Tanzanian Journal of Population Studies and Development, Vol. 32 No. 2, 2025: 58–72

Income Inequality-Fertility Nexus: Do Differing Levels of Economic Development Matter?

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Abstract

The economically more developed countries (EMDCs) are conjectured to differ from the less developed countries (LDCs) in terms of the link between income, income inequality and fertility, given their differing levels of economic development. This paper examined this view by revisiting the link between income inequality and fertility for 48 Sub-Sahara African countries (mainly LDCs), and 38 Organisation for Economic Cooperation and Development (OECD) countries (mainly EMDCs), covering the period 2000–2020, using the system generalized method of moments (GMM). The results indicate that the effects of income inequality and income on fertility are positive in both groups of countries, and even more significant in the OECD countries. Likewise, the direction of the relationship between level of education, contraceptive usage, labour participation rate and health expenditure with fertility are similar for SSA and OECD countries. The findings suggest that the differing level of development of the LDCs and EMDCs may not be crucial in the link between income inequality and fertility.

Keywords: *income, inequality, fertility rate, Sub-Saharan Africa, OECD*

1. Introduction

Over the years, there has been a growing interest and extensive investigation of the link between income, income inequality and health outcomes (fertility, life expectancy, mortality rates) as both factors remain major drivers of population health across economies (Li & Zhu, 2006; Feng et al., 2012; Odusanya & Agboola, 2017; Odusanya & Akinlo, 2021). Aside from the average level of income, it is contended that the level of fertility may be affected by the level of income inequality. As argued by Reppeto (1978), income inequality is aggravated when few elites hold sway in the modern sectors while the larger proportion of the population are engaged in the relatively traditional, subsistent sectors; and this tends to increase fertility, especially in economies with low level of development. The widening gap between the few 'haves' (i.e., the rich) and the majority 'have-nots' (i.e., the poor) increases with regards to access to good quality education,

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 ▪ *https://doi.org/10.56279/tjpsd.v32i2.350*

health services, income or wealth, and nutrition (UN, 2015). This widening gap in income and wealth has so far culminated into burgeoning fertility differentials within and across regions, with varying levels of impacts.

The microeconomic household theory of fertility postulates a positive relationship between income and fertility (Todaro & Smith, 2015), while income inequality is hypothesized to be positively associated with fertility at both the individual and aggregate levels (Bhattacharyya, 1975). Meanwhile, a popular strand of the literature surmised a negative relationship between income and fertility, and a negative link between female labour participation and fertility (Doekpe et al., 2023). It is also strongly contended that there seems to be an observable twist in terms of these links based on current realities across economies, including in rich countries, as the income-fertility nexus now seems to be flattening; while the relationship between women's labour participation and fertility is fast becoming positive even in high-income economies. The latter is specifically predicated on factors like favourable social numbers, family policy, flexible labour market conditions, and cooperative fathers (Doekpe et al., 2023). These developments are not only indicative of the intricacies of the drivers of fertility, but are reshaping the existing understanding in the analysis of fertility behaviour at both household and aggregate levels.

Notably, both rising income inequality and high fertility may portend deleterious effects on economic growth and development. Increases in fertility rate may not only result in population growth, but population explosion; with very grave consequences on migration, urbanisation, food security, environment and health. There is also a popular school of thought suggesting that high fertility and eventual population growth is desirable given its positive impact on the supply of labour force and aggregate demand, especially in domestic economy; while a number of empirical studies surmised its negative and far-reaching implications for the growth and development of the economy. From the foregoing submissions, income inequality remains one of the existing challenges of the world in the 21st century; and the widening gap between the rich and the poor has constituted a defining contemporary challenge; and hence making the extent of inequality, its determinants, and stemming the trend, one of the most constantly deliberated issues among economists (Odusanya et al., 2021; Odusanya, 2023).

When income inequality increases, fertility has a tendency to increase; while human capital investment (investment per child) falls. With high income inequality, there is a preponderance of disproportionately poor individuals and households having miniature investment in child education and health. This view is admissible in line with the economic analysis of fertility behaviour indicating a trade-off between child quality and child quantity for the rich and poor households (or countries) (Liu et al., 1996; Handa, 2000; Odusanya & Adegboyega, 2015; Bonner & Sarkar, 2018; Odusanya & Akinlo, 2020; Bloom et al., 2024). This submission may be well-typified by the prevailing conditions in Sub-Sahara African (SSA) countries (harbouring largely unequal and many poor

households), and the OECD countries (with relatively considerable number of rich households). Our study offers empirical evidence on this supposition.

