt, debt servicing and investment. While most studies employed the ARDL technique, this study adopts the fully modified ordinary least square (FMOLS) technique to examine the impact of external debt and debt servicing on investment in MINT.

3. DATA AND METHODOLOGY

3.1 Model Specification and Estimation Technique

This study focuses on evaluating the investment effect of external debt and debt servicing in MINT countries. Following the model specification of Mabula and Mutasa (2019) and Chukwu et al. (2021), the investment model is specified as follows:

$$INV_t = \delta_0 + \delta_1 EDB_t + \delta_2 DBS_t + \delta_3 RGDP_t + \delta_4 INT_t + \delta_5 EXR_t + \varepsilon_t \qquad (1)$$

where INV, EDB, DBS, RGDP, INT, EXR and ε are investment, external debt stock (public and publicly guaranteed), debt service on external debt (public and publicly guaranteed), real gross domestic product, deposit interest rate, real effective exchange rate and an error term, respectively. The reason for the choice of deposit interest rate as a proxy for lending interest rate is the unavailability of lending interest rate data for Türkiye over the sample period. All the variables, except interest rate, are expressed in natural logarithm for ease of result interpretation in percentages.

The fully modified ordinary least square (FMOLS) technique, developed by Philips and Hansen (1990), is employed to estimate the specified equation. The FMOLS technique presents three advantages. First, it addresses the problems of simultaneity and small sample biases as well as providing robustness checks for

the estimates. Second, it circumvents serial correlation problems and tests for possible endogeneity in the explanatory variables that could arise from the existence of cointegrating relationships. Finally, it introduces appropriate correction to overcome the inference problem in the Engle–Granger method (Philips & Hansen, 1990). Before estimating the FMOLS equation, the unit root and cointegration status of the variables are checked. The augmented Dickey–Fuller (ADF) is employed to check the stationarity properties of each variable to determine the appropriate estimation technique and avoid generating unreliable estimates. The Johansen cointegration test is adopted to check the existence of a long-run relationship between the variables.

3.2 Data Sources and Description

Annual time-series data spanning 1990–2022 were sourced from the World Development Indicators (2022) database to evaluate the impact of external debt and debt servicing on investment in MINT countries. The key variables of interest are external debt, debt servicing and investment while the control variables are real gross domestic product (GDP), interest rate and real effective exchange rate. The description, expected sign and sources of these variables are presented in Table 1.

Table 1: Data Description

Variable	Description	Expected Sign	Source
INV	Gross fixed capital formation (constant 2015 US$)	+	WDI (2022)
EDB	External debt stocks, public and publicly guaranteed (current US$)	+	WDI (2022)
DBS	Debt service on external debt, public and publicly guaranteed (current US$)	-	WDI (2022)
RGDP	GDP (constant 2015 US$)	+	WDI (2022)
INT	Deposit interest rate (%)	-	WDI (2022)
EXR	Official exchange rate (LCU per US$, period average)	-	WDI (2022)

Source: Author's Compilation

4. RESULT AND DISCUSSION

Trend of Public and Publicly Guaranteed External Debt and Investment in MINT Countries

The trend behaviour of public and publicly guaranteed external debt stock of MINT countries between 1990 and 2020 shows that Mexico borrowed more from external sources than other MINT countries for most of the period considered (see Figure 1). The high external debt in Mexico is structurally caused by the rising interest rate of creditors and falling oil revenue of the country (Toussaint, 2020). However, Indonesia maintained the second position throughout the review period, except in 2007, when Türkiye, the country with the third largest external debt between MINT countries, exceeded it. While Türkiye maintained the third position for most of the period under review, its external debt had an upward trend. Debt management initiatives such as the "Transition to Strong Economic Program" and "strategic criteria" were introduced to effectively manage debt, promote transparency and reduce the cost of debt service payments in Türkiye, but the initiatives failed to yield the desired outcomes (Balikcioglu & Iyidogan, 2016). Nigeria remained the least indebted nation among MINT countries with an external debt of less than US$50 billion throughout the review period. Nigeria's external debt has been growing steadily since 1990 but it declined between 2004 and 2006 largely due to the debt forgiveness offered by one of its creditors, the Paris Club, in 2006 (Ogunjimi, 2019). However, Nigeria's external debt stock has continued to grow as it increased drastically from about US$13 billion in 2016 to about US$70.6 in 2020. Overall, public and publicly guaranteed external debt stock in MINT countries has an upward trend for most part of the review period, indicating that domestic resources are not enough for development financing in MINT countries.

Figure 1: External Debt Stocks, Public and Publicly Guaranteed, in MINT Countries (US$ Billion)
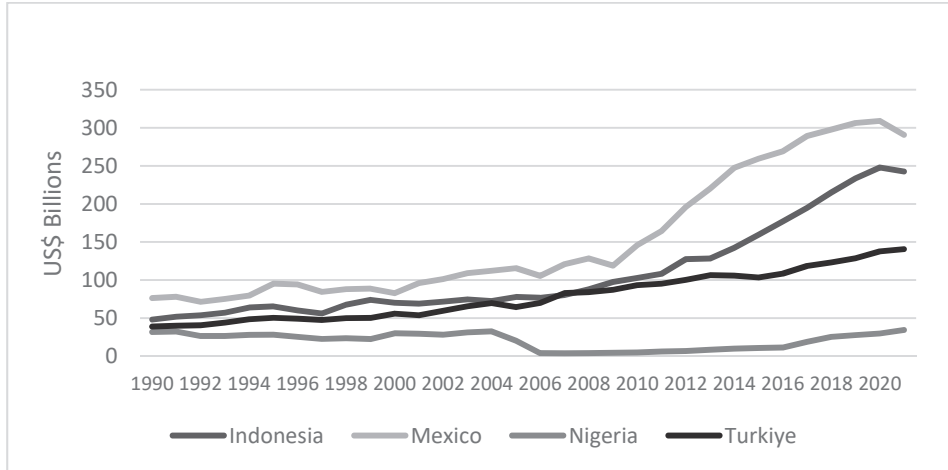
Source: Author's Computation from World Development Indicator (2022)

External debt often comes at a cost measured by the prevailing interest rate. This cost is paid together with the principal, and it increases with increasing debt stock. Expectedly, Mexico, which had the highest external debt stock (public and publicly guaranteed), also paid the highest sum to service debt on external debts (public and publicly guaranteed) among MINT countries (see Figure 2). In the same vein, Nigeria paid the least debt servicing costs of all the sampled countries, even though paying more to service debt between 2004 and 2006. On the other hand, Indonesia and Türkiye switched between the second and third positions. It is noteworthy that Mexico's debt service on external debts was higher than those of Türkiye and Nigeria together. Overall, debt service payment was highly volatile yet rising among the MINT countries. In relation to the volume of external debt stock, Figure 3 shows that investment in MINT countries is fairly low, suggesting that only a small proportion of their external debt is used for investment purposes. The 2013–2020 period, when Indonesia had the highest volume of investment of all MINT countries, coincides with the period in which Indonesia paid huge sums in debt servicing, signalling that the country had enough funds to both invest and service debt during that period. It could also imply that Indonesia's returns on investment had increased to the extent that some of the funds were used to service its huge external debt. Conversely, investment in

Mexico has continued to nosedive in recent years and this could be attributed to the huge debt burden and debt service payment of the country. Overall, the growing external debt stock (public and publicly guaranteed) and debt service (public and publicly guaranteed) payment influences the investment profile of MINT countries.

Figure 2: Debt Service on External Debt Stock, Public and Publicly Guaranteed, in MINT Countries (US$ Billion)
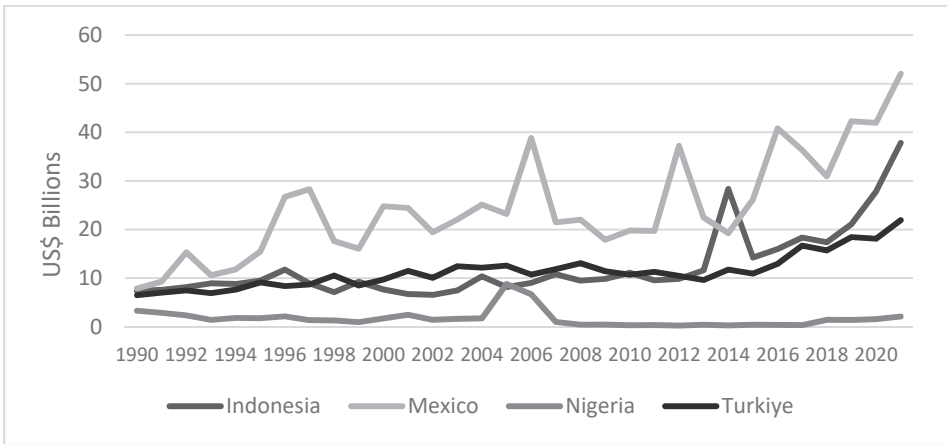
Source: Author's Computation from World Development Indicator (2022)

Figure 3: Trend of Investment in MINT Countries (US$ Billion)
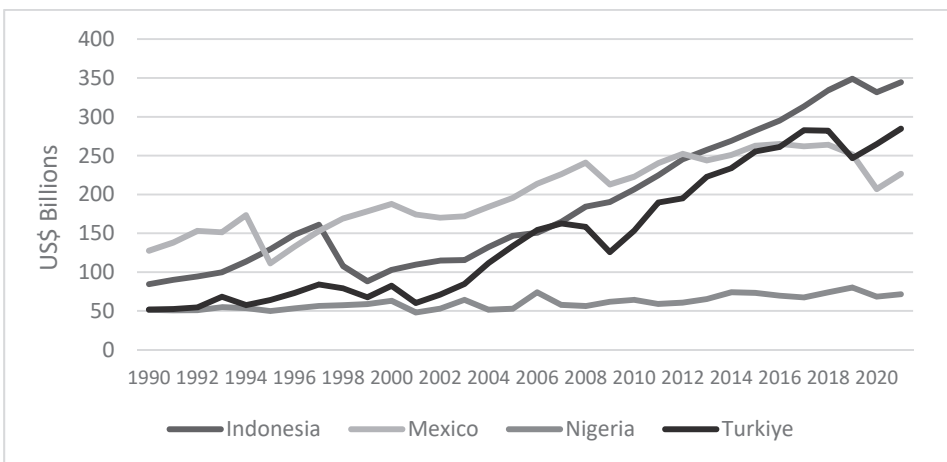
Source: Author's Computation from World Development Indicator (2022)

Descriptive Statistics

The statistical properties of the variables of interest are shown in Table 2. It is obvious that external debt averaged US$154 billion, US$108 billion, US$20.2 billion and US$78.5 billion in Mexico, Indonesia, Nigeria and Türkiye, respectively, and these average values are below the mean values of investment in all the countries. The average debt service payment gives credence to the earlier trend analysis that Mexico and Nigeria pay the most and least in debt service, respectively. With regard to the size of each country in terms of real GDP, the average values show that Mexico, Indonesia, Türkiye and Nigeria rank first, second, third and fourth, respectively. The average exchange rate of the Indonesian currency to US dollar is extremely high, indicating the unprecedented low value of the Indonesian domestic currency, making repayment of external debts and its associated debt servicing somewhat problematic. Most of the variables are positively skewed and platykurtic across the countries, and their standard deviations are relatively large.

Unit Root Tests

The unit root test is imperative in time-series and panel studies to determine an appropriate estimation technique while avoiding spurious results. Thus, this study conducted a unit root test using the augmented Dickey–Fuller (ADF) method and the results are shown in Table 3. The null hypothesis of "There is a unit root" will be rejected if the corresponding probability value is less than 10% but accepted if otherwise. Accordingly, the null hypotheses are accepted at level for all the variables, indicating that the variables are not stationary at level. However, the null hypotheses are rejected when all the variables are first differenced, suggesting that the variables are integrated of the first order. This result signals the Johansen cointegration approach is the appropriate cointegration method to be adopted because it accommodates first-differenced variables.

Table 2: Descriptive Statistics

Country	Statistics	Gross Fixed Capital Formation (US$ Billion)	External Debt (US$ Billion)	Debt Servicing (US$ Billion)	Real GDP (US$ Billion)	Interest Rate (%)	Exchange Rate ($)
Mexico	Mean	200.00	154.00	24.60	950.00	8.24	11.31
	Std. Dev.	45.70	83.70	10.70	195.00	9.81	5.29
	Skewness	-0.16	0.81	0.70	-0.03	1.62	0.16
	Kurtosis	1.84	2.03	2.91	1.82	5.05	2.38
Indonesia	Mean	187.00	108.00	12.40	594.00	12.22	8624.10
	Std. Dev.	88.00	61.10	7.23	252.00	7.49	4230.80
	Skewness	0.58	1.16	2.06	0.57	1.69	-0.44
	Kurtosis	1.90	3.01	6.74	1.97	6.30	2.05
Nigeria	Mean	60.90	20.20	1.71	309.00	11.38	136.50
	Std. Dev.	8.79	10.70	1.80	140.00	4.30	103.84
	Skewness	0.451	-0.444	2.584	0.255	0.675	0.686
	Kurtosis	2.075	1.604	10.096	1.437	3.424	2.677
Türkiye	Mean	146.00	78.50	11.40	589.00	39.74	1.84
	Std. Dev.	82.90	31.30	3.57	253.00	26.47	2.12
	Skewness	0.43	0.45	1.12	0.61	0.57	1.78
	Kurtosis	1.67	1.94	4.11	2.08	1.66	5.84

Source: Author's Computation from Eviews10

Table 3: Unit Root Test Result

	Augmented Dickey–Fuller (ADF)											
	Mexico			Indonesia			Nigeria			Türkiye		
Variables	Level	First Difference	I(d)	Level	First Difference	I(d)	Level	First Difference	I(d)	Level	First Difference	I(d)
LOG(INV)	-1.90	-6.76*	I(1)	-0.30	-3.00**	I(1)	-0.54	-10.47*	I(1)	-0.70	-5.95*	I(1)
LOG(EDB)	0.15	-4.94*	I(1)	0.92	-4.50*	I(1)	-1.78	-3.76*	I(1)	-0.14	-5.47*	I(1)
LOG(DBS)	-2.46	-5.63*	I(1)	-0.58	-7.19*	I(1)	-2.02	-4.90*	I(1)	-0.09	-7.94*	I(1)
LOG(RGDP)	-1.63	-5.81*	I(1)	-0.52	-4.13*	I(1)	-0.61	-2.85***	I(1)	0.51	-5.51*	I(1)
INT	-1.28	-5.11*	I(1)	-2.02	-6.13*	I(1)	-2.47	-6.83*	I(1)	-0.72	-8.07*	I(1)
LOG(EXR)	-2.02	-4.41*	I(1)	-1.69	-5.75*	I(1)	-1.96	-5.15*	I(1)	-2.16	-5.26*	I(1)

Note: *, ** and *** represent 1%, 5% and 10% significance levels while I(1) indicates stationarity at first difference.

Source: Author's Computation from Eviews10

Table 4: Johansen Cointegration Test Result

Trace Cointegration Rank Test Results									
		Mexico		Indonesia		Nigeria		Türkiye	
Hypothesised No. of CE(s)	Critical Value	Eigenvalue	Trace Statistic	Eigenvalue	Trace Statistic	Eigenvalue	Trace Statistic	Eigenvalue	Trace Statistic
None *	95.75	0.81	116.07	0.88	142.79	0.85	126.94	0.81	142.04
At most 1	69.82	0.56	66.00	0.68	79.56	0.68	69.13	0.73	91.72
At most 2	47.86	0.43	41.34	0.52	44.98	0.42	34.71	0.61	52.74
At most 3	29.80	0.41	24.24	0.36	22.74	0.33	18.31	0.37	24.14
At most 4	15.49	0.17	8.62	0.20	9.54	0.19	6.46	0.28	10.10
At most 5	3.84	0.09	2.94	0.09	2.82	0.00	0.02	0.00	0.09
Maximum Eigenvalue Cointegration Rank Test Results									
		Mexico		Indonesia		Nigeria		Türkiye	
Hypothesised No. of CE(s)	Critical Value	Eigenvalue	Trace Statistic	Eigenvalue	Trace Statistic	Eigenvalue	Trace Statistic	Eigenvalue	Trace Statistic
None *	40.08	0.81	50.07	0.88	63.24	0.85	57.81	0.81	50.32
At most 1	33.88	0.56	24.66	0.68	34.57	0.68	34.42	0.73	38.98
At most 2	27.58	0.43	17.10	0.52	22.24	0.42	16.40	0.61	28.60
At most 3	21.13	0.41	15.61	0.36	13.20	0.33	11.85	0.37	14.04
At most 4	14.26	0.17	5.68	0.20	6.73	0.19	6.44	0.28	10.01
At most 5	3.84	0.09	2.94	0.09	2.82	0.00	0.02	0.00	0.09

* denotes rejection of the hypothesis at the 0.05 level

Source: Author's Computation from Eviews10

Cointegration Test

The Johansen cointegration test was conducted in line with the unit root test results. It has two rank tests – trace cointegration and maximum eigenvalue cointegration rank tests. The cointegration tests basically check for the existence of a long-run relationship between the variables employed in the study. They test the null hypothesis, "There is no long-run relationship", and the decision as to whether to reject or accept depends on the values of the eigenvalue and trace statistics vis-à-vis the critical value. If the critical value is less than the trace statistics, the null hypothesis will be rejected but accepted if otherwise. Here, the null hypotheses of the trace and the maximum eigenvalue cointegration rank tests are rejected in all MINT countries, reflecting the existence of cointegration between the variables and their long-run convergence.