Moreover, several studies—including Repetto (1978), Bhattacharyya (1975), Flegg (1979), Boulier (1982), Kim (1984), De la Croix and Doepke (2002), Wei and Jinju (2009), Macan and Deluna (2013), Filho and Kawachi (2015), Odusanya and Adegboyega (2015), Odusanya and Akinlo (2020), Wietzke (2020) and van Wijk (2024)—have attempted to confirm the nature of the relationship between income, income inequality and fertility. However, a comparison of the income inequality-fertility nexus in the SSA (less developed group of countries) and OECD (developed group of economies), and its specific implications, seem to be omitted in the extant empirical literature. Therefore, the main objective of this paper is to examine whether, and to what extent, income and income inequality explain the variation in fertility in SSA and OECD countries. The focus is also to confirm if differing levels of economic development matter in explaining the inequality-fertility nexus as highlighted in Flegg (1979). This perspective in the analysis of the determinants of fertility is quite novel, and contributes significantly to a plethora of empirical studies on the subject matter. Since countries in these regions are in different stages of economic development and demographic transition, it is ordinarily envisaged that the interaction between income inequality and fertility should differ, and there ought not to be any basis for comparison. Such a comparative exploration will help specify the societal conditions under which the hypothesized relationship between income inequality and fertility is obtained.

The rest of the paper is divided into five sections. Section two presents stylised facts on economic development, income inequality and fertility in OECD and SSA countries. Section three reviews the relevant literature, while section four focuses on the methodology. Section five contains the results and discussion, while section six concludes the study.

2. Some Stylised Facts on Economic Development, Income Inequality and Fertility in OECD and SSA Countries

It is on record that a considerable proportion of OECD countries have maintained very high level of economic development, consistently recording high standard of living. Using the Human Development Index (HDI)—a very comprehensive indicator of development as a basis of assessment—most of these countries post very impressive HDI values: Switzerland (0.967), Norway (0.966), Iceland (0.959), Germany (0.950), Australia (0.946), Canada (0.935), United Kingdom (0.940), United States (0.927), France (0.910), Italy (0.906), Portugal (0.874), Costa Rica (0.806), among others (UNDP, 2024). The HDI has been well above 0.80 for most of OECD members for a number of years; with only countries like Mexico, Columbia having a record of HDI below 0.80. On the contrary, the majority of SSA countries post HDI in the range of 0.55 to 0.70 (indicating medium human development), or even below 0.55 (i.e., low human development): Gabon (0.693), Cape Verde (0.661), Namibia (0.610), Ghana (0.602), Kenya (0.601), Zambia (0.569), Nigeria (0.548),

Ivory Coast (0.534), Gambia (0.495), and Niger (0.394), among others. Relying on UNDP (2024), the only very few exceptions are Seychelles (0.802), Mauritius (0.796), South Africa (0.717) and Botswana (0.708). Hence, overall, a very glaring disparity exists between the OECD and SSA countries in terms of economic development.

Globally, there has been a substantial dispersion in the distribution of income within and across regions. The situation in OECD countries is not an exception: the Gini index has been between 0.22 and 0.44. For example, in 2021, the US, Turkey and Latin American OECD members had the highest income inequality; while the Nordic and some central European countries recorded very low dispersion in income distribution (OECD, 2024). Measuring income inequality in terms of pre-tax national income held by the top 10 percent of the population, dispersion in income distribution seems to be milder in the OECD countries. The estimates for most of the members (including Australia, Canada, France, Korea, Poland, and Japan) in 2022 ranged between 32 and 45 percent (WID, 2023). However, the US, Turkey and Mexico recorded 48.27, 51.68 and 64.61 percent, respectively, during the period. Meanwhile, inequality in income distribution has been consistently high in most SSA economies.

In specific terms, Chancel et al. (2023) documented a very high income inequality for Southern Africa (especially in South Africa and Namibia), while West and North Africa exhibited a considerably lower inequality, with the overall gaps in income in the entire region significantly being attributed to within-country inequalities. Estimates from the study indicated an abysmally imperfect income distribution relative to global estimates (ibid.). It also indicated that 56 percent of the aggregate income in the SSA belongs to the richest 10 percent (WID, 2023); underscoring unprecedented degree of wealth concentration, and the ubiquity and severity of income inequality in the sub-region. The estimates of pre-tax national income held by the top 10 percent of the population are very high for a large proportion of SSA countries (like Angola, Kenya, Ghana, Cameroun, Nigeria, Burkina Faso, among others), which ranged between 42 and 59 percent; while Zambia, Central African Republic, and South Africa recorded extreme figures of 61.74, 64.91, and 65.41, percent respectively. This largely indicates relatively higher degree of inequality in the SSA region.