Investment Effect of External Debt and Debt Servicing in MINT Countries

The result of the estimated FMOLS model is reported in Table 5. It shows a wide disparity in the magnitude and direction of investment effect of external debt and debt service payment across the MINT countries. With regard to the impact of external debt on investment, the result shows that external debt adversely affects investment in Mexico, Indonesia and Türkiye but stimulates investment in Nigeria. The inverse relationship between external debt and investment in Mexico, Indonesia and Türkiye confirms the validity of the debt overhang theory in these countries, and it corroborates the views of Sánchez-Juárez and García-Almada (2016), who found an inverse but insignificant relationship between external debt and public investment in Mexico. Interestingly, the investment effect of external debt is statistically significant in Mexico, Indonesia and Türkiye, signalling that external debt is a major determinant of investment in these countries. Intuitively, external debt crowds out investment in Mexico, Indonesia and Türkiye. This finding parallels that of Balikcioglu and Iyidogan (2016), who argued that external debt has significant investment effects in Türkiye. It also validates the arguments of Mabula and Mutasa (2019), Omodero (2019) and Kengdo et al. (2020) that public debt has a crowding-out effect on investment but contrasts with the finding of Ogunjimi (2019), who found that external debt crowds out investment. It is, however, noteworthy that the magnitude of impact of external debt on investment is highest in Türkiye, suggesting that external debt exerts the highest impact on investment in Türkiye than on any other MINT country.

With regard to the investment effect of debt service payment in MINT, the result follows a similar pattern as it shows that debt servicing has a catastrophic effect on investment in Mexico, Indonesia and Türkiye but enhances investment in Nigeria, which could be linked to the high volume of external debt in Mexico, Indonesia and Türkiye as the amount paid in debt service is directly proportional to the volume of external debt. The case is worst in Indonesia because of the country's exceedingly weak domestic currency occasioned by its persistent depreciation. Since external debts are denominated in foreign currencies, depreciation of the domestic currency increases the value of the foreign currency at the expense of the domestic currency (Ogunjimi, 2020a, 2020b). Thus, debt repayment becomes daunting as the depreciation not only raises the value of the debt but also increases the cost (interest payment) associated with the debt. The relationship between debt servicing and investment is statistically significant in Mexico, Indonesia and Türkiye, implying that debt servicing exerts significant influence on investment in these countries. In sum, debt servicing has a crowding-out effect on investment in Mexico, Indonesia and Türkiye. This finding corroborates the views of Fosu (2007) that debt servicing has a devastating impact on public investment. In view of the foregoing, it is imperative that policymakers make concerted efforts at identifying and reducing debt-related vulnerabilities given the investment-stifling effect.

For the control variables, the coefficients of real GDP show the expected sign, indicating that an increase in real aggregate output stimulates investment across the MINT countries. However, the magnitude of impact differs from country to country, with the impact being more pronounced in Mexico, Indonesia and Türkiye than in Nigeria. Thus, while investment in Mexico, Indonesia and Türkiye responds sharply to a change in real GDP, the response is quite low in Nigeria. This indicates that a larger proportion of the increase in national output is invested in Mexico, Indonesia and Türkiye than in Nigeria. This finding corroborates the results of Aminu and Ogunjimi (2019), Mabula and Mutasa (2019) and Chukwu et al. (2021). Similarly, the coefficients of the interest rate are in line with the a priori expectation in Nigeria and Türkiye, showing the existence of an inverse relationship between investment and the interest rate in Nigeria and Türkiye. Investment theories posit that an increase in the interest rate is a disincentive to potential investors, thus, stifling actual and potential investment

in an economy. However, the interest rate moves in the same direction as investment in Indonesia, in violation of investment theories.

Moreover, exchange rate depreciation adversely affects investment in Mexico and Indonesia but stimulates it in Nigeria and Türkiye. However, exchange rate movement only has significant impact on investment in Mexico and Indonesia and the magnitude of impact is higher in Mexico than in Indonesia. This implies that exchange rate movements explain the investment profile in these countries. The inverse relationship between exchange rate and investment is counterintuitive as exchange rate depreciation increases the value of a foreign currency and reduces real money balances in the domestic economy (Ogunjimi, 2020a, 2020b). This depreciation will attract investment in foreign currencies given the relative increase in the value of the foreign currency. Thus, exchange rate depreciation stimulates investment while exchange rate appreciation does the converse.

Overall, the findings show heterogeneity in the investment effects of external debt and debt service payments across the sampled countries. This might be related to the different structure and the political economy of each sampled country. For example, political leaders in MINT countries have short-term horizons due to electoral cycles, which span six years in Mexico, five years in Indonesia and Türkiye, and four years in Nigeria. These leaders may prioritise short-term projects that yield immediate political benefits over long-term public investments (Khurshid et al., 2023). This short-term focus can result in less emphasis on public investment, which, in turn, can lead to an overreliance on external debt to finance current expenditures. Moreover, the practice of allocating public resources to political allies that benefit the ruling class, rather than to those with the greatest public benefit, often results in a misallocation of resources and hinders the effective use of external debt for productive public investments (Morakinyo & Sibanda, 2016). The pervasive corrupt practices and rent-seeking behaviours in MINT countries erode the effectiveness of public investment, and external debt could be diverted for personal gain rather than for public benefit. With regard to the model diagnostics, the adjusted R-Squared statistics show that external debt, debt servicing, real GDP, interest rate and exchange rate largely explain investment behaviour in MINT countries. The Hansen parameter instability results suggest the rejection of the null hypothesis that the series are cointegrated.

Table 5: Result of FMOLS Estimates

Variables	Mexico		Indonesia		Nigeria		Türkiye	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
LOG(EDB)	-0.219*	0.068	-0.218*	0.030	0.014	0.016	-0.331	0.284
LOG(DBS)	-0.077***	0.041	-0.026**	0.013	0.006	0.014	-0.270**	0.139
LOG(RGDP)	2.501*	0.313	1.717*	0.038	0.206**	0.058	1.656*	0.249
INT	0.002	0.003	0.005*	0.001	-0.006***	0.003	-0.003**	0.001
LOG(EXR)	-0.293*	0.057	-0.205*	0.009	0.014	0.021	0.004	0.020
C	-34.801*	7.112	-5.511*	0.206	18.922*	1.678	-4.528	3.291
No. of Obs.	32		32		32		32	
R-Squared	0.969		0.995		0.629		0.984	
Adj. R-Squared	0.963		0.994		0.554		0.980	
Hansen Parameter Instability Test [Prob]	0.987 [0.042]		0.950 [0.047]		1.195 [0.018]		1.059 [0.029]	

Note: *, ** and *** represent 1%, 5% and 10% significance levels. Numbers in block brackets are probability values.
Source: Author's Computation from Eviews10

5. CONCLUSION

Debt sustainability has been a recurring issue in the international arena in recent decades owing primarily to the growing burden of debt servicing and mismanagement of funds in developing and emerging countries. In view of this, a number of empirical studies have been carried out on the impact of external debt on investment as well as the impact of debt servicing on investment, with only a few studies examining the three macroeconomic variables together. Specifically, there is a dearth of studies on the investment effects of external debt and debt servicing in MINT countries. Thus, this study examined the effect of external debt and debt servicing on investment in MINT countries for the period 1990–2021. The ADF unit root test method was adopted to check the stationarity properties of the variables while the Johansen cointegration test was deployed to check for the long-run relationship between the variables. The FMOLS estimation technique was employed to run the specified model.

The unit root test results showed that all the variable are stationary at first difference, while the cointegration test revealed a long-run relationship between the variables. The FMOLS estimates showed that external debt adversely affects investment in Mexico and Indonesia but stimulates investment in Nigeria and Türkiye. However, the investment effect of external debt is only statistically significant in Indonesia and Türkiye. On the other hand, debt servicing has a catastrophic effect on investment in Indonesia and Türkiye but enhances investment in Mexico and Nigeria. However, the relationship between debt servicing and investment is statistically significant in Indonesia, Nigeria and Türkiye. For the control variables, real GDP stimulates investment across the MINT countries even though the magnitude of impact differs from country to country. The interest rate is inversely related to investment in Indonesia, Nigeria and Türkiye, while exchange rate depreciation adversely affects investment in Mexico, Indonesia and Türkiye but stimulates it in Nigeria.

Given the foregoing, this study concludes that the effects of external debt and debt servicing on investment are mixed in MINT countries. Hence, the government of each country needs to put measures in place to ensure debt sustainability. Policy makers should ensure effective domestic resource mobilisation for investment purposes and ensure debt transparency by adopting effective debt management practices. If MINT countries are to live up to the expectation of being among the

top 20 leading economies in the world by 2030, external debt needs to be appropriately channelled towards capital projects, which will help increase the ease of doing business in these countries, incentivise domestic investors and ultimately drive sustainable economic growth. The quest for increased global economic competitiveness can also be fuelled by mobilising domestic resources and investing external debts in profitable ventures that will increase investment positions, create new jobs, improve welfare and sustain economic growth. In addition, the governments in MINT countries must focus on implementing sound fiscal policies, adhering to debt sustainability criteria, and adopting mechanisms that prioritise long-term planning over short-term political gains to promote effective public investment while managing external debt responsibly.

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SUPPORTING VOLUNTARY PROLONGED LABOUR MARKET PARTICIPATION THROUGH FISCALLY SUSTAINABLE SCHEMES

ABSTRACT: *The article deals with the issue of fiscal support of participation of the senior population in the labour market. The main reasons for addressing this issue are not only the ageing population and the shortage of people on the labour market in Czechia but also the need to improve the fiscal revenues and fiscal sustainability in general. The article aims to define rules for setting employees' tax burden that would motivate older workers to remain on the labour market after reaching the statutory retirement age and to demonstrate the impact of these measures on the fiscal yield. The article contains model calculations relating to specific proposals for addressing this situation. We show why and how those fiscal measures work, first at a theoretical level of individual variables, and then we assess the impact on public finance if these measures are introduced.*

KEY WORDS: *Employment of the elderly, workplace, social policy, retirement, fiscal policy, fiscal revenue.*

JEL CLASSIFICATION: E62, E24, J26

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INTRODUCTION

The identification, recruitment, and retention of employees with a high degree of potential and the development of their talent in favour of both the individual and the organisation constitutes an integral part of the activities undertaken by most human resources departments (Armstrong & Taylor, 2020). However, we are gradually arriving at the situation where we have several specialised tools to help identify and recruit employees, but the real size and share of the economically active population from which potential employees can be drawn has shrunk and the outlook is not very positive (Eurostat, 2023a).

European countries in general have been experiencing demographic stagnation and further population ageing is expected. The main factor contributing to a possible increase in the population count is immigration, with this being exceptionally high in Czechia in 2022 because of the conflict in Ukraine. However, this process involves additional costs and a particular need for complex social integration mechanisms, and also does not improve the situation in the home countries of the immigrants. Even if various family policy measures are used to help improve the shape of the population pyramid, it is clear that, at least for the current generation, population ageing and worsening dependency ratios are inevitable. This is also true for Czechia, as current demographic data and projections show (Czech Statistical Office [CZSO], 2022b).

Therefore, answering the question of how to ensure there are enough workers available on the labour market has become a major challenge for developed economies, as confirmed by the findings of several authors (Cindrea, 2020; Farkačová, 2021; Chiripuci & Scrieciu, 2021). One significant option is to motivate the older generation to remain in employment beyond the statutory retirement age by adjusting the level of their tax and social insurance burden. Such a fiscal policy instrument should motivate the people reaching retirement age to stay in employment. At the same time, the instrument should not be a randomly chosen procedure but a targeted tool that meets the nature and requirements of, in our case, Czech public finance. Thus, a significant contribution of this article will be to define the rules and conditions for the choice of incentive instruments. Fiscal policy has several ways to support individuals' labour market participation, but when using them it is appropriate to consider both intended and unintended consequences, as pointed out, for instance, by

Beran (2020). The need to develop useful solutions in this area in relation to the sustainability of the pension system was emphasised by Durdisová and Mertl (2020), as solutions currently often suggested – individual savings and parametric changes of pension system – carry significant limitations.

The aim of the article is to define rules for setting employees' tax burden that would motivate older workers to remain on the labour market after reaching the statutory retirement age and to demonstrate the impact of these measures on the fiscal yield. Although the article is focused on the situation in Czechia, given certain geopolitical similarities between the countries of the European Union, it takes into consideration the context and situation of other EU countries.

We show the relationship of fiscal measures both at the theoretical level of individual variables and the impact on public finance when these measures are introduced. The study is primarily focused on the voluntary participation in the labour market of those who would otherwise retire. Therefore, it is important to quantify the marginal impact of the measures per person who would participate.

The article follows previous research of the Czech tax and social system (Farkačová, 2021). We take into consideration the specific conditions of the Czech tax system, which has low income tax rates but high social insurance rates, and the design of possible tax policy tools is adapted according to these characteristics.

To achieve the article's aim, the following research questions will be answered:

Q1) What conditions ought to be met so that people can stay active on the labour market after reaching the statutory retirement age?
Q2) What social policy instruments and schemes that help increase older workers' participation exist and how can we classify them?
Q3) What tax policy tools can we design for Czech conditions and what would be their fiscal yield?

1. THE PREREQUSITIES AND LIMITS FOR LABOUR MARKET PARTICIPATION

In this article, we primarily focus on the limits to productive labour market participation. Some of them can be weakened or removed with appropriate social

and fiscal policy instruments. Of course, the extension of labour market participation is not infinite, as we also encounter biological limits. It is therefore useful to define in general terms what is at stake in this regard.

Figure 1. Key life milestones in terms of prolonging labour market participation
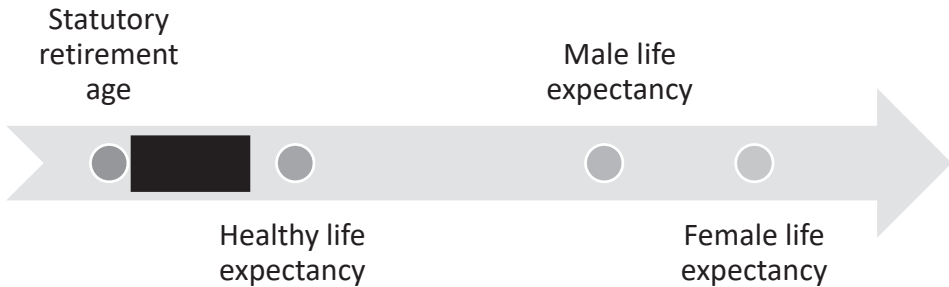
Source: *Authors*

Figure 1 shows the main lifetime milestones in terms of prolonged employment. Statutory retirement age is analytically important because no specific measures or benefits are envisaged in relation to the pension system until it is reached, except for early retirement. It is therefore seen as a socially acceptable threshold after which entitlement to draw a pension is triggered without examining health or degree of disability. Healthy life expectancy, although its measurement is certainly controversial, indicates the point at which we can realistically envisage greater participation of the older population in economic activity. Strictly speaking, equating healthy life expectancy with the statutory retirement age would mean a return to the disability concept of old-age pensions. Therefore, the scheme contains a rectangle between statutory retirement age and healthy life expectancy, which can be seen as a "window of opportunity" for those who want to work further after reaching the statutory retirement age while still maintaining good health.

Healthy life expectancy can be measured according to several internationally used indicators (HLY – Healthy Life Years, QALY – Quality Adjusted Life Years, etc.); however, these are typically defined in terms of quality of life and comparison with full health, which are not necessarily correlated with the ability and

willingness to work at older ages. In addition, we must consider the methodology behind these indicators, which need not be the ability to work, but the quality of life in general. It also depends on the criteria or calculation methodology chosen for the indicator, including in relation to the parametric setting of the pension system. For Czechia, the HLY indicator can be found in the following table.

Table 1. HLY (Healthy Life Years) indicator for Czechia (2015, 2021)

	2015	2021
HLY at birth males	62.4	60.7
HLY at 65 years males	8.0	7.0
HLY at birth females	63.7	63.4
HLY at 65 years females	8.6	8.2

Source: *Eurostat (2023b)*

In sum, at 65 years of age healthy life expectancy is 73.6 years for women (73.2 for 2021) and 73 years for men (72 for 2021). The data for 2021 were influenced by the COVID-19 pandemic and are expected to return to previous levels in the future.