A total fertility rate connotes the number of children that each woman is likely to bear if she lives to the end of her child-bearing years. Though it varies from within and across countries-cum-regions, the total fertility rate has generally been falling (on average) over the years. Historically, fertility rate dropped to an average of 1.5 in 2022—from an average of 3.3 children per woman in 1960—in the OECD economies, indicating a whopping 54.5 percent decline. Thus, as at 2022, the fertility rate had slipped below the replacement rate in the OECD region. A replacement rate indicates the total fertility rate at which women give birth to enough babies required to sustain population based on an assumed zero mortality rate, and a constant net migration. The standard replacement rate is 2.1, especially in developed economies. During the year 2022, the decline was

noticeable in Korea, Turkey, Mexico, Costa Rica and Columbia; which hitherto had a record of between 4 and 5 (on average) per woman (OECD, 2024; World Bank, 2023; Bloom et al., 2024: 160). It is apt to note that the total fertility rate rose slightly between 2020 and 2021 in two-thirds of the OECD countries.

According to the Population Reference Bureau (PRB) (2024), a sizeable proportion of OECD countries have a fertility rate below the replacement level: Canada (1.5), the UK (1.6), Korea (0.7), Germany (1.4), Mexico (1.6), Turkey (1.5), Iceland (1.6), USA (1.6), France (1.6), Italy (1.2), among others. South Korea recorded an extreme and the lowest fertility of 0.7 among the OECD countries. This development could, *inter alia,* be largely attributed to a number of socio-economic conditions: long-term preferences for smaller household size, diverse dating habits, higher age of couples at marriage, trade-off of child quantity for child-quality, biological sterility, and rising women's employment opportunities (Bloom et al., 2024: 160).

In a sharp contrast, the African continent maintains the highest population growth rate globally, with the SSA sub-region recording extremely high fertility rates. The average fertility rate in SSA stands at an average of 4.4 children per woman; doubling the world's average of 2.2 children per woman (PRB, 2024). Specifically, most of the countries in SSA exhibit fertility far beyond the replacement rate: Central African Republic (6.4), Niger (6.1), Chad (6.1), Nigeria (4.5), Ethiopia (4.0), Sierra Leone (3.8) Kenya (3.4), Botswana (2.9), and South Africa (2.4). It was only in Seychelles, Cape Verde, and Mauritius where the fertility rates were 2.0, 1.5, and 1.3, respectively; which is exceptionally below the conventional replacement rate (ibid.). In the last 30 years, the average fertility rate in the SSA declined to 4.7 from a towering 6.5 children per woman; but it still ranks relatively high globally. Hence, the population is projected to increase twofold by 2050. Major factors driving high fertility in SSA include, *inter alia*, low contraceptive prevalence (which still hovers around 30 percent in the last few years), cultural and religious dispositions (including common practices and acceptance of polygyny), and increasing rates of adolescent childbearing (Porter, 2020). These factors are obviously different compared to the core determinants of fertility in the OECD countries.

3. Literature Review

There has been a growing number of studies documenting the nature and pattern of the association between income, income inequality and fertility across developed and developing economies. These studies have provided divergent perspectives on the subject matter, by either accentuating or discrediting notable and age-long theoretical conjectures. In a very notable study covering a pool of developed and less-developed economies, Reppeto (1978) reports the existence of a highly consistent association between a more equal income distribution and lower fertility. Flegg (1979) also confirms that diminution in income inequality will result into substantial reduction in fertility, while increases in income per head are likely to lead to a decline in fertility rates in underdeveloped countries. In a closely related submission, Handa (2000) reported a negative elasticity between income and the

number of births in Jamaica. As per Boulier (1982: 165), these inferences do not hold in the case of Philippines, where the scholar found a positive relationship between fertility and initial income levels of the husbands; while the relationship turns negative at higher income levels. He concludes that, essentially, marginal transfers of income from the rich to the poor slightly reduces fertility (ibid.). Meanwhile, Macan and Deluma (2013) indicate that both income inequality and labour productivity are negatively related with fertility, as increases in these variables brought a decline in fertility rate in the Philippines between 1985 and 2009. Husain (2022) finds no evidence of considerable asymmetries between inequality and fertility in Bangladesh, both in the short- and long-run.

However, Docquier (2002) contends that aggregate fertility rate fluctuates with income consequent upon private cost of education and income dispersion among a country's populace. In the analysis of fertility in SSA, a majority of the economies recorded more profound decline in fertility around 2000 than in the mid-1990s, while it seemed stagnant in the transition economies in the region (Bongaarts, 2008). Similarly, Castro and Fajnzylber (2017) find a robust evidence indicating a negative association between income dispersion and adolescent fertility for a sample of low-income countries. This is unlike Filho and Kawachi (2015), who report a consistent positive link between variations in income inequality and changes in fertility in Brazil, despite adjusting for average income, youth homicide rate and access to education. Dao (2008) establishes a significant role of per capita national income, among other factors, in driving fertility in a sample of 107 developing countries, comprising 40 SSA economies. De La Croix and Doepke (2003) finds income inequality lowers growth via endogenous fertility.