This shows that it very much depends on the point (age) at which we measure healthy life expectancy; while the 65-year threshold is the current baseline age for retirement, we could just as well have used, for example, the 60-year threshold in the past and we would have come up with different results again, because healthy life expectancy at a certain age logically excludes those who do not reach that age (i.e., are already dead).

The applicability of these indicators in terms of labour market analysis and prolongation of productive employment is therefore limited and it is advisable to choose or supplement them with a more empirically anchored criterion that would be more compatible with the Czech social security system. Such a criterion could be the number of disability pensions in the various stages at the time of reaching the statutory retirement age. To illustrate, according to the data of the CSSZ, in 2020, in the age group 60–64 years (the statistics indicate a five-year cohort) there were 37,532 disability pensions paid in the third, 14,206 in the second, and 26,705 in the first degree of invalidity (CSSZ, 2022). It can be reasoned that if the initial number of these pensions does not change, ceteris

paribus, the rate of "use of the disability concept" in old-age pensions is constant. If it changes, for example increases, then old-age pensions shift towards this disability concept; if it decreases, they shift towards the earnings concept. This criterion, too, has its problems: for example, there is the question of whether only the second and third stages of invalidity pensions should be counted in this respect, where the loss of working capacity is already significant, or also the first stage, where, on the contrary, the person is expected to be significantly active in the labour market. Of course, the number of invalidity pensions may also be influenced by the methodology of awarding them and other factors, so when using this criterion, the ceteris paribus condition should be emphasised and any changes caused by other factors should be statistically removed from the appropriateness of setting the statutory retirement age.

The second criterion that could help monitor and alleviate the social and health impact is the average sickness rate of the older workers. This would take into account the circumstance that a person who applies for and receives an old-age pension is no longer in the invalidity pension statistics. Thus, we may evaluate whether the person can handle the work duties well or not by using the average number of sick days per year. This indicator can thus help to evaluate the health impact of prolonging participation in the labour market. If it does not change at all or changes just slightly after the introduction of new incentive schemes, we can conclude that a negative impact on health does not occur. If this indicator rises significantly, we may then need to consider or further examine whether we are forcing people to work in old age even though they have social and health issues that cause them to fall sick. Looking in more depth, we could also compare the average number of sick days in the group of older people already working with that of those who started to work under the new incentive schemes. The depth of these analyses will certainly depend on the care and detail with which we want to examine the social and health effect of the new measures.

In any case, it is advisable that incentives to prolong labour market participation should be genuinely optional, including, for example, part-time work, i.e., in general, an optional level of participation based on the individual decision. In this sense, one can see the time span between the statutory retirement age and healthy life expectancy indicated by the rectangle in Figure 1. We may use broader measures such as healthy life indicators to provide adequate scope to make that

choice once the statutory pension age is reached, and we can use stricter (or more job-related) indicators to monitor whether this really works, but voluntariness is crucial, because, especially at this stage of life, conditions vary widely while personal motivation and respect for individual choice are essential.

Another milestone is life expectancy, which, it should be noted, differs significantly between men and women. For the sake of simplicity, we do not provide this breakdown for healthy life expectancy, although statistically we find differences here as well. In contrast, there is a tendency for the statutory retirement age to be uniform (unisex) across OECD pension systems (Chybalski & Marcinkiewicz, 2021). In practice, it appears that although demographic projections are relatively optimistic and Czechia still has some room to increase life expectancy relative to many OECD countries, there may be circumstances that will (probably temporarily) halt this increase, such as the COVID-19 pandemic, when life expectancy in Czechia was reduced by about one year for both sexes (Aburto et al., 2022). When designing socio-political measures, it is therefore advisable to start from the current state of these indicators, or the low variant of the demographic forecast, and to consider any improvement in the longer term as a "positive dividend" that may subsequently be reflected in an improvement in the balance of public finances.

Recently, the determinants of employment at higher age in Czechia have been tackled by Zubíková et al. (2021). Three main determinants were found: the social security system and its design, the education level, and health status. The findings suggest support for tertiary education and investment in health.

With the help of the above, the answer to the first research question Q1 can therefore be made.

Supporting participation in the labour market will only be functional for the selected group if these conditions are met:

- it is voluntary,
- the level of participation is chosen according to individual needs and meets the age levels set by healthy life expectancy indicators,
- sickness and invalidity rates will not (significantly) increase by involving the elderly.

2. DEFINING THE TARGET SOCIAL GROUP IN THE CONTEXT OF THE POPULATION AND LABOUR MARKET IN CZECHIA

When adopting measures in fiscal and social policy, it pays off to first examine the population for effects we want (or need) to achieve and the benefits they will bring. There are several reasons for focusing on people who are reaching retirement age but can still work:

1) From an age perspective, this is the dominant age cohort that it is desirable to support to continue working. It is crucial to highlight that in Czechia, the strong generations of the 1970s are currently at their most productive age (Nývlt, 2022), thus the share of the senior population will grow in the following decades and enter these age groups, making the target social group larger. It is not desirable to ensure a larger stock of human capital by adjusting the lower age limit or influencing the behaviour of the youngest workers; overall, it is preferable that adolescents prepare for work rather than leave the education system early, otherwise a barrier to intensive economic growth will be created (Grigorescu et al., 2020).

2) This group of employees is important for ensuring the competitiveness of firms, and retaining senior employees maximises the innovation potential of firms (Říhová et al., 2019). Senior workers are of particular importance in the case of creative intergenerational cooperation in the workplace, where multi-generational cooperation works in a desirable direction, as Valenčík et al. (2022) state in terms of the concept of prolonging productive employment.

3) Supporting an individual's participation in the labour market for a longer time can also benefit the workers themselves. As demonstrated by Mosca and Barrett (2014), forced retirement has a negative and statistically significant effect on mental health. At the same time, it must also be considered that retirement carries the risk that retirees will suffer from a loss of daily routines, physical and/or mental activity, sense of identity and purpose, and social interactions, which may lead them to adopt unhealthy behaviours (Kuhn, 2018).

4) Promoting the participation of old-age pensioners could also be a way of addressing the balance of the pension system. For instance, Holub (2020) argues that major steps need to be taken to ensure the financial sustainability of pension systems. For example, according to data of the Ministry of Finance of Czechia, the balance of the pension system was negative in 12/2022 (-CZK

21.49 billion). And the outlook is not more positive, either. According to a recent calculation of the NRR (2022), the negative balance is expected to deepen to as much as -3.8% of GDP in 2062.

These reasons show that it makes sense to support the participation of people who are either approaching the pension age or have reached it and still can work. Based on this, the next logical step is to define the actual target social group in Czechia to whom the fiscal and social policy measures can be applied. The question is whether we target these measures at people who are already retired (or could be according to current retirements rules) or at people who are required to be on the labour market (either as employed or unemployed). On the basis of the theory of social policy, it is clear that we cannot adopt the same measures for both groups. In this study, we decided to focus on the first group, more precisely those who are retired and can still work, in other words those who can voluntarily participate.

The total number of pensioners in Czechia varies between around 2.3–2.4 million, of which a relatively substantial proportion (approx. 428,000 in 2011, 680,000 in 2022) are early retirees, as illustrated on Figure 2 below.

Figure 2. Number of pensioners in Czechia 6/2010–6/2023
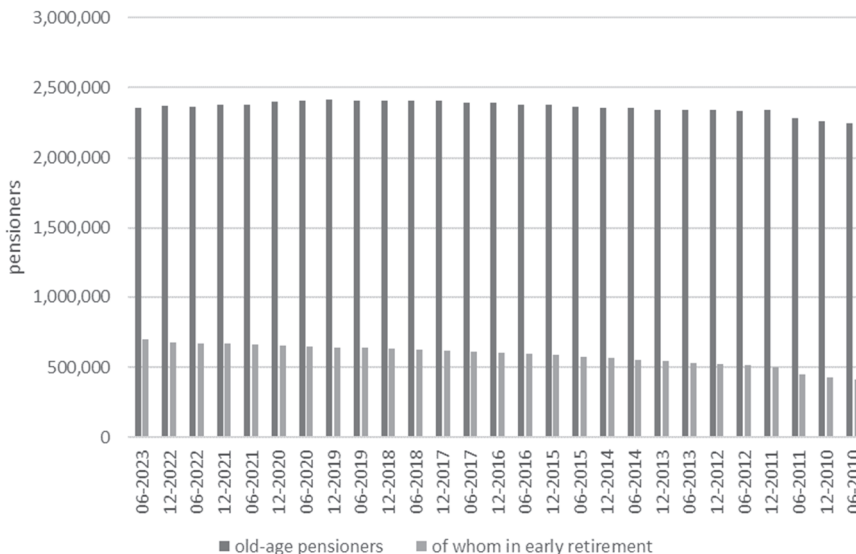
Source: *Authors, based on data CSSZ (2023b)*

It can be assumed that in most cases it is not necessarily poor health making these retirees unable to participate in the labour market which is the reason for their taking early retirement. Especially meaningful in this regard are the data from the beginning of the period 2010–2011, when the statutory retirement age was even lower than it is today. Thus, we see here how a large number of workers have been unnecessarily displaced from the labour market. The above represents one of the reasons why the issue of promoting labour market participation at older age is so important.

The target social group for the proposed measures consists of people who have reached retirement age, receive pension benefits, and potentially could continue working. This age differs among the members of this group because of the gradual but variable and birth-year-dependent increase in the statutory retirement age threshold in the Czech pension policy. Currently, the statutory retirement age is 65 years for both men and women born after the year 1971, but it is lower for those who were born earlier; these people have retired or will retire according to the pension age rules that apply to them (CSSZ, 2023c). This is why we use the number of actual pensioners in the following calculations, not a fixed lower age limit. Because of this heterogeneity according to retirement age, the actual composition of this group can only be estimated. Therefore, only calculations per person (marginal value) in this group can be made precisely. Additionally, we are aware that the size of this group it also important for fiscal policy, but we can only estimate the maximum number of people that can be affected by these measures.

According to the only available sample survey conducted by the Czech Statistical Office (CZSO, 2022a), in 2012 more than one fifth (21.5%) of inactive pensioners under 70 years of age wished they had continued working on reaching their retirement age. Thus, the rate of willingness to work was approximately one fifth of inactive pensioners. Given that since this survey the retirement age has increased in the last decade, we can apply this rate for the year 2022 to pensioners under 75 years of age (adding the next five-year cohort). This threshold will be used for the calculation of the maximum impact of the proposed measures. As for the number of inactive people, the last available data for 2022 (CZSO, 2023) states that the average rate of economic activity for people 65+ is 7.1 %, thus 92.9 % of them are inactive. Assuming that we neglect the number of working pensioners older than 75 years of age (which is insignificant anyway), the estimated

maximum number of people that can be targeted by the proposed measures in 2022 can therefore be calculated as follows:

$$0.2 * (0.929 * 2{,}367{,}185 - 930{,}706) = 0.2 * 1{,}436{,}479 = 253{,}681,$$

where we took the number of pensioners in 12/2022 (2,367,185 people, see Figure 2), calculated the inactive part of the group (1,436,479 people), subtracted the number of pensioners older than 75 years of age (930,706 people; CSSZ, 2023b) to obtain the number of inactive pensioners younger than 75 years, and calculated one fifth of them.

Since there are no other retirement schemes in Czechia, the calculations apply universally to all the people that reach retirement age regardless of whether they worked in the public or private sector.

Inactive pensioners are thus a significant labour reserve, the use of which is problematic in the current labour market situation (CZSO, 2022a). At the same time, the interest in remaining in active employment was not only financial, according to the above-mentioned survey, since one fifth of active pensioners worked mainly for non-financial reasons. Non-financial reasons included cases where respondents were unable to find a replacement in their job or could not find a person to whom they would hand over their business activities. Relatively speaking, non-financial reasons were most frequently mentioned by specialists, technical and professional workers, and service and sales workers. Thus, our findings confirm and build on those of other authors who are of the opinion that diversity in the workplace and knowledge transfer between generations are key for the long-term success of businesses.

Pertold and Federičová (2022) show that the Czechia has a high rate of unexpected retirements compared to other European countries, even if they classify the responses according to the socioeconomic background of respondents. They also show that the statutory retirement age has a signalling effect for retirement decisions in Czechia. As a socially less problematic step than raising this age, they suggest a pension subsidy for longer working careers.

The phenomenon of early retirement has been intriguing even in challenging conditions, as Dvořáková (2021) shows. Her findings include that stress at work

and job insecurity reduce both the quality of life and the quality of working life. Perceptions of uncertain futures vary according to gender and age groups. When harder times come and labour conditions worsen, certain older workers may also react by retiring early. She suggests focusing on further developing human resource practices that support higher commitment, job satisfaction, and autonomous tasks motivating older Czech workers to stay at work.

Recently, research has been done on women's early retirement in Czechia (Dudová & Pospíšilová, 2022). It demonstrated that gender also matters in the design of retirement policies, even if the main predictor is pension eligibility.

The importance and positive benefit of age management for an organisation in Czechia has been demonstrated using a sample of 1271 companies by a team of authors (Urbancová et al., 2020).

It is worth pointing out that Czechia is below the EU average in terms of the share of working seniors. While the share of working seniors exceeds 20% in the EU and 35% in Sweden, in the case of Czechia the share is below 20%. In contrast, Italy, for instance, is much worse off, but has already taken steps (for instance, promoting the participation of those who have not yet reached retirement age through fiscal policy instruments – incentives for companies) to support the labour market participation of the senior population (the data presented above refer to the situation in 2018), as reported by the Union of Employers' Associations (2019). It should be noted that Italy cannot be seen as a model in this respect, as its approach to pension policy is not constant. (OECD, 2023)

Regarding the labour market situation, we are aware of the equilibrium in this market which, statically considered, may suggest that if we employ more new workers *ceteris paribus*, the existing wages will simply be distributed among the new, larger workforce and no additional wages and related tax revenues will emerge. But the theoretical knowledge (Mertl & Valenčík, 2016; Valenčík et al., 2017, 2019) and the participation rate in developed countries, e.g. Sweden (Statistics Sweden, 2022), do not support this static approach; rather, the opposite is true: the economy can (at least to some extent) dynamically utilise higher participation rates in the workforce if social policy provides appropriate tools as an incentive. From a certain point of view, we can see this new workforce as an increase in labour level in the Solow model of long-term economic growth. These

workers (economically active people) can supply new goods and services, thus creating new additional value, which they get paid for. Furthermore, they can increase demand based on their earnings and higher disposable income, even specific demand attributed to the elderly. Moreover, new capital accumulation may occur. In this article, we therefore assume that the newly participating workers will gain appropriate jobs and corresponding wages, not replace existing workers or lower their earnings.

We can therefore estimate that a maximum of 254,000 workers can enter (return to) the labour market compared to the current situation if the conditions and environment are set up well. Of course, all of them need not do this. This is the potential we identify, and the reality will depend on actual macroeconomic circumstances, but also on the social policy tools used. The above estimate is also aligned with the rate of economic activity among men aged 60–64 (one five-year cohort before 65+), which was just over 67% in 2022. In the case of women in the same age group, the rate is lower at 46% (CSSZ, 2023d). Moreover, as Nývlt (2022) points out, the newly arriving older generations have a different value ranking than previous generations and it can be assumed they will be striving to maintain their living standards. At the same time, their interest in remaining on the labour market up to the statutory retirement age and possibly even after it may support the growing importance of self-realisation.

3. THE TYPOLOGY OF TOOLS USED ACCORDING TO THEIR MECHANISMS OF ACTION

In this section, we shall focus on answering the second research question Q2. To do this, it is crucial to analyse best practices abroad. Thus, after defining the rules for supporting the labour market participation of the elderly population, it is appropriate to mention selected instruments that have already been implemented in other developed countries, especially the EU. It should be stressed again that the instruments used abroad must also be understood in the context of the model approaches to taxation and social systems' configuration in the individual countries concerned. It is not effective to transfer an instrument to another system without further linkage, as its mere 'transplantation' does not guarantee its compatibility with the other social policy instruments in use or with the social model used in the target country. There is thus a risk of ineffectiveness of a non-

systemic solution transferred to a different systemic approach (Holub et al., 2019).

An example of supporting older workers in the labour market can be found in the approach of the Netherlands, where the employer need not pay further individual contributions for any such employees (Government of the Netherlands, 2022), covered specifically by:

-   the Unemployment Insurance Act (WW),
-   the Sickness Benefits Act,
-   the Disability Insurance Act (WAO),
-   the Work and Income according to Labour Capacity Act (WIA),
-   the General Old Age Pensions Act (AOW).