Meanwhile, Guest and Swift (2008) highlight possible differences in the nature of the relationship between fertility, income inequality and labour productivity across economies. Evidence indicates no significant long-run relationships among the variables for Sweden and Japan; while a long-run relationship was established in the case of the US (ibid.). This underscores the peculiarities of every economy in possibly defining the direction and magnitude of the association. The effects of income inequality on fertility also tend to be varied across income categories in the Chinese economy (Wu & Zhao, 2024). Specifically, income inequality were found to exert significant positive and negative effects on the fertility behaviour of high-income and low-income groups, respectively; while it had no noticeable effect on the fertility of the middle-income class (ibid.). This finding runs somewhat contrary to Wei and Jinju (2009), who confirm a sizeable association between lower inequality in income distribution and lower fertility for the Chinese economy.

Moreover, Wijk (2024) finds fertility to be increasingly connected with higher income in the Netherlands for first births, suggesting children to be normal goods. However, this link becomes tenuous for higher-order births. Kremer and Chen (2002) infer a greater fertility differential between the educated and uneducated segments of the population in highly unequal developing countries than the more equal ones. In instances where the educated prioritizes child quality over quantity—thereby producing off-springs relatively more educated, and hence with

higher skills, better employability and prospectively higher wages—then income inequality tends to be exacerbated. Bonner and Sarkar (2018) re-assess the quality-quantity trade-off in relation to the effect of an increase in family size on children's educational and health attainments; ultimately providing evidence of adverse effects of higher child quantity on both educational and health outcomes in Australia. Relying on the relative deprivation index, Li et al. (2024) also surmise that, in China, rising income inequality pointedly enhances the fertility intention of individuals with low educational attainment, little household assets, and with no pension insurance. This largely portends that income and education play crucial roles in the inequality-fertility nexus.

In the case of SSA, Odusanya and Akinlo (2020) find income inequality to exert a significant negative effect on economic growth via the fertility differential channel; thereby corroborating the child quality-quantity trade-off in the analysis of household fertility behaviour. However, in a study of 25 SSA countries, Bongaarts (2020) identifies women educational attainment and family planning programmes as the leading contributing factors to declining fertility. For Nigeria, Odusanya and Adegboyega (2015) found a negative relationship between income and fertility; depicting children as inferior goods, and accentuating the child quality-quantity trade-off. Schoumaker (2019) re-examines the popular notion of stalls in fertility in SSA, and finds that the noticeable stalls are neither pervasive nor exceptional. A study by Santelli et al. (2016) explores the relationship between trends in specific indicators of socioeconomic status (SES) and adolescent fertility across nations and regions. The study covered 142 countries, comprising seven regions. Adolescent birth rates were found to be positively associated with greater income inequalities, while they were negatively related with expenditure on education and national income.

Overall, fertility has a positive association with greater income inequality, while a negative relationship exists between gross domestic product (a measure of aggregate income), as well as educational expenditure. The negative association between income and fertility suggests that children are inferior goods; while the child quality-quantity trade-off is strengthened by the inverse relationship between educational expenditure and adolescent fertility. In a related study on the connection between the dimensions of inequality and total fertility rate in Ghana, Agbaglo et al., (2022) finds a steadily high fertility rate among the most impoverished women; with women with no formal education also recording very high levels of fertility rates. Hence, it is deducible that both income gaps and educational attainment are crucial in shaping fertility behaviours.

4. Methodology

Following Dao (2008), we express indicator of fertility rate as a function of income inequality and a set of control variables:

$$FTR = \alpha_0 + \beta_1 INEQ_{i,t} + \sigma\vartheta_{i,t} + \varepsilon_{i,t}$$

Where: *FTR* represents indicators of fertility (i.e., the ratio between the number of births in a given year and the average number of women of reproductive age); β is the coefficient of income inequality; while ϑ is the vector of control variables that also influence fertility rates in SSA and OECD regions. The set of control variables are income (Y) measured as per capita GDP, health expenditure (HE), level of education (EDU), contraceptive prevalence rate (CPR), and labour participation rate (LPR). ε denotes the error term.

The panel data models were estimated using the system generalized method of moments (GMM) (Blundell & Bond, 1998). In line with the recommendation of Roodman (2009), the appropriateness of this method is based on the peculiarity of our panel dataset covering 2000 to 2020; and comprises 48 and 38 cross-sections for SSA and OECD countries, respectively, for a period of 21 years, with the cross-sections (N) exceeding the number of years (T). The sample size is limited to the year 2020 due to the data available on the market Gini index, our measurement of income inequality.

4.1. Sources of Data

The study is inferential, and we employed secondary data sourced online. Table 1 details the data with their nature and sources.

Table 1: Sources of Data, Description, and Measurement of Variables

Variables	Measurement	Description	Source of Data
FTR	Fertility Rate	The ratio between the number of births in a given year and the average number of women of reproductive age	World Development Indicators (WDI)
INEQ	Gini Index	Estimate of Gini index of inequality in equivalized household market (pre-tax, pre-transfer) income	Standardized World Income Inequality Database (SWIID).
Y	GDP per capita	The income per head for individuals in the population obtained as the GDP divided by the total population	World Development Indicators (WDI)
HE	Current health expenditure per capita (current US$)	Current health expenditure per capita (current US$) covering healthcare goods and services consumed each year.	World Development Indicators (WDI)
EDU	School enrolment, secondary (% gross).	It is the ratio of total enrolment, regardless of age, to the population of the age group that officially relates to the level of education shown.	World Development Indicators (WDI)
CPR	Contraceptive prevalence, any method (% of married women ages 15–49)	Contraceptive prevalence is the percentage of married women ages 15–49 who are practicing, or whose sexual partners are practicing, any method of contraception	World Development Indicators (WDI)
LPR	Labour force participation rate, total (% of total population ages 15+))	It is the proportion of the population ages 15 and older that is economically active:.	World Development Indicators (WDI)

As mentioned earlier, this study covers the 48 SSA countries, and 38 OECD countries from 2000 to 2020.

5. Results and Discussion

The results in columns 2 and 3 of Table 2 are on the effects of income inequality, health care expenditure, level of education, labour participation rate, contraceptive usage, and GDP per capita on fertility rates in SSA and OECD countries, respectively.

Table 2: Estimates of System GMM on the Link between Income Inequality and Fertility

Dependent Variable	Fertility Rate (SSA Countries)	Fertility Rate (OECD Countries)
Lagged Fertility Rate	1.1169*	0. 8457*
	(0. 0319)	(0. 0692)
Gini Index	0. 03847	0. 0058**
	(0.0024)	(0. 0026)
GDP per capita	0. 0430	0. 0895*
	(0. 0265)	(0. 0292)
Level of Education	0. 0018**	-0. 0006
	(0. 0010)	(0. 0004)
Contraceptive Usage	0. 0036*	0. 0019
	(0. 0013)	(0. 0012)
Labour Participation	- 0. 0034**	-0. 0013
Rate	(0. 0016)	(0. 0024)
Health Expenditure	- 0. 0254	-0. 0776*
	(0. 0198)	(0. 0279)
Constant	-0. 9651*	- 0. 329
	(0. 3659)	(0. 2317)
Instruments	24	25
AR 1	0.092	0.335
AR 2	0.208	0.316
Hansen Test	0.500	0.550

Note: The values in parentheses are the standard error (SE). The AR (1), AR (2), and the Hansen test are p-values. *, **, denote 1%, 5% level of significance respectively.

The results indicates that the coefficient of a year lagged is positive and statistically significant at 1 percent, suggesting that fertility rate in the previous year contributes substantially to the contemporaneous fertility in both SSA and OECD countries. This obviously depicts that the divergence in the level of economic development between SSA and the OECD countries may not really matter in terms of the relationship between the contemporaneous and one-year lagged fertility rates. For the two categories of countries, the coefficient of income inequality is positive. The coefficient of income inequality is positive but highly significant for the OECD countries, i.e., the effect of income inequality on fertility seems to be more pronounced in the OECD countries based on its statistically

significant coefficient. This runs contrary to expectation as a negative relationship is anticipated between income inequality and fertility in more developed economies (OECD countries), relative to the less developed ones (SSA). Empirical evidence abound on an inverse relationship between higher income and fertility; as well as a positive correlation between higher income inequality and fertility (Odusanya & Adegboyega, 2015; Odusanya & Akinlo, 2020, Santelli et al., 2016).

In highly unequal societies—usually characterized by the predominance of poor households, and a common perception of large numbers of children as sources of both means of increased household income (via child labour) and old-age financial supports—the demand for children tends be higher. This implies a positive influence of income inequality on fertility. Thus, preferences for lower numbers of children are not ordinarily anticipated in OECD countries given their level of development (in terms of relatively lower income inequality). This finding is also suggesting that the slightly increasing income inequality in OECD countries in recent years may cumulatively lead to higher fertility in these economies.