As such, the individual is no longer insured against unemployment or incapacity to work. Of course, the person will continue to collect an old-age pension if employment is terminated, which means that benefits during any period of incapacity to work no longer make sense. On the other hand, the individual is still entitled to a sickness benefit, even if the insurance contribution is no longer paid. Precisely this approach is a suitable incentive for individual companies, and it can also be recommended that the payment of sickness insurance should be preserved under Czech conditions, as the rate is low.

Another example can be found in Italy, where the government is endeavouring to motivate employers to employ older workers over the age of 50. The Italian government sees unemployed people over the age of 50 as one of the most vulnerable groups, according to Law No. 92/2012 (the Monti-Fornero Reform). In compliance with Article 4, paragraphs 8 to 11, tax relief applies to companies that employ workers over the age of fifty who have been unemployed for more than twelve months. Even though these bonuses are subject to many limitations, these tools can still be considered a positive step on the part of the government aimed at incentivising the extension of the period of active inclusion in the labour market.

It should be noted that legislative incentives such as those used in Italy may not always work. As evidence from Germany shows, such incentives may lead

employers to hire senior workers, but only for marginal positions or marginal jobs (Heywood & Jirjahn, 2016).

If we move within the framework of legislative and policy instruments of individual employers, it is worth mentioning the approach of Japan. In particular, the labour force participation rate of older Japanese is much higher, and it does not fall as steeply with age as that in Germany or other EU countries, such as Czechia. Individuals in Japan who work until the age of 65 receive a state pension, but this is paid regardless of whether they work or not, meaning that the pension does not affect the decision to retire. A consequence of this arrangement is that Japan has an extremely low implicit tax on continuing to work past age 65 (Duval, 2003). Thus, there are few barriers for workers in Japan to continue in the labour market. Similarly, there are few barriers for firms to hire older workers, and not just for marginal positions.

We can see a certain similarity with the situation in Czechia. In Czechia, old-age pensioners can also receive a retirement pension while continuing to work, thus achieving a concurrence of income from work and income from the old-age pension. However, the difference between Czechia and Japan is that in Czechia, old-age pensioners must actively apply for a pension themselves.

Based on previous studies showing that the oldest workers respond positively to changes in the tax burden, as demonstrated by Messacar (2017) in a large sample in Canada, it is desirable to focus specifically on reducing the tax burden when demonstrating the potential of the senior population. Indeed, the above is confirmed by the findings of a 2017 study in Sweden (Laun, 2017), which is geographically and culturally closer to Czechia, and it can be assumed that reducing the tax burden of the target group will positively motivate them to participate in the labour market.

Thus, the employment rates of older persons and persons of retirement age depend to a significant extent on the characteristics of the pension and welfare systems, which reflect different historical and cultural factors in different countries (Šerák et al., 2019). Given the above, the high proportion of working seniors in Sweden, for example, is also easier to explain. In the case of Sweden, a fixed share of salaries goes towards pensions and the amount thus collected is distributed among current pensioners. In addition, the system allows retirement

at any time between 61 and 70, so there is no fixed retirement age, but there is also the possibility to postpone retirement indefinitely.

At the same time, it can be pointed out that the pension systems in countries such as Austria, Germany, Finland, and Sweden include several models with different eligibility conditions for each system, for instance as regards the statutory (legal) minimum retirement age and the possibility of early, partial, or deferred retirement, etc. At the same time, in three of the countries mentioned above, the principle of a minimum pension for low-income earners or for those who do not receive a sufficient pension from a basic pay-as-you-go system derived from previous income is explicitly formulated (Šerák et al., 2019).

Raising the statutory retirement age is a straightforward strategy to increase employment of older people, but it is also difficult to achieve politically and severely limits the possibility of creating optional schemes. In this context, Šerák et al. (2019) recommend the concept of partial retirement as one of the tools to promote employment and delay the exit from the labour market. Valenčík uses the concept of a gradual decrease in the workload at older ages in this regard (Mertl et al., 2019).

As the above findings show, approaches to supporting the participation of older workers in the labour market are influenced at various levels, either through special legislation, as in Italy, or through systemic approaches and linkages to the social or pension system in a given country.

To sum up, within the social and fiscal policy framework, two main types of instruments can be used: instruments legally regulating the substantive nature of labour (employer-employee) relations and financial instruments rooted in fiscal policy and the financing of social systems. The first type regulates or supports the functioning of the labour market, which may spontaneously displace older people, especially in times of recession or other unfavourable conditions. It can also regulate the conditions of older people with a view to facilitating their employment and reflecting their specific needs. It is also possible that some of the initially legislatively enforced changes will become a common part of the functioning of the labour market over time as society adapts to demographic change and increased participation of older people.

As regards the second type (financial instruments), given the very low homogeneity of potentially "activated" older employees, it is rather difficult to calculate the fiscal benefits exactly. On the other hand, at least some impacts can be estimated using marginal values and general labour market statistics. Indeed, the uncertain fiscal impact of individual measures has been pointed out by several authors, e.g., Hantzsche (2019). The key uncertainty stems from information asymmetry as well (Stemp, 1998). As for general trends that are present in demographic analyses, given the growing senior population, the increased importance of work in their lives (Nývlt, 2022), and other points mentioned above, we may expect further involvement of seniors.

Thus, in more detail, the following tools can be used:

- Legislative instruments aimed at motivating employers to hire senior workers;
- Legislative instruments aimed at motivating employees to remain active in the labour market;
- Systematic financial tools that have a link to fiscal and social policy;
- Voluntary tools, such as in-company career development policies (Gulyás, 2009), which can be recommended to employers.

In the case of Czechia, it seems feasible and suitable to use financial instruments favouring the employment of older persons, for instance in the form of income tax relief or a social insurance rate reduction. Indeed, selective instruments are often pointed out in the contemporary literature (Farkačová, 2021). The use of social insurance rate adjustment and additional income tax reliefs seems to be promising, and we shall introduce and analyse this in the next two sections.

4. A MODEL APPROACH TO THE EFFECTS OF DESIRABLE FISCAL TOOLS SUPPORTING LABOUR MARKET PARTICIPATION

The second type from the previous section, the financial tool rooted in fiscal and social policy, assumes the existence of personal income taxation and social security mechanisms that are set with a view to achieving a balanced government budget. Within these mechanisms, we can then use selective instruments favouring the employment of older people, for example in the form of tax reliefs or reductions in social insurance premiums. The compulsory nature of these

fiscal schemes also makes it possible to set their parameters in such a way as to contribute to the achievement of the desired social policy objectives. This implies, primarily, setting the initial parameters (rates and bases) so as to generate an adequate fiscal return. A strategy of promoting one or the other, without regard to the basic settings of the scheme, would lead to the breakdown of the mechanisms in question or to an unsustainable development of public budgets. Similarly, a strategy of "low taxes for all" would in turn make it impossible to use selective tools, as we would no longer have the means to further favour the target groups of certain measures.

In the long run, we can expect that the costs associated with the use of these tools will be partly recouped economically in the increased participation of older people in the economy. In terms of the current year's budget balances, it is therefore useful to see that if we want to implement a measure in a fiscally neutral way, then we have to compensate for the revenue shortfall or expenditure increase associated with it by increasing other revenue or reducing other expenditure. At the same time, it is important to see that the measures in question can only apply to a limited target group. This raises the possibility of achieving a noticeable advantage for the group in question by slightly increasing the unit burden across the population. In the case of a proportional rate on earnings, we can use this reasoning to express this in its simplest form on the revenue side of the system as follows:

Equation 1

$$T = \sum_{i=1}^{n} t \cdot w_i + \sum_{i=1}^{m} t_r \cdot w_i$$

where n is the number of people who are not subject to, for example, the rate reduction from t to t_r, m is the number of people with the reduced rate, w is their earnings and T is the total tax revenue. Overall, TTR (total tax reduction) is the loss of tax revenue caused by this operation compared to the previous situation without the lowered rate t_r:

Equation 2

$$TTR = \sum_{i=1}^{m+n} t \cdot w_i - \left(\sum_{i=1}^{n} t \cdot w_i + \sum_{i=1}^{m} t_r \cdot w_i \right)$$

If we do not consider a rate reduction but a specific tax deduction (TD) for a certain group and a uniform tax rate, the above formula can be modified as follows. At the same time, we shall add the possibility of including additional persons in the number o who were economically inactive (already retired) and, given the tool used, would decide to extend their participation.

Equation 3

$$T = \sum_{i=1}^{n} t \cdot w_i + \sum_{i=1}^{m} (t \cdot w_i - TD) + \sum_{i=1}^{o} (t \cdot w_i - TD)$$

Since the total values (revenues) assume a calculation with the total number of taxpayers in each category, it is also worth developing a formula for marginal values, indicating what the change will be for one additional taxpayer in a given category. For simplification, we can assume that everybody will have the same income – the median income (the most common), w_m. In this case, marginal tax revenue will be the same as average tax revenue both for the reduced tax rate and the tax deduction as follows.

Equation 4

$$MT = AT = t_r \cdot w_m$$
$$MT = AT = t \cdot w_m - TD$$

And the reduction in tax revenue for those who already work will be by analogy:

Equation 5

$$MTR = ATR = t \cdot w_m - t_r \cdot w_m = (\boldsymbol{t - t_r}) \cdot \boldsymbol{w_m}$$
$$MTR = ATR = t \cdot w_m - (t \cdot w_m - TD) = \boldsymbol{TD}$$

We must note that, again for model simplification, we do not work with other forms of tax relief that usually apply and differ amongst taxpayers. For real computations, we may include the basic tax deduction per taxpayer (TDE, e.g. CZK 2,570 in 2022), which could be subtracted from all the expressions containing any form of $t \cdot w$ in the above equations in the form of $(t \cdot w - TDE)$. More detailed and individualised computations in the case of income taxes can also be done in practice, but then the above equations will become much more complex and would not show the conceptual relationships we want to show in this article.

In the same way, the sliding progressivity of taxation can spread the tax burden among taxpayers and thus put more burden on those who can pay more easily. This will automatically relieve those who cannot pay so much and who may be members of the very social groups that we want to support to prolong participation. Using a sliding scale (thresholds) of progression, the tax relief technique seems even more appropriate than the flat proportional rate.

In other words, the design of support tools, although it may not seem so at first sight, is consistent with the mechanisms of public finance and can be meaningfully built into these mechanisms. Moreover, if the positive effects associated with the employment of older people are achieved, in terms of increased income from economic activity but also expenditure associated with a more active lifestyle and increased budgetary constraints, the inclusion of this social group can be expected to have a positive macroeconomic impact on economic growth in the long term. This does not, of course, obviate the need to calculate the effects and costs of individual measures in the current fiscal year, but long-term trends may influence the budget outlook and thus the subsequent calculations in future years.

5. A DEMONSTRATION OF POSSIBLE FISCAL CHANGES AND THEIR IMPACT ON FISCAL YIELD

The following section focuses on answering research question Q3. Based on all the above findings, as well as the effects formulated above, it would be appropriate to:

1) Introduce an additional income tax credit for any taxpayer who is actively engaged in the labour market but has reached the statutory retirement age. The tax rate as such would remain as defined in Act No. 586/1992 Coll., the Act of the Czech National Council on Income Taxes. The additional tax credit would be linked to the median wage of employees 65 years old and older in the previous period and would amount to a maximum of 5% of the gross median wage of employees of age 65 and older.

For instance, if we wanted to use this tool in 2022, we would have to consider the median gross earnings (CZK) of employees of age 65 and older in 2021, which

was CZK 34,500 after rounding (CZSO, 2022c). The additional tax credit would thus amount to CZK 1,725.

It should be noted here that the tax burden on personal income from employment in Czechia (as illustrated in Figure 3) is already exceptionally low compared to most European countries. It is crucial to point out that there was a substantial drop in income tax revenue in Czechia in 2021. This happened due to a general reduction in the income tax burden (Žurovec, 2020). Specifically, the tax rate (burden) was reduced by 5 percentage points for all employees. The second reason for the decline in income tax revenue in the years 2020/2021 was the COVID-19 pandemic, which caused restrictions for both businesses and citizens and other negative externalities that limited economic activity in general.

Figure 3. Collected personal income tax from employment, 2003–2022
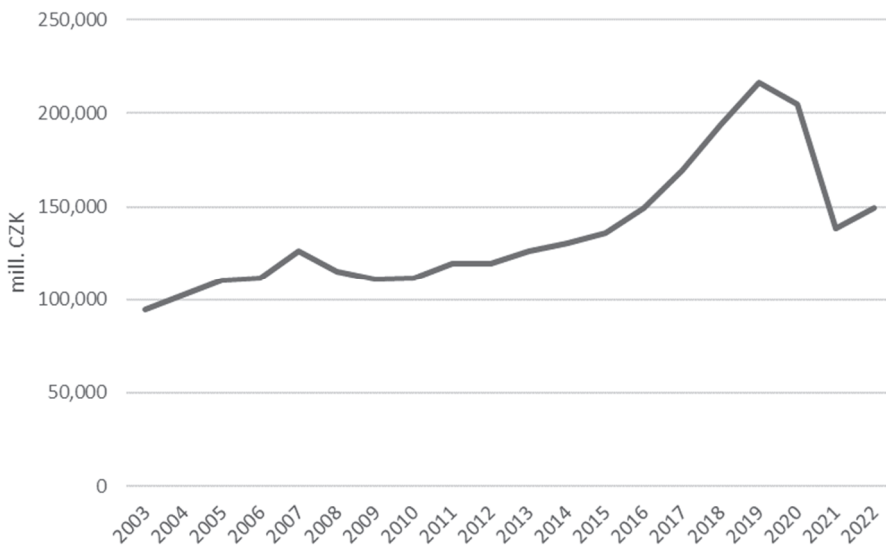
Source: *Authors, based on Financial Administration (2023) data.*

The facts mentioned above can be seen as significant arguments why we cannot recommend a further reduction in the general tax income rate in tax policy. The above tax relief measure would be even more effective and sustainable if the initial tax burden corresponded to the level of income taxation in other EU countries.

2) Provide preferential treatment in the case of social security contributions. The above-mentioned income tax relief should be supplemented by a possible minor reduction in social security contributions to approximate the fiscal policy measures implemented in other EU countries. These contributions include earmarked compulsory payments for sickness insurance, pension insurance, and the government employment policy expenditure. The argument for reducing the social security contribution rate is to improve the employability of older people in the labour market. This would favour only those employees who work on a permanent or long-term basis with a regular employment contract that includes social security coverage. Employees themselves would thus not be incentivised to switch to working under a temporary contract or other forms of precarious work without social security coverage, which is a common attempt by employers to reduce the cost of employing such an individual.

In the case of social security payments, we can recommend a reduction in the old-age pension insurance rate of 2 percentage points. This is also an option that could be accepted in practice by the current political representation and therefore may be implemented in public policy. According to current press statements of the relevant ministries (Morávek, 2022), the above reduction may well be accepted. In the final stage of our research, we did in fact observe the introduction of a reduction in social insurance rates for several categories of part-time employees, including employees over 55 years of age, as of 1 February 2023 (CSSZ, 2023a). Although the conditions for this reduction are administratively complex and apply to part-time jobs only, it can be seen as a shift in social policy in the direction that we propose in this article.

The following two tables show the fiscal impact of these fiscal tools. First, Table 2 shows the marginal fiscal yield gained when one additional person with median income starts working under the new regime. Table 3 then shows what the impact will be on existing workers if they fulfil the criteria of the new regime (as these criteria will apply to all the workers in a given category, e.g. age). We must note that for these calculations we include the basic tax deduction per taxpayer (TDE, e.g. CZK 2,570 in 2022). This complements equations 4 and 5 from the previous sections.

Table 2. Calculation of the additional (marginal) fiscal yield from the additional involvement of an individual from the ranks of currently inactive pensioners

Payroll deductions according to the new proposal	Additional fiscal yield in the case of a monthly income of CZK 34,500
Income tax = 15 % Additional tax deduction = CZK 1,725 per month	Income tax = +CZK 880 per month
Employee: Social and health insurance = 11 %	Social and health insurance = +CZK 14,835 per month
Employer: Social and health insurance (i.e., health insurance, pension insurance, state unemployment insurance, health insurance) = 32 %	Total per year = +CZK 188,580

Source: *Authors*

Table 3. Calculation of the change in fiscal yield for an individual currently participating in the labour market

Payroll taxes (current situation)	Initial fiscal yield in the case of a monthly income of CZK 34,500
Income tax = 15 % Employee: Social and health insurance = 11 %	Income tax = +CZK 2,605 per month Social and health insurance = +CZK 15,525 per month
Employer: Social and health insurance (i.e., health insurance, pension insurance, state unemployment insurance, health insurance) = 34 %	Total per year = +CZK 217,560
The newly proposed approach to payroll taxes	Change in fiscal yield in case of a monthly income of CZK 34,500
Income tax = 15 % Additional tax deduction = 1,725 CZK per month	Income tax = -CZK 1,725 per month
Employee: Social and health insurance = 11 %	Social and health insurance = +CZK 690 per month
Employer: Social and health insurance (i.e., health insurance, pension insurance, state employment policy, health insurance) = 32 %	Total change per year = -CZK 28,980

Source: *Authors*

We shall now estimate the expected fiscal yield based on the tables above in two main directions.