The coefficient of income (measured by the per capita GDP) is positive for both the SSA and OECD countries. This is very probable if children are perceived as normal goods (in line with the microeconomic theory of household fertility). However, in rich households (societies)—with noticeable higher preferences for child quality than child quantity—usually there is a relatively lower demand for children (lower fertility rate) than in poor households (societies). Relying on this view, our finding is valid for the SSA. In the case of the OECD economies, in recent years policies relating to fertility behaviour are favouring higher birth rates. This is mainly to address the age-long gaps in population growth and economically unfeasible population distribution and size, as a number of these economies are fast becoming ageing. This is likely to be a major ostensible factor in the income-fertility nexus. Hence, our result seems to be justified for the OECD countries.

The coefficient of the level of education is positive and statistically significant at 5 percent for the SSA region, while it is negative and statistically insignificant for the OECD countries. The coefficient of education indicates that a one percentage increase in the level of education brought about a rise in fertility by about 0.002, *ceteris paribus,* in the SSA region. Theoretically, it is anticipated that high levels of education—in the form of higher literacy levels—should cause diminution in average fertility. The SSA—which still harbours a large proportion of uneducated people, with a very huge literacy gap between males and females—accounts for a very low female labour participation rate, which in turn stimulates relatively higher fertility rates in the region. However, for the OECD countries, the level of education has not really translated into a reduction in fertility rate as a negative relationship prevails between the average level of education and fertility. This is not expected as the economic development in these countries has been characterized by unfettered access to qualitative education across ages and gender, culminating into very minimal inequality in employment opportunities and labour participation rates between men and women, thereby

driving down fertility in these economies. In developed economies, there is also very high tendency for a low demand for children relative to other goods, given their peculiarities. Similarly, households in the OECD are likely to prefer having fewer but high-quality educated children, with high-income earning potentials; than having low-quality uneducated children, with abysmally low income-earning potentials. All this, in turn, reduces the tendency of women in the OECD bearing more children compared to their counterparts in the SSA.

For contraceptive usage, the coefficient is positive for both OECD countries and the SSA; and it is highly significant for the latter. This finding is contrary to the theoretical exposition since the use of contraceptives—a common means of birth control—should ordinarily influence fertility behaviour negatively. For the SSA region, this outcome may not be too astounding given the poor adoption of birth control practices, which are still considered to be antithetical to cultural and religious beliefs in some societies. This is still undermining the impact of both traditional and modern birth control methods (including contraception) on fertility in the SSA compared to the OECD countries, where there is a higher and age-long adoption of birth control methods.

The coefficient of labour participation rate is negative for both the OECD and the SSA; with a 5 percent level of significance reported for the SSA. This suggests that labour participation rate does not promote fertility rate, which is theoretically plausible. This implies that engagement in employment activities influences households' decision in the demand for children. Specifically, the participation of females in labour alters their opportunity cost of child care and career as this implies that they will have less time for child bearing and care, hence leading to the demand for a fewer number of children. The statistically significant value observed in the SSA suggest that the improvements in enrolment and higher labour participation portends a stronger influence on fertility behaviour in the region.

We observed a negative relationship between healthcare expenditure and fertility in both the SSA and OECD economies. This is theoretically plausible, especially when income is controlled for. In this case, the relationship is not only negative for the two groups of countries, but it is also statistically significant. It is apt to note that the association between health expenditure and fertility is somewhat intricate and ambivalent. This is because it depends on factors such as the level of income of a country, the nature of a country's health expenditure, and the forms of mortality involved.

6. Conclusion

This paper basically assesses if the differing level of economic development of the SSA and the OECD countries are crucial in determining the link between income, income inequality, and fertility rate in these two groups of countries. We infer from the results of the Blundell-Bond GMM estimator that the effects of income inequality and income on fertility are positive in both groups of countries, while being more significant in the OECD countries. Likewise, the direction of the

relationship between the levels of education, contraceptive usage, labour participation rate and health expenditure with fertility rate are similar for SSA and OECD countries. These findings suggest that differing level of economic development may not play a crucial role in determining the interconnection between income, income inequality and fertility.

This study offers useful insights into the interplay between income, income inequality, and fertility from a novel perspective, and contributes substantially to the extant empirical literature. However, given the intricate interplay between income, income inequality and fertility, further studies are still required to explore the nexus from perspectives akin to that of this study, but taking cognizance of peculiar social, cultural and other related factors that are crucial in shaping fertility behaviour in rich and poor economies. Likewise, country-level studies on the effect of income inequality on fertility rate will be necessary to help formulate appropriate policies for each respective country. Such policies will capture the inherent peculiarities of each economy, and engender a better decision-making process.

References

Agbaglo, E., Agbadi, P., Tetteh, J.K., Ameyaw, E.K., Adu, C. & Nutor, J.J. (2022).Trends in total fertility rate in Ghana by different inequality dimensions from 1993 to 2014. *BMC Women's Health,* 22: *49* https: //doi.org/10.1186/s12905-022-01629-w.

Bhattacharyya, A. K. (1975). Income inequality and fertility: A comparative view. *Population Studies*, 29(1): 5–19. https: //doi.org/10.1186/s41118-020-00098-z.

Bloom, D.E., Kuhn, M. & Prettner, K. (2024). Fertility in high-income countries: trends, patterns, determinants, and consequences, *Annual Review of Economics,* 16: 159–184. https: //doi.org/10.1146/annurev-economics-081523-013750.

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

Bongaarts, J. (2008). Fertility transitions in the developing world: progress or stagnation? *Studies in Family Planning*, 39(2): 105–110. https: //pubmed.ncbi. nlm.nih.gov/ 18678174/.

Bongaarts, G. (2020). Trends in fertility and fertility preferences in Sub-Saharan Africa: The roles of education and family planning programs. *Genus*, 76(32): 1–15. https: //genus. springeropen.com/articles/10.1186/s41118-020-00098-z.

Bonner, S. & Sarkar, D. (2018). The quality-quantity trade-off among Australian children. *Economic Modelling*, 70: 383–389. https: //doi.org/10.1016/j.econmod.2017.08.010.

Boulier, B. L. (1982). Income redistribution and fertility decline: A skeptical view. *Population and Development Review*, 8: 159–173.

Chancel, L., Cogneau, D., Amory, G., Myczkowski, A. & Robilliard, A. (2023). Income inequality in Africa, 1990–2019: Measurement, patterns, and determinants. *World Development*, 163, 2–23. https: //doi.org/10.1016/j.worlddev.2022.106162.

Charles-ColI, J., Granados, E.M. & Ramos. M.I. (2015). Income inequality, fertility, human capital accumulation and economic growth in Mexico. *Research in World Economy*, 6(1): 172–183. https: //www.sciedu.ca/journal/index.php/rwe/article/ viewFile/6616/ 3937.

Castro, R. & Fajnzylber, E. (2017). Income inequality and adolescent fertility in low-income countries. *Cadernos De. Saúde Pública,* 33(9): 1–8. e0020361.

Dao, M. Q. (2008). An empirical analysis of the determinants of fertility in developing countries. *Journal for Studies in Economics and Econometrics*, 32(1): 47–55. https: // doi. org/ 10.1080/10800379.2008.12106442.

De la Croix, D. & Doepke, M. (2003). Inequality and growth: why differential fertility matters. *American Economic Review*, 93(4): 1091–1113. http: //dx.doi.org/ 10.1257/ 000282803769206214.

Docquier, F. (2004). Income distribution, non-convexities and the fertility-income relationship. *Economica,* 71: 261–273.

Doepke, M., Hannusch, A., Kinderman, F. & Tertilt, M. (2023). The economics of fertility: a new era. *Handbook of the economics of the family*, 1(1): 151–254. https: //doi.org/ 10.1016/bs.hefam.2023.01.003.

Feng, Z., Wang, W., Jones, K. & Li, Y. (2012). An exploratory multilevel analysis of income, income inequality and self-rated health of the elderly in China. *Social Science and Medicine*, 75: 2481–2492.

Filho, C. & Kawachi, I.,(2015). Inequality is associated with adolescent fertility in Brazil: a longitudinal multilevel analysis of 5565 municipalities. *BMC Public Health*, 15–103. doi 10.1186/s12889-015-1369-2.

Flegg, A. T., 1979. Role of income inequality in the determination of birth rates. *Population Studies*, 33(3): 457–477. https: //doi.org/10.2307/2173892.

Guest, R. & Swift, R. (2008). Fertility, income inequality, and labour productivity. *Oxford Economic Papers*, 60: 597–618.

Handa, S. (2000). The impact of education, income and mortality on fertility in Jamaica. *World Development*, 28(1): 173–186.

Husain, H. (2022). The dynamics of asymmetry among fertility, income inequality and financial development in Bangladesh. *World Development Sustainability*, 1. https: // doi. org/10.1016/j.wds.2022.100014.

Kim, D. (1984). Effects of income distribution on fertility in Korea and the United States. *Bulletin of the Population and Development Studies*, 13: 1–18.

Kremer, M. & Chen, D. L. (2002). Income distribution dynamics with endogenous fertility. *Journal of Economic Growth*, 7: 227–258.

Li, H. & Zhu, Y. (2006). Income, income inequality, and health: evidence from China. *Journal of Comparative Economics*, 34: 668–693.

Li, J., Li, T. & Wang, W. (2024). The impact of income inequality on the fertility intention: A micro-perspective based on relative deprivation. *PLoS One*, 19(12): e0311991. https: //doi.org/10.1371/journal.pone.0311991.