1) *Impact on tax revenue.* The marginal tax revenue per additional individual who has already reached the statutory retirement age would be CZK 880 per month in the case of earnings at the median level of employees 65 years and older in Czechia (the amount of CZK 10,560 per year paid by one additional individual). If the efficiency were maximised and all available pensioners specified in Section 2 were involved (whole workforce reserve), the tax revenue could reach approximately CZK 2.7 billion. However, this is an extreme scenario in which the effect would be maximum, i.e., a situation in which the decision-making of these individuals would be influenced exclusively by the above-mentioned benefits. At the same time, it is necessary to focus on the fact that these individuals are often influenced by their state of health and other factors. It should therefore be stressed that the proposed solution is beneficial for government even if only some of these individuals are involved. The background to this argument is that there will be an overall expansion of labour market capacity, thereby increasing the potential of the economy. In this case, therefore, there is no advantage for one group at the expense of another, i.e., those who do not qualify for the tax credit. It is thus a fiscal solution that does not require additional fiscal resources for the newly working people; the only costs would be decreased fiscal revenues from the (small – see the share in Section 2) group that had been already working past their retirement age when this solution was introduced.

2) *Effect on the yield on social insurance contributions and public health insurance system.* Again, it must be stressed that the implementation of the solution would lead to the activation of those pensioners who are currently not actively participating in the labour market. It is therefore possible to talk about additional contributions, not about shifting the burden to another part of the population. In the case of an individual who is additionally involved and who receives a wage equal to the median wage in Czechia, the additional monthly social and health insurance contribution of this individual would be CZK 14,835 (annually it would be CZK 178,236). If the efficiency were maximised and all available pensioners specified in Section 2 were involved (whole workforce reserve), the total social and health insurance revenue could reach approximately CZK 45 billion. The large difference between this and

the personal income tax impact would be due to the above-mentioned specific settings of personal income tax in Czechia. Furthermore, because we used the old-age pension insurance for the reduced rate, which pays out benefits in relation to the contributions paid in by the participants, the lowered contributions would not represent a significant fiscal challenge because future benefits would be paid according to the actual level of contributions, and the participants, already being past their retirement age, have already contributed to the social insurance system at the full rate throughout their careers.

CONCLUSION

The aim of the article was to suggest measures that would support older workers in remaining in the labour market after reaching their retirement age and to demonstrate their fiscal consequences.

To define the typology of tools, as well as to identify potentially effective tools, it was necessary to analyse approaches to the problem abroad. We presented an overview of this in Section 3 and then focused on fiscal tools. The choice of these tools was made in relation to the identified specifics of the approach in Czechia. It is worth pointing out that the proposal we put forward is in line with contemporary Czech political debate. In the final stage of the study, we even observed empirical use of a reduction in the social insurance rate for selected social groups and part-time employment, which we see as a confirmation that the approaches we identified and suggested before have a certain relevance in real social policy in Czechia.

Our study thus not only covered selected meaningful theoretical approaches to motivating the elderly population to prolong their active participation, but also explored suitable ways to adopt best practices, including experience from abroad. The article is based on the documented findings that adjusting the tax burden of the elderly population does indeed affect their participation rate in the labour market.

It was found that by setting appropriate incentives for participation, it is possible to obtain an additional fiscal yield of CZK 188,580 per year (based on 2022 economic indicators) by involving one more individual with median income. Thus, by targeting the incentive through a decrease in the social insurance

contribution rate as well as additional income tax relief, the potential in the form of a working pool of retirees can be effectively tapped. Theoretically, in Czechia, up to approximately 254,000 pensioners could voluntarily participate in the labour market supported in this way at present. Although we do not assume that the proposed measures would succeed in attracting all the above pensioners to the labour market, the proposal appears to have significant fiscal and macroeconomic benefit, given that their inclusion would not result in a shift of the tax burden to another group, but that the effect would come from the additional activity it brings.

Of course, these approaches assume that the increase in the statutory retirement age would not continue to levels where the voluntary prolongation of economic activity would be pointless for many because they would already be exhausted or sick by the time they reach it. Therefore, we recommend being cautious with further increases in the statutory retirement age so that the nature of participation in the labour market remains voluntary, not forced.

Conceptually, it is worth pointing out the pitfalls of employing people who have already reached the statutory retirement age, with this lying in maintaining their health. If the above proposal is to be implemented, continuous monitoring and evaluation of the health status of the working senior population is recommended to identify work overload that would lead to a negative impact on the health of these individuals. In this regard, using the statistics of invalidity pensions before reaching the statutory retirement age and sickness insurance statistics of working elderly can help. Generally, the relationship between health, age, and work must not be neglected when making changes to pension systems and the labour market, even if it can be difficult to evaluate and is usually highly individual.

It is noteworthy to underscore an additional merit of the proposed initiative, namely its lack of association with the potential for adverse public reactions. As articulated by Ostrovidov et al. (2019), endeavours aimed at prolonging active working life frequently carry unfavourable connotations, primarily attributable to concerns such as apprehension about raising the retirement age. However, the proposal presented in our article does not entail the risk of general non-acceptance, because it is based on positive motivation for those who can and want to work and does not force participation by changing the conditions of retirement.

Finally, while our article was focused mainly on fiscal tools and the conditions they can work in, we would like to mention that several topic-related issues are open for further research. They include the actual design of pension systems so that they support flexible and voluntary prolonging of economic activity, the ways to increase the employer motivation to retain older workers, and the psychological and socioeconomic analysis of transition from work to retirement. This shows how complex the issue is, but, on the other hand, with proper design and application of fiscal and social policy tools, we believe it is manageable and the labour market can work well even in the recently emerging demographic situation.

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WOMEN ARE LESS INNOVATIVE IN BUSINESS, OR ARE THEY? A DESCRIPTIVE STUDY ON INNOVATIONS IN WOMEN- AND MEN-OWNED BUSINESSES

ABSTRACT: *Innovation studies do not generally focus on the innovator. Consequently, the role of gender in a firm's innovation practice is out of the focus of research. In order to fill this research gap, the present study explores the intensity and the type of innovative practice of women- and men-owned businesses operating in production and service sectors in the USA. This descriptive study's results show that women- and men-owned businesses differ in terms of their innovativeness while the nature of these differences is related to the business sector and to the way in which the innovations are operationalised. Women-owned businesses are more likely to introduce product/service innovations, both generally and by sector. On the other hand,* women-owned businesses are found to be less innovative in terms of process improvements, in general and in the service sector. The existence and the nature of the female-male innovation gap vary depending on the operationalisation of the innovation variable as well. The paper includes the gender perspective in examining innovation, thus tackling the under-researched profile of the innovator. Moreover, it examines the wider context of innovations by including marginalised forms of innovations, such as incremental and process innovations, and it covers a range of industries which are usually neglected in innovation studies.*

KEY WORDS: *innovation, innovator, small businesses, gender*

JEL CLASSIFICATION: L26, J16, O30

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1. INTRODUCTION

Business innovation activities are extensively studied as it is suggested that they are important for sustainable competitive advantage and long-term survival of businesses (Alves et al.*,* 2017; Belghiti-Mahut et al.*,* 2016; Farida & Setiawan, 2022; Herskovits et al., 2013; Yu & Chen, 2016). Various studies suggest that innovations fuel both macroeconomic growth and the success of the individual businesses that innovate (Alsos et al., 2013; Carrasco, 2014; Dutta, et al., 2022; Laguir & Den Besten, 2016). Innovations are important not only for increasing income (or decreasing costs) by introducing new products and processes, but also as a framework for establishing cooperation networks, improving the competences of human resources, and for developing a continuous learning process (Alves et al., 2017).

Innovations are inseparable from the concept of entrepreneurship, which goes back to Schumpeter's understanding of an entrepreneur as an innovator or creative genius (Ballor & Claar, 2019; Belghiti-Mahut et al., 2016). There is evidence that innovations have a positive effect on small businesses' performance, and it is thought that these businesses are more innovative due to their flexibility and entrepreneurial orientation (Hausman, 2005; Le et al., 2023; Qiao et al., 2013; Vasconcelos & Oliveira, 2018). Nevertheless, although studies on innovations are multidisciplinary, the social sciences approach (business, management, or economic) does not dominate them at all (Alsos et al., 2013). Moreover, innovation studies are primarily focused on external factors and the features of the business itself as determinants of the innovation activity (Yu & Chen, 2016). Although important, these factors are not sufficient to explain the complex phenomenon of innovations. What is missing in the research is the innovations' actor, or, in other words, the innovator (Belghiti-Mahut et al., 2016).

In arguing that the innovation process and its outcomes cannot be understood if the actor who performs it is not the focus, we use the lens of upper echelons theory to capture the importance of the innovator. This theory suggests that personal characteristics, both demographic and psychological, of the firm's top executive(s) can explain a firm's decisions and outcomes (Hambrick & Mason, 1984). Because in most cases entrepreneurs are at the same owners and managers of their ventures, it can be assumed that the entrepreneurs' personal-level factors are important for the innovativeness of their businesses (Chen et al., 2015).

Moreover, because of the intensity of the personal engagement of the owner/manager, the innovativeness of a small business tends to be the innovativeness of its owner/manager rather than the innovativeness of the firm (Hausman, 2005). Nevertheless, the individual characteristics of the entrepreneurs are less explored as a determinant of business innovations (Laguir & Den Besten, 2016). In such a framework, the gender aspect is marginalised and under-studied while the literature on innovations is gender-blind (Belghiti-Mahut et al., 2016). Or, as Alsos et al. (2013, p. 237) put it: *"When people are invisible in the discourse, gender easily becomes invisible…which does not mean that gender is irrelevant"*.

Another important issue when studying innovations is their type. It is argued that product innovations are more readily adopted by small and medium sized enterprises (SMEs) than process innovations (Hausman, 2005). Consequently, most of the innovation studies on SMEs focus on product innovations (Goel & Nelson, 2018). These innovations are tangible and visible to market participants. They create new demand and markets or alter the existing ones. On the other hand, process innovations affect the operations' costs and are intangible by their very nature. As process innovations are also important for growth and competitiveness, the purpose of the present study is to explore the innovative practice of small businesses in a wider context, covering both product and process innovations. Moreover, our study covers both production and the service sector, thus overcoming the limitation of the majority of innovation studies, which are focused on the production sector.

The importance of this paper stems from the fact that there is an evident lack of gender perspective in innovation studies. In order to fill this research gap, this study answers the following research questions: Do women- and men-owned businesses differ in the intensity of innovation activities? Does the nature of the innovation gender gap differ by business sectors? The purpose of the study is to explore the intensity and the type of innovative practice of women- and men-owned businesses operating in different business sectors. More specifically, the characteristics and differences between women- and men-owned small businesses' innovativeness are examined by adopting wider operationalisation of innovation.

2. LITERATURE REVIEW

Exploring the determinants of business innovativeness is a prerequisite for defining strategies and policies which foster innovation. Various factors are found to determine the innovative potential of a firm (Vasconcelos & Oliveira, 2018). The relationship between personal or individual factors and business competitiveness is gaining importance in strategic and organisation theory (Felin et al., 2015). Nevertheless, the mainstream studies on innovation do not focus on the innovator (Nählinder et al., 2015). Within this *innovator perspective*, Foss and Henry (2016) show that a small number of scientific papers deal with the relationship between gender and innovation. They also conclude that the gender perspective in innovation studies lags behind gender mainstreaming in the entrepreneurship literature, where greater shifts are visible. Studies on gender and innovation have not been extensive and the majority of those which include gender do not focus on it but rather include gender as a control variable (Alsos et al., 2013). Moreover, the majority of studies exploring the gender effect on innovation are within technology, psychology, medicine, and nursing scientific fields. The role of gender in firms' innovation practice is not frequently studied in the social sciences. When they do exist, results on the gender effect on innovation are inconclusive (De Tienne & Chandler, 2007). For example, Mueller and Thomas (2000) argue that men have more pronounced innovation orientation. Similarly, Yu and Chen (2016) find that female entrepreneurs underperform their male counterparts when it comes to innovations. Differences in innovation practices in favour of men are also shown to exist by Ding et al. (2006) and Thursby and Thursby (2005). Quite differently, Akulava (2015) finds that women create and run more innovative businesses. And finally, the third stream of results suggest that gender is not important for innovation capacity (Kushnirovich & Heilbrunn, 2013). Thus, for example, Sonfield et al. (2001) show that there are no gender differences when it comes to the level of innovation and associated risk between ventures owned by men and women. A study focused on a female-dominated sector (the health care sector) reveals that there are no differences in the innovativeness of women and men (Nählinder et al., 2015). Similarly, Danilda and Thorslund (2006, cited in Alves et al., 2017) and Stošić Panić (2019) find no gender-based differences in choosing innovation strategies.

In order to capture the bigger picture of the relationship between gender and business innovation practice, it is important to research gender together with the

business sector. Within this framework, there are some arguments suggesting that men are found to be more innovative because the majority of the innovation studies focus on the male-dominated manufacturing sector (Nählinder et al., 2015). Although the relationship between business sector and innovative potential of a firm is found to exist, the results are not consistent. While certain authors argue that the manufacturing sector has higher innovative potential (Laguir & Den Besten, 2016), others find that this potential is more pronounced within service sector firms (Renko et al., 2012).

Another problem in studying the gender aspect of innovations is the fact that the concept of innovations and especially their operationalisations are gendered. The innovation constructs seem to be focused on technology and patents (Vasconcelos & Oliveira, 2018) and do not include innovations in service sectors or open innovation processes. Generally, innovations can be measured by objective measures, such as research and development (R&D) costs or number of patents, or by self-reported measures (Perani, 2021). The downside of R&D costs as a measure of innovation is the fact that not all innovative firms perform R&D activities, while most innovations are in fact novel ways of using the existing knowledge to satisfy a need (Nählinder et al., 2015). Because they reflect the ability to exploit knowledge and transform it into economic value, patents are often used as a measure of innovation process output (Busolt & Kugele, 2009). But patents are more a measure of inventions, rather than innovations (Nählinder et al., 2015), and, in addition to the existence of the new idea (invention), innovations imply its implementation and commercialisation (Bijedić et al., 2016; Kushnirovich & Heilbrunn, 2013). Moreover, patents are related to technology, a field in which women are underrepresented (Treanor, 2022; Wheadon & Duval-Couetil, 2018). Consequently, when innovations are measured by patent applications, empirical studies show that women are less innovative, as very small number of patent applications list women as inventors (Milli et al., 2016; Busolt & Kugele, 2009).

Although definitions of innovation are gender-neutral and often binary (including product/process, commercial/social, and incremental/radical innovations), empirical studies mainly focus on radical, commercial, and product innovations (Belghiti-Mahut et al., 2016). And all these innovations are more frequently implemented by men. Definitions of innovation are usually wider than

most of the commonly used operationalisations and the later ones are more gender biased. In other words, innovations are gendered constructs associated with masculinity (Alsos et al., 2013). They are primarily associated with technology and are captured by one-dimensional measures such as patents. When innovations are measured in this way, it is not a surprise to find that the technological intensity of a sector affects the innovativeness of the operating businesses (Yu & Chen, 2016). On the other hand, women-owned businesses are almost three times less likely to operate in the innovation-intensive or in medium and high-technology sectors (Greene & Brush, 2023; Love et al., 2023; McAdam, 2023). As a result, women are less visible as innovators. An illustrative example is the Oxford Handbook of Innovation, which mentions *women* four times and never as innovators (Nählinder et al., 2015).

Based on the literature review's findings, the following hypotheses are proposed:

H1. There are differences in innovativeness of women- and men-owned businesses and they are related to the types of innovations.

H2. The nature of the gender-based differences in the innovation practices changes when the business sector is included in the analysis.

3. METHODOLOGY

3.1. Data and sample

Secondary data available in the US Annual Survey of Entrepreneurs (United States Census Bureau, ASE) data sets are used for the analysis. The ASE offers estimates based on a sample of approximately 290,000 employer businesses. This data set provides data on the characteristics of businesses and owners and covers businesses filing Internal Revenue Service tax forms as individual proprietorships, partnerships, or any type of corporation, with receipts of $1,000 or more and with paid employees. Business establishments classified in the following North American Industry Classification System (NAICS) sectors are included: 11 (Forestry, fishing and hunting, and agricultural support services [NAICS 113–115]), 21 (Mining, quarrying, and oil and gas extraction), 22 (Utilities), 23 (Construction), 31–33 (Manufacturing), 42 (Wholesale trade), 44–45 (Retail trade), 48–49 (Transportation and warehousing), 51 (Information), 52

(Finance and insurance), 53 (Real estate and rental and leasing), 54 (Professional, scientific, and technical services), 55 (Management of companies and enterprises), 56 (Administrative and support and waste management and remediation services), 61 (Educational services), 62 (Health care and social assistance), 71 (Arts, entertainment, and recreation), 72 (Accommodation and food services) and 81 (Other services).[1] Ownership is defined as having 51 percent or more of the stock or equity in the business and is categorised by gender as women- owned businesses or men-owned businesses.

The gender structure of the sample shows that the majority of the businesses are owned by men (64.54% are owned by men, 20.46% are owned by women, while businesses equally women-men owned represent 15% of the sample) and operate in the service sector (73.65%). The dominance of the service sector is evident in both the group of women- owned businesses and men-owned businesses (81.23% and 71.25% of all women- and men-owned firms operate in the service sector, respectively). As for the internal gender structure of the production and service operating firms, the majority of all firms from both the production and service sector are owned by men, but this difference is more pronounced within the production sector (87.71% and 73.45%, respectively).

3.2. Variables

Our study explores the frequency of introducing product/service innovations and process improvements by women- and men-owned firms in the US. Since it is suggested that the literature on innovations is extensive but with a restrictive approach in understanding this concept (Belghiti-Mahut et al., 2016), both of the broad innovation categories are analysed in more detail, as is shown in Table 1. The ASE data set used for this study uses self-reported measures of innovations, meaning that the respondents are asked to choose between various forms of innovations with multiple choice options.

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[1] Businesses classified in the following NAICS industries are excluded: Crop and Animal Production (NAICS 111 and 112), Rail Transportation (NAICS 482), Postal Service (NAICS 491), Monetary Authorities–Central Bank (NAICS 521), Funds, Trusts, and Other Financial Vehicles (NAICS 525), Religious, Grantmaking, Civic, Professional, and Similar Organisations (NAICS 813), Private Households (NAICS 814), Public Administration (NAICS 92).

Table 1. Innovations variables

Product/service innovations	Process improvements
New good/service no other has offered before	New way of purchasing, accounting, computing, maintenance, inventory control, or other support activity
New good/service that observed firm has not offered before	Changed way of a good/service distribution
Improved good/service's performance by making changes in materials, software, or other	Upgraded technique, equipment or software to significantly improve a good/service
New use for a good/service	Increased automation, decreased energy consumption, use of a better software
Easier use of good/service	Improvement of materials, software, or other components
Good/service with new feature	Changed delivery method to be faster or more reliable

Source: Authors, based on the US Annual Survey of Entrepreneurs (ASE)

Because the ASE covers only data on the specific forms of innovations, the data (percentages) on product/service innovations and process improvements in general are obtained as averages of all types of innovations within product/service innovations and process improvements, respectively. Percentages in the column *All* (Table 2) are obtained as weighted means of female and male shares, where the weights are number of total reporting firms within each gender category.

Additionally, the effect of operating in the production or service sector on the frequency of introducing innovations by women- and men-owned businesses is explored. The production sector is defined by grouping the following NAICS sectors: 11 (Forestry, fishing and hunting, and agricultural support services [NAICS 113–115]), 21 (Mining, quarrying, and oil and gas extraction), 22 (Utilities), 23 (Construction) and 31–33 (Manufacturing). All remaining NAICS industries were considered to be the service sector. The frequency of introducing innovations is measured as a share of firms that introduce certain innovation types within a gender. These shares are for respondent firms only. According to the ASE methodology, 'respondent firms include all firms that responded to the

characteristic(s) tabulated in the dataset and reported gender, ethnicity, race, or veteran status or that were publicly held or not classifiable by gender, ethnicity, race, or veteran status'.

3.3. Methods

The use of a range of statistical methods is limited by the fact that the ASE data are already grouped. Therefore, in addition to descriptive statistics, the *z-score* test for two populations proportions is applied. The samples are large and independent, and the key assumption that the difference of two proportions is normally distributed is thus met. Some businesses have introduced more than one type of innovation. As the data within the used data set are already grouped, the information on the number of these kinds of businesses and the number and the exact type of innovations they have introduced is missing. This imposes another limitation on our analysis.

4. RESULTS

The results on the innovative practice of the US businesses presented in Table 2 show that, in general, women-owned businesses more often introduce product/service innovations (17.40% vs. 16.70%). This type of difference in favour of women exists both in the production (15.54% vs. 14.49%) and in the service sectors (17.61% vs. 17.39%). On the other hand, at the general level (irrespective of the business sector) men-owned businesses are more likely to pursue process improvements (19.38% vs. 19.04%). However, this kind of difference only exists in the service sector (20.26% vs. 19.29%), while it is in favour of women-owned businesses within the production sector (19.33% vs. 17.13%).

With regard to particular forms of innovations, when analysed in general, irrespective of the business sector, women-owned businesses are more innovative regarding all forms of product/service innovations, with the exception of introducing a new good/service no other has offered before. In other words, women-owned businesses more often introduce a new good/service which they have not offered before or a good/service with a new feature, they more frequently improve good/service's performances, and define a new or easier use of good/services. Unlike the product innovations, process innovations are less common for women-owned businesses, the exception being the improvements in

certain support business activities, such as purchasing, accounting, computing, maintenance, and inventory control. All other forms of process improvements and process improvements in general are more frequently introduced by men-owned businesses.

As was expected, the introduction of the business sector into the analysis changes the nature of some of the existing gender differences. Our results show that in the production sector there are no gender differences in the frequency of introducing new goods that no other has offered before (while at the general level this difference is in favour of men-owned businesses). Moreover, women and men equally often define a new or easier use of goods in the production sector and a new use or improved service's performance in the service sector, while all the above differences are in favour of women-owned business at a general level. The specific business sector does not change the existence or the direction of gender differences in other aspects of product/service innovations.

The pattern of gender differences in process improvements in the service sector is the same as the one existing in general (regardless of the business sector), that is to say: with the exception of changing the way of performing supporting activities, women-owned businesses are less innovative in all other aspects of process improvement. The production sector changes the picture of these gender differences. Quite contrary to the situation in the service sector, or in general for that matter, women-owned businesses operating in the production sector are more innovative regarding all forms of process improvements. Not only do women-owned businesses more frequently introduce new ways of doing various support activities, but they also more frequently change the way they distribute and deliver, upgrade manufacturing techniques, equipment, or software, improve materials, increase automation, and decrease energy consumption.

Table 2. Frequency of introducing innovations, by innovation output type, gender, and business sector (%)

Product innovations

Type of product innovations	Gender			Business sector					
				Manufacturing			Services		
	Female	Male	All	Female	Male	All	Female	Male	All
New good/service no other has offered before	4.87**	5.09	5.04	5.00	4.92	4.93	4.78**	5.14	5.05
New good/service that observed firm has not offered before	15.98**	14.65	14.96	15.39**	13.18	13.46	15.96**	15.22	15.41
Improved good/service's performance by making changes in materials, software, or other	26.90*	26.78	26.81	28.15**	27.33	27.43	26.81	26.87	26.85
New use for a good/service	9.19*	9.09	9.11	8.11	8.16	8.16	9.31	9.32	9.32
Easier use of good/service	27.45**	26.05	26.39	20.41	20.49	20.48	28.56**	27.93	28.09
Good/service with new feature	20.03**	18.99	19.23	16.18**	15.87	15.91	20.26**	19.84	19.95
Product/service innovations, in general	17.40**	16.70	16.92	15.54**	14.49	15.05	17.61**	17.39	17.45

Process improvements

Type of process improvements	Gender			Business sector					
				Manufacturing			Services		
	Female	Male	All	Female	Male	All	Female	Male	All
New way of purchasing, accounting, computing, maintenance, inventory control, or other support activity	20.89**	19.45	19.79	21.54**	18.26	18.67	20.86**	19.81	20.09
Changed way of good/service distribution	15.35**	15.91	15.77	15.27**	13.65	13.85	15.01**	16.40	16.03
Upgraded technique, equipment or software to significantly improve a good/service	33.76*	33.96	33.91	32.20**	27.23	27.85	34.74**	35.88	35.58
Increased automation, decreased energy consumption, use of a better software	19.55*	20.13	19.99	18.52**	17.93	18.01	20.38**	21.70	21.35
Improvement of materials, software, or other components	12.30**	13.82	13.46	17.33**	15.35	15.59	11.93**	13.61	13.17
Changed delivery method to be faster or more reliable	12.41**	13.03	12.89	11.10**	10.37	10.46	12.83**	14.16	13.81
Process improvements, in general	19.04**	19.38	19.30	19.33**	17.13	17.40	19.29**	20.26	20.00

*p<0.05; **p<0.001
Source: Authors, based on ASE data

5. DISCUSSION

Our results confirm both hypotheses. Women- and men-owned businesses differ in terms of innovativeness and the nature of these differences is related to the type of the innovation and the business sector in which they operate. Women-owned businesses are more likely to introduce product/service innovations, both generally and by sector (production and service). These results are similar to those reported by Akulava (2015), who analyses a data set covering 5,254 SMEs from 30 European and East Asian countries and finds that women-owned firms are more likely to introduce a new product or service. A gender difference in the level and the dynamism of innovativeness measured by changes in the product/service portfolio and sales/promotional strategies in favour of women is also reported by Jensen (2014), Serviere-Munoz and Saran (2012), and Runyan et al. (2006).

On the other hand, women-owned businesses are found to be less innovative in terms of process improvements. This applies to businesses in general (regardless of the sector in which they operate) and for the businesses in the service sector. The results are in line with those presented by Tonoyan and Strohmeyer (2006), who find that the female-male innovation gap is the widest when it comes to process innovations, because men-owned small businesses are almost twice as likely to innovate their processes as their female counterparts. Similarly, Huysentruty (2014) reports that although both female and male entrepreneurs invest similar sums in product/service innovations, female entrepreneurs invest less in process innovations. Technological aspects dominate the structure of the process improvement variable used in the present study (upgraded technique, equipment, software, automation, energy consumption, materials, distribution). If women are less likely to carry out technology-based innovations (Bijedić et al., 2016), then it is not surprising to find that they are less prone to process improvements when these improvements are defined in a technological sense.

However, our results suggest that women-owned businesses are more likely to introduce process improvements in the production sector. This result is not expected but it is very interesting. One can argue that the very fact that women-owned businesses operate in a men-dominated production sector is itself innovative (Blake & Hanson, 2005). Therefore, if these women own businesses in a gender-atypical sector, it is fair to say that they are prone to nonconformist

behaviour. This behaviour can also be a driver of their innovativeness because the innovations are 'doing things differently' (Bijedić et al., 2016, p. 52). Huysentruty (2014) finds that women more often list competitive pressure as a reason for introducing innovations. Therefore, it is possible that women feel competitive pressure to innovate in order to 'overcome their illegitimate status' (Blake & Hanson, 2005, p. 693) and to be successful in a male-dominated sector.

Taken all together, what the present study shows is that there is no simple answer to the question of which businesses are more innovative, those owned by women or those owned by men. The results are mixed and sometimes they reveal surprising facts. The existence and the nature of the female-male innovation gap vary depending on the operationalisation of the innovation variable as well as on the business sector involved. In some cases, the results obtained when product/service and process innovations variables are decomposed are different from those at the aggregate variable level (product/service innovations and process improvements in general). Thus, for example, contrary to the results for the aggregate product/service innovations variable, women-owned businesses are less likely to introduce product/service innovations when they are defined more specifically, such as introducing new products/services that no one has previously offered (independent of the business sector and in the service sector). Unlike the results for the process improvements aggregate variable, women-owned businesses are more likely to improve supporting business activities processes (independent of the business sector and in the service sector). In other cases, when variables are decomposed, gender differences in the frequency of innovations were not found. For example, in the production sector, women- and men-owned businesses equally often introduce new products that no one has offered before and define a new or easier use of products. In the service sector, these businesses are equally innovative when innovations are measured by improving service performance or introducing a new use for a service.

6. CONCLUSIONS

Although the literature on innovations is extensive, the innovator is rarely studied. Consequently, most innovation studies have failed to explore the relationship between gender and innovations. On the other hand, many of the innovation studies that do exist are based on individual case studies rather than on large samples (Ficulescu, 2016; Sullivan & Meek, 2012). Another important

feature of innovation studies is that when the innovations are considered and examined, they are predominantly understood as technological innovations in the manufacturing sector (Blake & Hanson, 2005). The concept of innovations is usually related to economic activities that are mainly technology-based, while other activities are omitted. At the same time, the former are in the sectors in which men dominate, either as employees or as employers. Therefore, technological innovations are the focus of both theory and support policies. In this context, this paper has at least four important contributions.

First, by including the gender perspective, this paper contributes to theory enrichment. Gender is a personal characteristic of the innovator, and the inclusion of this variable contributes to better understanding of not only the under-researched profile of the innovator, but the innovation itself (Belghiti-Mahut et al., 2016). Second, by decomposing the aggregate variables of product/service and process innovations, our paper extends the innovation framework to include now marginalised forms of innovations, such as incremental and process innovations (Belghiti-Mahut et al., 2016; Carrasco, 2014). Third, the present study is based on data on 23 NAICS sectors which are grouped in two broad categories (production and service). Consequently, our study covers a wide range of industries which are usually neglected in innovation studies, thus providing a comprehensive insight into the innovative behaviour of small businesses. Finally, our paper presents results which show that women-owned enterprises are more innovative in terms of product/service innovations, but less likely to improve their business processes. However, the direction of this women-male innovation gap varies depending on the specific form of product/service and process innovations, and on the sector in which businesses operate. Hence, any conclusion about the gap in innovativeness of women- and men-owned businesses should be made with caution, since the results are largely determined by the way in which innovations are operationalised and by the business sector examined.

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*Rotimi Ayoade Ogunjumo**

INVESTIGATING THE EFFECT OF AN UNDERDEVELOPED FINANCIAL SECTOR ON NON-OIL EXPORT IN NIGERIA

ABSTRACT: *Several policies have been implemented in Nigeria to shift the export trade from oil to non-oil goods; yet the share of non-oil export in total exports remains very small compared to oil export, which may be due to the low level of financial sector development in the country. Unlike previous studies on Nigeria that focused exclusively on financial sector development and aggregate export (combined exports of oil and non-oil goods), this study concentrates on financial sector development and non-oil export using an autoregressive distributed lag technique, the dynamic ordinary least squares technique, and the non-linear autoregressive distributed lag technique over the period 1986–2020. The empirical results showed that the relationship between financial sector development and non-oil export is linear. Results also showed that, in the short term, the country's level of financial sector development worsens exports of non-oil products. However, in the long term, there is no connection between non-oil export and financial sector development, which challenges the theoretical view that trade and financial sector development are linked at any given time period. The study recommends that the government and policymakers in Nigeria should make sure that the financial sector is sufficiently developed, otherwise the goal to diversify the export base may not be achieved.*

KEY WORDS: *Financial sector development, non-oil export, ARDL, DOLS, NARDL, Nigeria*

JEL CLASSIFICATION: F12, G20, 016

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1. INTRODUCTION

Ever since Nigeria gained independence, the proportion of non-oil export in the country's overall exports has steadily decreased and its export base has been dominated by crude oil. For instance, non-oil export, which accounted for about 98 percent of all exported goods in 1960, declined to about 12 per cent in 2020 (Central Bank of Nigeria [CBN], 2021). More particularly, the growth of non-oil export was sluggish throughout the reference period. On average, for instance, it accounted for about 0.4 per cent between 1986 and 2020 (CBN, 2021). Nevertheless, due to persistent oil price shocks, which worsen oil revenue, and the enormous and mostly unexploited employment potentials in the non-oil export sector which could hasten economic growth and decrease the escalating level of poverty in the country, diversifying the export base from oil to non-oil export has been a priority for the government and policymakers. However, this goal has yet to be realised despite several policy efforts.

Although several factors may have combined to explain this development, the poor performance of the country's financial sector could be a major contributor. Available evidence shows that even though the financial sector development index in Nigeria is increasing, it is shallow and seems underdeveloped (see International Monetary Fund [IMF], 2022). For instance, while Nigeria's index of financial sector development rose to 0.22 in 2020 from 0.19 in 1986, South Africa and Malaysia saw increases from 0.32 and 0.31to 0.62 and 0.73, respectively, between 1986 and 2020 (IMF, 2022). It has been emphasised (see Caglayan et al., 2013; IMF, 2009) that the amount of credit that will be provided by an underdeveloped financial sector might be less significant and insufficient to facilitate trade and, hence, may function as a trade barrier to exporting firms that rely on external funding.

Furthermore, even though it has been theoretically acknowledged (see Dornbusch et al., 1977; Heckscher et al., 1991) that the endowments of physical capital, labour, land, and technology are the necessary and sufficient conditions for the attainment of a desired trade volume, the stability and proper development of the financial sector is absolutely important to the restoration of growth in the non-oil export sector and, indeed, the overall economy (see Beck, 2002). In his path-breaking theory, Beck (2002) argued that nations with lower

levels of financial sector development will always experience lower export shares of manufactured goods in total merchandise exports.