Liu, G.G., Yamada, T. & Yamada, T. (1996). Economic analysis of Chinese fertility behaviour. *Social Science and Medicine*, 42(7): 1027–1037.

Macan, V.J.S. & Deluna, R.S. (2013). Relationship of income inequality and labour productivity on fertility in the Philippines: 1985–2009. *Munich Personal RePEc Archive* (*MPRA)* Paper No 51679, 1–16.

Organisation for Economic Co-operation and Development (OECD). (2024). Society at a Glance 2024: OECD Social Indicators. https: //www. oecd. org/en/publications/ society-at-a-glance-2024_918d8db3–en.html.

Odusanya, I.A. & Adegboyega, S.B. (2015). Impact of income, schooling and mortality on fertility in Nigeria. *Ife Journal of the Humanities and Social Studies*, 2(1): 1–12.

Odusanya, I.A. & Agboola, B. (2017). Income, income inequality and health: Evidence from Nigeria. *IZVESTIYA Journal of Varna University of Economics*, 61(4): 345–36. https: //journal.ue-varna.bg/uploads/20180309062942_8481015625aa229d660273.pdf.

Odusanya, I.A., Akinlo, A.E. & Onanuga, A.T. (2021). Income distribution and growth process in Sub-Saharan Africa. *Iranian Economic Review,* 25(4): 711–726. https: // ier.ut. ac.ir/article_85084.html.

Odusanya, I.A. & Akinlo, A.E. (2020). Growth effect of income inequality in Sub-Saharan Africa: exploring the transmission channels. *International Journal of Management and Economics,* 56(2): 1–15. https: //doi.org/10.2478/ijme-2020–0012.

Odusanya, I.A. & Akinlo, A.E. (2021). Income inequality and population health in Sub-Saharan Africa: revisiting income inequality-health hypothesis. *Journal of Population and Social Studies*, 29, 235–254. https: //so03.tci-thaijo.org/index.php/ jpss/ article/ view/242032.

Odusanya, I.A. (2023). Effect of economic growth on income inequality in Sub-Saharan Africa. *Economic Horizon*, 25(2): 103–115.

Population Reference Bureau, 2024 (PRB). (2024). *World population data sheet*. https: //www.prb.org/international/indicator/fertility/table.

Porter, Z. (2020). High fertility in Sub-Saharan Africa. Population connection. https: //populationconnection.org/blog/high-fertility-sub-saharan-africa/.

Repetto, R. (1978). The interaction of fertility and the size distribution of income. *Journal of Development Studies*, 14(4): 22–39.

Roodman, D. (2009). How to do Xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, 9(1): 86–136. https: //doi.org/ 10.1177/ 1536867X0900900106.

Santelli, J.S., Song, X., Garbers, S., Sharma, V. & Viner, R.M. (2016). Global trends in adolescent fertility, 1990–2012, in relation to national wealth, income inequalities, and educational expenditures, *Journal of Adolescent Health*, 1–8. http: //dx.doi.org/ 10. 1016/j.jadohealth.2016.08.026.

Schoumaker, B. (2019). Stalls in fertility transitions in Sub-Saharan Africa: Revisiting the evidence. *Studies in Family Planning*, 50(3): 257–277.

Todaro, M.P. & Smith, S.C., 2015. *Economic development*, 12th Edition. United States: Pearson Publishing Inc.

United Nations (UN). (2015). Concepts of inequality. Department of Economics and Social Affairs, 1: 1–2.

United Nations Development Programme (UNDP). (2024). Human development report 2023–24: Breaking the gridlock-Reimaging cooperation in a polarized world. https: //hdr.undp.org/content/human-development-report-2023–24.

van Wijk, D. (2024). Higher incomes are increasingly associated with higher fertility. *Demographic Research*, 51, 809–822.

Wei, C. & Jinju, L. (2009). Equality and fertility: evidence from China, Paper Prepared for the XXVI IUSSP International Population Conference 27 September - 2 October 2009, Marrakech, Morocco, 1–11.

Wietzke, F. (2020). Poverty, inequality, and fertility: the contribution of demographic change to global poverty reduction. *Population and Development Review*, 46(1): 65–99.

World Bank (WB). (2023). *World Development Indicators 1960–2023*. Washington, DC: World Bank.

World Inequality Database (WID). (2023). What's new about inequality in Sub-Saharan Africa? https: //wid.world/news-article/2023–wid-update-sub-saharan-africa/.

Wu, W. & Zhao, X. (2024). Income inequality and fertility behaviour: an empirical study on China. *Journal of Advanced Computational Intelligence and Intelligent Informatics*, 28(4): 817–828. https: //doi.org/10.20965/jaciii.2024.p0816.