With this understanding, the purpose of this study is to examine the effect of Nigeria's financial sector development on non-oil export. Although there have been some attempts (see, for instance, Adeboje et al., 2021) to present a clear understanding of how the country's financial sector development has impacted merchandise export, these studies, nevertheless have some significant weaknesses. For one, they relied on aggregate merchandise export, that is, the combination of oil and non-oil exports, which does not show the relationship between financial sector development and non-oil export, despite the nation's efforts to grow non-oil export in the face of an underdeveloped financial sector. Furthermore, the private sector credit-to-GDP ratio — which measured financial depth — was employed in these previous studies to capture financial sector development. Unfortunately, available evidence suggests that it is, in fact, financial efficiency, access and, depth that are the characteristics of financial sector development. Thus, the private sector credit-to-GDP ratio may not reflect the multidimensional nature of financial sector development (see IMF, 2022). Therefore, by examining the proportion of private sector credit to GDP, it may not be possible to properly understand how developed the country's financial sector is. Worse still, while previous studies (see Raifu & Folarin, 2020; Bank-Ola, 2022; Adeboje et al., 2021) assumed a linear relationship between financial sector development and total merchandise export, evidence (Sare et al., 2019; Kurul, 2021; Xinzhong et al., 2022) suggests that there could be a potential non-linear relationship as financial sector development indicators may generate breakpoints that could trigger nonlinearity.

Thus, the significant ways that our study adds to the literature are as follows: First, unlike previous studies in which aggregate export was the main focus, this study examines disaggregated export. In particular, it examines how financial sector development has impacted non-oil export over the last few decades in Nigeria. Second, while previous studies use the private sector credit-to-GDP ratio as an indicator of financial sector development, this study employs a robust financial sector development index that accounts for the multidimensional nature of financial sector development - in terms of efficiency, access and depth. Third, whereas previous studies on Nigeria assumed a linear relationship, our study

investigates the possibility of a non-linear relationship between financial sector development and non-oil export.

Our short-term finding supports Beck's theoretical claim. In particular, in the short-term, we specifically found that the financial sector in Nigeria is not yet sufficiently developed to support exports of non-oil products. Surprisingly, the link between non-oil export and financial sector development is insignificant in the long –term, which challenges the theoretical view that financial sector development and trade are significantly linked at any given time period. The results are robust to different estimation techniques. Four sections make up the remaining discuss. In Section 2, the body of literature is evaluated. The theoretical framework, model, and data as well as methodology employed are reported in Section 3. The empirical findings are presented in Section 4, with the conclusion in Section 5.

2. A REVIEW OF THEORETICAL AND EMPIRICAL LITERATURE

2.1. Theoretical Literature

Theoretical models on trade flows between and among nations abound in the trade literature. In the Ricardian and Heckscher-Ohlin trade models, for instance, trade is predicted in terms of a nation's levels of technology, physical capital, land and labour (see Gandolfo, 1986; Ricci, 1997). However, on the basis of the ground-breaking trade model of Kletzer and Bardhan (1987), Beck (2002) realised that the differences in nations' levels of financial sector development could predict trade flow. Concentrating on the Kletzer and Bardhan (1987) theoretical model, Beck (2002) noticed that the manufacturing sector, unlike the agricultural sector, depends more on external financial assistance and, consequently, nations with a more-developed financial sector would always have a greater export share in manufactured products. In line with Beck (2002), Berthou (2010) and Xinzhong (2022) established theoretically that when there is an increase in the level of financial sector development, firms begin to export, particularly firms that depend more on external funding.

2.2. Empirical Literature

Several empirical studies have linked financial sector development and trade. For instance, Caporale et al. (2022) established that, in six European economies, both

the volume and the variety of trade are connected to long-term expansion of the financial sector, although the relationship is more obvious in the industrial sector than in the trade of agricultural goods. Adeboje et al. (2021) also found that the expansion of the financial sector and Nigeria's entire export are linked. The authors established that overall merchandise exports are considerably and favourably affected by an expansion of the financial sector, which is in line with the findings of Raifu and Folarin (2020). However, focusing on a group of 64 nations, Kurul (2021) noticed that too much expansion of the financial sector worsens trade. For instance, the author confirmed that as financial services improve, trade openness and exports rise to a point beyond which further financial sector expansion causes trade openness and exports to fall. Surprisingly, Babatunde and Fowowe (2010) found no connection between levels of expansion of financial sectors in sub-Saharan African economies and the overall volume of their trade, whereas Sare et al. (2019) discovered little impact of financial sector expansion on overseas trade in 46 African economies. However, Bilas et al. (2017) claimed that while the expansion of Croatia's financial industry had a positive and significant short-term effect on trade flows, the long-term effects are negative and severe. Focusing on South-North and South-South trade, Demir and Dahi (2011) revealed that financial sector expansion in the South promote trade within South-South economies but its role in trade is minimal in the South-North nations, which supports the findings of Kim et al. (2010), who documented minimal impact of financial sector expansion on trade openness in 87 OECD and non-OECD economies.

On the other hand, Cezar (2014) found mixed effects of financial sector development on trade in manufactured goods from 80 nations across the globe. More specifically, his study showed that firms in the manufacturing sector that rely more on external funding export larger quantities from nations with developed financial sectors. At the same time, financial sector development decreases trade for firms with low levels of financial dependence. Jaud et al. (2015) also found that financial sector development supports the long-term export of agricultural products with high export-related financial requirements in Tanzania, Senegal, Malawi, Mali, and Ghana. However, the findings of Nguyen and Su (2021) on 48 high- income countries, 31 upper-middle-income countries, and 49 low-middle-income countries showed a feedback effect between a multidimensional financial development index and export quality. Moreover, the

results revealed a positive and significant effect of the multidimensional financial development index on export quality at all income levels. Nieminen (2020) measured the impact of multidimensional financial sector development on exporting firms' behaviour and export trade diversification using firm-level export data from more than 60 nations. He showed that there is disparity in the structure of export in the nations included in the study and, specifically, provided evidence that the disparities are connected to a cross-country difference in the level of financial sector development as well as the composition of financial sector development. Furthermore, his results revealed that access to financial services significantly promote export diversification. Contrarily, Kasseeah et al. (2013) examined the link between access to finance and trade in Mauritius but found an insignificant link between the two variables.

In addition, Kumarasamy and Singh (2018) verified how financial sector development and financial access influence firms' capacity in Asia–Pacific nations to go into the export business. Their study revealed that access to finance is critical in improving firms' capacity to export. Their findings also showed that the development of the financial sector encourages firms to participate in foreign trade. Jiang et al. (2020) investigated the effect of financial sector development on foreign trade in services in Asian, South and Central American and African economies. They found that financial sector development exerts a positive and significant effect on trade in services in Central and South America. However, the effect is insignificant in Asia and Africa. Jaud et al. (2018) looked at how financial vulnerability affects export dynamics in 34 developing nations in the regions Europe and Central Asia, East Asia and the Pacific, the Middle East and North Africa, sub-Saharan Africa, and South Asia, and found that financial crises decrease firms' goods and destination entry rates. In addition, financial crises raise exit rates excessively more in financially vulnerable firms. Minetti et al. (2021) verified the effects of financial composition and regulation on export dynamics using data from 39 nations around the world, finding that while market-oriented systems do not increase the number of exporters, bank-oriented financial systems play a significant role in boosting their number. On the other hand, they found that in lower income nations where bank regulations are lax, banks have a propensity to slow down exporters' exit and entry.

3. THEORETICAL FRAMEWORK, MODEL, DATA, AND METHODOLOGY

3.1. Theoretical Framework

This study is anchored on the theoretical model of Beck (2002). Beck (2002) is the first to link foreign trade and financial sector development by extending the theoretical model of Kletzer and Bardhan (1987) which is rooted in the Heckscher-Ohlin trade model. According to Beck's (2002) theoretical model, a nation's level of finance sector development could help determine the level of physical capital in the Heckscher-Ohlin trade model. Inspired by Beck (2002), Berthou (2010) and Xinzhong (2022) further stressed the role of finance sector development in trade flow. Beck (2002) notes that a highly developed financial sector is a key to promoting trade but emphasises that exporting firms of goods (manufactured) with increasing returns in capital gain more from a well-developed financial sector than exporting firms of goods (agricultural and natural resources) with increasing returns in land and labour. The model also indicates that manufacturing firms depend more on external funding, unlike the producers of other products, which could facilitate scale economies in the manufacturing sector, thereby resulting in large-scale production and the export of manufactured goods in overall production in nations with a well-developed financial sector.

3.2. Model and Data

We specify a trade model that links non-oil export and financial sector development as specified in Beck (2002)

$$NO_t = \alpha_0 + \zeta FSD_t + \vartheta CV + \mu_t \tag{1}$$

where *NO* is non-oil export, *FSD* is financial sector development, *CV* represents a variety of control variables, and μ_t is the error term. The control variables, as established in the literature, are the real exchange rate (*RER*), foreign direct investment (*FDI*), real per capita GDP (*RPCGDP*), and the world financial crisis dummy (*GFC*). *FDI* is included to account for the impact of multinational oil companies on non-oil exports since a larger amount of FDI that flows into the country goes to the oil sector. It is anticipated that an increase in FDI inflows will negatively affect non-oil export since FDI inflows promote oil exploration and exportation, which intensify the Dutch disease and the neglect of the non-oil

sector. In theory, depreciation of a currency should increase export trade and vice versa. The link between income and non-oil exports is taken into consideration by means of real per capita GDP. It is thought that exports of non-oil goods should rise with increased per capita income. The consequences of the 2007-2008 financial crisis, which are expected to have a detrimental influence on non–oil export as the crisis may reduce a nation's export capabilities by worsening the performance of its financial sector, are simulated using a global financial crisis dummy.

Except for the global financial crisis dummy, all the variables were represented by natural logarithms. Annual data covering the period 1986—2020 were utilised in the study. The timeline was carefully chosen to fall within the time when international trade and the financial sector were both liberalised. With the exception of the hypothetical worldwide financial crisis, all data utilised in the study were extracted from the CBN Statistical Bulletin (CBN, 2021), the IMF's online database (IMF, 2022) and the WDI's online database (World Bank, 2022). Real non-oil export values are used to calculate exports of non-oil commodities. The nominal exports of non-oil goods data from the CBN Statistical Bulletin, measured in millions of domestic currency, were deflated by the CPI to obtain the real quantities. The WDI online database was used to extract the consumer price index data. This measurement of non-oil export was inspired by Akinlo and Adejumo (2014).

Unlike previous studies, we used a robust financial sector development index that simultaneously covers the depth or size, accessibility, and efficiency of financial sector development. Financial crisis is taken as 1 to reveal the existence of the global financial crisis that occurred from 2007 until 2008. However, we take other periods without financial crisis as 0. It is in this way that we have measured the global financial crisis, which we called the dummy. The real exchange rate (*RER*) was measured using the real effective exchange rate. Foreign direct investment (*FDI*) was captured by net FDI inflows as a percentage of GDP. GDP per capita in constant local currency, drawn from the WDI, is our measure of real per capita GDP (see Table 1 for a comprehensive measurement and sources of data).

Table 1. Measurement and Sources of Data

Variables	Measurement	Source(s) of Data
Real non-oil exports (*NO*)	Nominal non-oil exports values expressed in millions of Naira deflated by Nigeria's CPI	CBN, WDI
Financial sector development index (*FSD*)	Index in terms of depth including liquidity and size, access, and efficiency including the ability of financial institutions and markets to provide financial services at low cost	IFS
Real exchange rate (*RER*)	Real effective exchange rate	IFS
Foreign direct investment (*FDI*)	Net FDI inflows as a percentage of GDP	WDI
Per capita GDP (*RPCGDP*)	GDP per capita (constant local currency)	WDI
Global financial crisis dummy (*DUMGFC*)	We set financial crisis to 1 for the period of the global financial crisis between 2007 and 2008, and 0 otherwise	Author's computation

Note: CPI and GDP signify the consumer price index and the gross domestic product, respectively

3.3. Methodology

The estimation method is the autoregressive distributed lag (ARDL) technique (see Pesaran & Shin, 1995). This method is relevant to this work because it can help to estimate the short-term and long-term effects of financial sector development on non-oil export. Furthermore, it deals with the problem of mixed stationarity (I(0) and I(1) in particular) inherent in macroeconomic variables. It also corrects endogeneity and serial correlation issues in economic modelling (see Pesaran & Shin, 1995). Thus, Equation (1) is re-written in the ARDL form

$$\Delta NO_t = \alpha + \varphi_1 NO_{t-1} + \varphi_2 FSD_{t-1} + \varphi_3 RER_{t-1} + \varphi_4 FDI_{t-1} + \varphi_5 RPCGDP_{t-1}$$

$$+ \varphi_6 DUMGFC_{t-1} + \sum_{i=1}^{p} \beta_i \Delta NO_{t-i} + \sum_{i=0}^{p} \phi_i \Delta FSD_{t-i} + \sum_{i=0}^{p} \psi_i \Delta RER_{t-i}$$

$$+ \sum_{i=0}^{p} \wp_i \Delta FDI_{t-i} + \sum_{i=0}^{p} \varepsilon_i \Delta RPCGDP_{t-i} \qquad (2)$$

$$+ \sum_{i=0}^{p} \gamma_i \Delta DUMGFC_{t-i} + \mu_t$$

where the primary difference operator is provided as $\triangle$, long-term coefficients are given as $\varphi_i (i = 1 - 6)$, and coefficients in the short -term are $\beta, \phi, \psi, \wp, \varepsilon, \gamma$. Inspired by Vuong et al. (2019), the lag lengths are optimally selected using the smallest lag length from the SIC and AIC. To verify whether the variables in the study move together in the long-term, an F-test was conducted for the lagged level coefficients in Equation (2). In this regard, the null hypothesis, H$_o$: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = \varphi_6 = 0$ was tested vis-à-vis the null hypothesis's alternative, H$_1$: $\varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq \varphi_6 \neq 0$. Pesaran et al. (2001) bounds critical values (lower and upper) of an identified significance point are employed as decision criteria.

Our study also used the dynamic ordinary least squares (DOLS) method to estimate Equation (1) in order to check the robustness of the long-term ARDL coefficients. This method also deals with mixed stationarity, serial correlation, endogeneity, simultaneity, and small sample size issues (see Stock & Watson, 1993). Furthermore, since one of the objectives of this study is to verify the possibility of a non-linear relationship between financial sector development and non-oil export, an extended version of the ARDL, known as non-linear ARDL or NARDL (see Shin et al., 2014), which was designed to estimate a non-linear relationship between variables, was considered. Following Shin et al. (2014), Equation (2) is reformulated to reflect nonlinearity as specified in Shin et al. (2014). Hence,

$$\Delta NO_t = \alpha + \varphi_1 NO_{t-1} + \varphi_2 FSD_{t-1}^{+} + \varphi_3 FSD_{t-1}^{-} + \varphi_4 RER_{t-1} + \varphi_5 FDI_{t-1} + \varphi_6 RPCGDP_{t-1}$$

$$+ \varphi_7 DUMGFC_{t-1} + \sum_{i=1}^{p} \beta_i \Delta NO_{t-i} + \sum_{i=0}^{p} \phi_i \Delta FSD_{t-i} + \sum_{i=0}^{p} \psi_i \Delta RER_{t-i}$$

$$+ \sum_{i=0}^{p} \wp_i \Delta FSD_{t-i}^{+} + \sum_{i=0}^{p} \omega_i \Delta FSD_{t-i}^{-} \sum_{i=0}^{p} \varepsilon_i \Delta RPCGDP_{t-i}$$

$$+ \sum_{i=0}^{p} \gamma_i \Delta DUMGFC_{t-i} + \mu_t$$

(3)

In addition, we tested the stationarity properties of the variables to ensure the suitability of the techniques employed. The augmented Dickey-Fuller (ADF) unit root test was used to confirm the stationarity properties. However, the ADF model to test a unit root is of three types: the ADF model with a trend and a constant, the ADF model with a constant, and the ADF model without a trend and without a constant (see Wolters & Hassler, 2006). For this reason, we study applied the strategy found in Dolado et al. (1990) to choose the appropriate ADF model. For instance, when running the test on a variable, it is required that the significance of the trend is determined and if found to be significant, the ADF model with a trend and a constant is appropriate. If the trend is found not to be significant, the ADF model with a trend and a constant is not appropriate and the significance of the constant is checked. If the constant is found to be significant, the ADF model with the constant is employed; otherwise, it is discarded and the ADF model without a trend and without a constant is considered appropriate. We also employed the Phillips-Perron (PP) unit root test as a robustness check, since the ADF test could miss a substantial discontinuity in a series' development, if one exists, and thus might fail to sufficiently reject the null hypothesis of a unit root (see Phillips & Perron, 1988). The results of the ADF unit root test are shown in Table 2 (panel A). The results indicated that the variable *NO* is stationary after first difference, thus an I(1) variable. *FSD, RER, FDI, RPCGDP*, and *DUMGFC* are all stationary in their original values and, thus, they are I(0) variables. Surprisingly, the PP unit root test results, presented in Table 2 (panel B), are similar to those of the ADF test, except for the *RPCGDP* variable, which is now stationary after first difference. Therefore, due to the fact that the variables are either I(0) or I(1), the ARDL, DOLS, and NARDL are appropriate techniques for the study.

Table 2. Panel A: Results of ADF Unit Root Test

Variable	Constant	Trend and Constant	No Trend and No Constant	Remark
NO	-7.16***	-7.09***	-	I(1)
FSD	-	-3.64**	-	I(0)
RER	-3.47***	-3.66**	-	I(0)
FDI	-	-4.01***	-	I(0)
RPCGDP	-	-3.31*	-	I(0)
DUMGFC	-	-	-3.31***	I(0)

Note. ADF represents augmented Dickey-Fuller. *=10%, **=5%, ***=1% significance levels
Source: Authors' computations, 2023 via Eviews

Table 2. Panel B: Results of PP Unit Root Test

Variable	Constant	Trend and Constant	No Trend and No Constant	Remark
NO	-7.79***	-8.54***	-	I(1)
FSD	-	-3.33*	-	I(0)
RER	-3.68***	-3.75**	-	I(0)
FDI	-	-3.99***	-	I(0)
RPCGDP	-	-3.20***	-	I(1)
DUMGFC	-	-	-3.20***	I(0)

Note. PP represents Phillips-Perron. *=10%, **=5%, ***=1% significance levels
Source: Authors' computations, 2023 via Eviews

4. EMPIRICAL ANALYSIS AND DISCUSSION OF RESULTS

We carefully examined the descriptive statistics of variables before performing the model estimation. The characteristics of sample statistics, such as the standard deviation, mean, and median, are detailed in Panel A, Table 3. The close proximity of the median and mean of the variables makes it clear that data are consistent and also, show evidence of a normal distribution. Additionally, the standard deviations of the variables are relatively small, which suggests that the data do not diverge drastically from their mean values. To further determine whether the independent variables are related or not, we use the correlation matrix. Panel B, Table 3 demonstrates unequivocally that none of the factors

affecting non-oil export included in the model are strongly connected, as correlation coefficients are less than 0.5. As a result, the models are free of the multicollinearity issue. Although, there are pairs with higher coefficients, 0.67 and 0.83, these are between the dependent variable and two of the explanatory variables (*FSD* and *RPCGDP*).

Table 3. Descriptive Statistics and Correlation Matrix

	NO	*FSD*	*RER*	*FDI*	*RPCGDP*	*DUMGFC*
Panel A						
Mean	7.76	-1.69	4.61	0.25	12.49	0.05
Median	7.64	-1.68	4.60	0.37	12.44	0.00
Maximum	9.39	-1.30	5.60	1.75	12.86	1.00
Minimum	6.30	-2.10	3.90	-1.63	12.20	0.00
Std. Dev.	0.86	0.19	0.40	0.73	0.24	0.23
Panel B						
NO	1					
FSD	0.67	1				
RER	-0.03	0.11	1			
FDI	-0.24	-0.30	-0.41	1		
RPCGDP	0.83	0.36	-0.10	-0.25	1	
DUMGFC	0.12	0.49	-0.07	0.12	0.10	1

Source: Authors' computations, 2023 via Eviews

Now, it is critical to determine a specific lag time for the ARDL model and its extension (NARDL) to avoid spurious regression. From Table 4, SIC has the smallest lag, making it suitable for the ARDL model and its extension. Thus, lag length 1 was considered for this study.

Table 4. Lag Length Findings

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-45.85	NA	1.65e-05	3.17	3.40	3.25
1	48.20	152.83*	2.26e-07*	-1.13	0.23*	-0.68*
2	70.68	29.51	2.99e-07	-0.98	1.53	-0.14
3	102.09	31.40	2.83e-07	-1.38*	2.28	-0.16

Note. *=lag length, selected by criterion
Source: Authors' computations, 2023 via Eviews

Next, we check for co-integration between non-oil export and its explanatory variables using the bounds test. As shown in Table 5 (Panel A), the computed F-statistic emanating from the bounds tests for the ARDL and NARDL models are evidently bigger than the upper limit found in Pesaran et al. (2001), which was reported in Panel B of Table 5. As a result, the explanatory and dependent variables have enduring ties. Both models disprove the null hypotheses of Equations (2) and (3) in this way.

Table 5. Panel A: Results of Bounds Tests

Model	**K**	**Calculated F-statistic**	**Interpretation**
ARDL**	4	5.03	reject H_0
N ARDL*	4	3.60	reject H_0

Note. *=10%, **=5%, ***=1% significance levels

Source: Authors' computations, 2023 via Eviews

Table 5. Panel B: F-Table

K	**10%**	**5%**	**1%**
4	I(0) I(1)	I(0) I(1)	I(0) I(1)
	2.45 3.52	2.86 4.01	3.74 5.06

Source: Pesaran et al. (2001)

We then examine the effect of financial sector development on non-oil export in Nigeria over the last few decades. We used the ARDL technique and checked the robustness of the findings via DOLS and NARDL methods. The results of the estimated ARDL are presented in Table 6, while those of the DOLS and NARDL are presented in Table 7 and 8. From Table 6, it is evident that financial sector development has a negative and significant effect on non-oil export in the short -term. This finding differs from the result of Babatunde and Fowowe (2010), who discovered no connection between financial sector development in sub-Saharan African nations (including Nigeria) and the region's total exported goods. This finding also contradicts the result of Kasseeah et al. (2013) that access to finance and trade in Mauritius are unrelated. Furthermore, the findings of our study are contrary those of Raifu and Folarin (2020) and Adeboje et al. (2021), who found that the expansion of the financial sector had a favourable and considerable short-run impact on the total volume of goods exported from Nigeria. However, our

findings indicate that, in the short -term, the country's financial sector, in terms of its development, is not at a level that could support non-oil export. Therefore, to promote Nigeria's non-oil export, it is advisable that the government execute policies that would quickly improve the financial sector through increased mobilisation of savings, adequate access to finance, and ensure that financial institutions and markets provide financial services at low cost so that domestic credit depth, access, and efficiency are increased.

The results in Table 6 throw -up more interesting facts. They demonstrate, for instance, that the real exchange rate does not have a major impact on non-oil export in the short-term. This suggests that non-oil export has not been competitive internationally as real exchange rate appreciates. This finding diverges from Ikpe et al. (2020), who observed that the exchange rate significantly depressed Nigeria's non-oil export in the short-term. However, the result is consistent with Raifu and Folarin (2020) and Adeboje et al. (2021) who found that real exchange rate in Nigeria had little short-term effect on aggregate merchandise exports. Table 6 also shows that there is a significant negative impact of foreign direct investment on non-oil export in the short -term. In particular, the result indicates that an increase in foreign direct investment inflow leads to a decrease in non-oil export. This finding might not be unconnected with the huge share of oil foreign direct investment in total foreign direct investment inflow, which promotes oil exploration and exportation and intensifies the Dutch disease and the neglect of the non-oil sector. This result is not in line with Paudel and Alharth (2021), who determined that an increase in foreign direct investment inflows in Nepal has no link with export performance. Real per capita GDP has a favourable short-term impact that is substantial. The same was also stated for sub-Saharan African countries by Babatunde and Fowowe (2010), but this result diverges from Paudel and Alharth (2021), who established an insignificant link between per capita GDP and export performance in Nepal. Surprisingly, financial crisis appears to have a significant and favourable short-term impact on non-oil export. This might be due to devaluation (depreciation) of the nation's currency during financial crisis which makes exports more competitive internationally. This observation is supported by Ma and Cheng (2005), who discovered that financial crisis increases export in the short run. Additionally, the calculated error correction component of the ARDL model is highly significant at one per cent and correctly signed (-0.74). This demonstrates that non-oil export would require

a very long time to reach equilibrium in response to changes in the independent variables.

The results from Table 6 further show that financial sector development, the real exchange rate, foreign direct investment, and global financial crisis have insignificant long-term impact on exports of non-oil goods. The insignificant link between financial sector development and non-oil export challenges the theoretical view that trade and financial sector development are significantly linked at any period of time. This finding might, however, be due to the low level of Nigeria's financial sector development, as Babatunde and Fowowe (2010) revealed that access to finance in sub-Saharan Africa is low, which could weaken the relationship between financial sector development and trade. This finding is in line with Xinzhong (2022), who also found a weak link between financial sector development and export growth in Jiangsu County, China. Contrarily, however, Xinzhong et al. (2022) established that excessive financial sector development could also worsen growth of foreign trade significantly, whereas Nguyen and Su (2021) determined that a more developed financial sector enhances export quality, which is at variance with the finding of Xinzhong et al. (2022). Furthermore, the results from Table 5 show a positive and statistically significant long-term effect of real per capita GDP on non-oil export. This finding is consistent with the literature, indicating that non-oil export would rise with an increase in income.

Table 6. Estimated ARDL Model

Short-term	Coefficient	t-Statistic		Long-term	Coefficient	t-Statistic
ΔFSD	-1.67*	-1.71		*FSD*	-0.39	-0.45
ΔRER	0.18	0.93		*RER*	0.25	0.92
ΔFDI	-0.19*	-1.75		*FDI*	-0.26	-1.61
ΔRPCGDP	5.67***	3.12		*RPCGDP*	2.92***	4.86
ΔDUMGFC	0.67*	1.89		*DUMGFC*	0.89	1.66
CointEq(-1)	-0.74***	-4.46		*c*	-16.12***	-2.59

Note. *=10%, **=5%, ***=1% significance levels
Source: Author's Computation, 2023 via Eviews

4.1. Robustness of the ARDL Results

This study verifies the robustness of the long-term ARDL results in Table 6, since the findings that financial sector development exerts an insignificant effect on non-oil exports contradicts the theoretical view (see Beck, 2002). Table 7 reveals the findings of the DOLS regression. It is interesting to see that the results are robust to different estimation techniques. In particular, the results support our prior findings, indicating that financial sector development, the real exchange rate, foreign direct investment, and global financial crisis have insignificant long-term impact on exports of non-oil goods (see Table 7). Yet, several studies, including Sare (2019), Kurul (2021), and Xinzhong et al., (2022) suggest that there

Table 7. Estimated DOLS Model

	Coefficient	Std. Error	t-Statistic	Prob.
FSD	-1.65	1.40	-1.17	0.26
RER	0.63	0.43	1.45	0.17
FDI	-0.21	0.24	-0.85	0.40
RPCGDP	4.03***	1.04	3.85	0.00
DUMGFC	0.95	0.69	1.38	0.19
c	-28.42**	11.54	-2.46	0.03
Adjusted R^2	0.77			

Note. *=10%, **=5%, ***=1% significance levels
Source: Author's Computation, 2023 via Eviews

could be a potential non-linear relationship as financial sector development indicators may generate breakpoints that trigger nonlinearity. In this regard, our study employs the extended version of the ARDL, known as non-linear ARDL or NARDL (see Shin et al., 2014), to rigorously analyse the relationship between financial sector development and non-oil export. The results in Table 8 show the NARDL estimates and indicate that a positive shock in financial sector development is significant in explaining non-oil export in the short -term, whereas a negative shock is insignificant. In the long -term, however, both positive and negative shocks in financial sector development are insignificant in explaining non-oil export. These results imply that financial sector development and non-oil export are unconnected in the long -term, thus corroborating the earlier findings from the ARDL and DOLS regression. The short-term results also confirm the findings of the ARDL regression, indicating that the effect of financial

sector development on non-oil export is linear and negative. Therefore, this implies that previous studies suggesting a non-linear relationship between financial sector development and trade might be erroneous.

Table 8. Estimated NARDL Model

Short-term	Coefficient	t-Statistic		Long-term	Coefficient	t-Statistic
ΔFSD^+	-2.09**	-2.44		FSD^+	-1.87	-1.30
ΔFSD^-	0.03	0.02		FSD^-	-2.59	-1.01
ΔRER	0.34*	1.94		RER	0.24	0.63
ΔFDI	-0.10	-1.27		FDI	-0.36	-1.46
$\Delta RPCGDP$	6.65***	4.62		$RPCGDP$	1.92*	1.74
$\Delta DUMGFC$	0.59**	2.29		$DUMGFC$	0.38	1.17
$CointEq(-1)$	-0.61***	-5.29		c	-16.84	-1.64

Note. *=10%, **=5%, ***=1% significance levels
Source: Author's Computation, 2023 via Eviews

4.2. Diagnostic Tests

Our study uses a number of diagnostic tests associated with the ARDL and NARDL models. From Table A (see the Appendix), we found no serial correlation in the two models since the computed F-values from Breusch-Godfrey LM tests are statistically insignificant. The probabilities of the calculated Jarque-Bera statistic are also not significant. Hence, the errors are normally distributed. Because the F-values are not significant, the functional forms are correctly specified, as shown by the Ramsey RESET tests. Furthermore, neither model exhibits the problem of heteroscedasticity.

5. CONCLUSION AND POLICY IMPLICATIONS

Efforts to diversify Nigeria's export trade from oil to non-oil export abound, but the proportion of non-oil export in total exports remains low, which may be due to the low level of financial sector development in the country. Unlike previous studies that focused entirely on aggregate export (combined exports of oil and non-oil goods), this study investigates the effect of Nigeria's financial sector development on non-oil export. Moreover, in contrast to previous studies where the private sector credit-to-GDP ratio was used as an indicator of financial sector development, this study employs a robust financial sector development index that

accounts for the multidimensional nature of financial sector development —in terms of efficiency, access, and depth. It also controls for a potential non-linear relationship as financial sector development indicators may generate breakpoints that trigger nonlinearity, which has been overlooked in previous studies. The findings of our study indicated that the relationship between financial sector development and non-oil export is linear. Specifically, it revealed that financial sector development is an important determinant of non-oil export in the short -term. More particularly, our study found that Nigeria's level of financial sector development worsens exports of non-oil goods in the short -term, suggesting that its financial sector development is not at a level that could support non-oil export. Surprisingly, however, the study found no significant long-term link between non-oil export and financial sector development, even with different estimation techniques. This finding might be due to the low level of Nigeria's financial sector development, as Babatunde and Fowowe (2010) demonstrated that low access to finance in sub-Saharan Africa could weaken the relationship between financial sector development and trade.

Another important finding of this study is that foreign direct investment and per capita GDP are critical in determining non-oil export in the short -term. More particularly, it found that foreign direct investment depresses non-oil export, which may be connected to the huge share of oil foreign direct investment in total foreign direct investment inflow that promotes oil exploration exportation, thus intensifying the Dutch disease and the neglect of the non-oil sector, whereas per capita GDP significantly supports non-oil export. Our study also found a favourable short-term impact of financial crisis on non-oil export, which might be due to devaluation (depreciation) of the nation's currency during the crisis, making exports more competitive internationally. Furthermore, the impact of the real exchange rate is positive in the short run, but statistically not significant. Additionally, it was found that out of all the determinants of non-oil export included in this study, only per capita GDP significantly influences non-oil export in the long run.

In light of these findings, we recommend the following: One, the Nigerian government and policymakers should ensure that the financial sector is sufficiently developed. In particular, the government and policymakers in Nigeria should execute policies that would induce greater mobilisation of savings, induce

adequate access to finance, and ensure that financial institutions and markets provide financial services at low cost. This would deepen the financial sector by improving credit depth, access, and efficiency. Two, we recommend that government and policymakers in Nigeria should consider reducing the proportion of oil foreign direct investment in total foreign direct investment inflow, in favour of non-oil foreign direct investment. This would improve non-oil sector growth as well as enhance non-oil export performance, thereby promoting diversification. Three, given that per capita GDP exerts a more favourable effect on non-oil export, the Nigerian government and policymakers should provide an enabling environment that would support greater economic activity in order to uphold GDP growth which would sustain per capita GDP.

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Data Availability Statement:

Dataset for this study is freely accessible at https://www.cbn.gov.ng/, https://www.imf.org/, and https://www.data.worldbank.org/

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APPENDIX:

Table A. Diagnostic tests for the ARDL and NARDL Models

Diagnostic Test	ARDL	NARDL
Adjusted R^2	0.83	0.59
Serial Correlation LM Tests	0.44 (0.64)	0.88(0.43)
Heteroscedasticity Tests	0.42 (0.89)	0.96(0.51)
Ramsey RESET Tests	0.08 (0.76)	0.80(0.38)

Note. Probability of F-Statistic in brackets

Source: Author's Computation, 2023 via Eviews

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