

Least Developed Countries (LDCs): Development Trend and Determinants

Jeet Bahadur Sapkota

Abstract

In 1971, the United Nations established the Least Developed Countries (LDCs) category to support the world's most vulnerable and impoverished nations in achieving greater integration into global development and prosperity. While international efforts have been made to assist LDCs in this endeavor, the development gap between these countries and the rest of the world continues to widen. The factors driving LDCs toward sustained development remain unclear. This paper analyzes aggregate data from 1971 to the present, sourced from the World Bank's World Development Indicators (WDI), to assess LDCs' progress in income, health, and education relative to other income groups and the global average. The findings show minimal improvements in GNI per capita for LDCs, leading to an increasing gap with wealthier countries. However, LDCs have achieved significant progress in health outcomes and demonstrate similar trends in education indicators. Additionally, using a system GMM model on cross-country panel data from 45 current and 7 former LDCs from 1971 to 2020, this study identifies manufacturing value-added, gross domestic savings, population growth, international trade, and foreign aid as key determinants of development in LDCs.

Keywords: the least developed countries (LDCs); development trend; determinants of development; panel data econometrics

1. Introduction

The least developed countries (LDCs) are not only the poorest and weakest segment of the international community but also less explored and hence less understood (Navarro-Pabsdorf, Martínez-Vázquez, & de Pablo-Valenciano 2024). The Committee for Development Planning, the predecessor of the Committee for Development Policy (CDP) of the United Nations, established the category of the LDCs with 25 LDCs in 1971 as a special group of developing countries characterized by a low level of income and suffering from structural obstacles to socioeconomic development that requires special measures and efforts to overcome the problems (United Nations 2024). The main objectives were to

give greater economic development assistance and concessional development financing from the international donor community to accelerate global efforts to tackle those problems and bring LDCs into the mainstream of global progress and prosperity (Biswas 2018). However, the LDCs number peaked at 52 in 1991; 7 LDCs graduated from the group at various times, and there are still 45 LDCs, mainly in Africa and Asia currently (United Nations 2024). Why do so many LDCs still exist? To what extent are the objectives of establishing the LDCs category achieved, and what are the key factors that affect the development of LDCs? Using the World Bank's World Development Indicators database, this paper assesses the development trend of LDCs since its establishment and finds the key determinants of LDCs development.

Starting in 1981, after the 10 years of the establishment of the LDCs category, the international community began to hold United Nations Conference on the LDCs every 10 years, designing and launching the Program of Action to transform these countries towards sustainable development (UN-OHRLLS 2022). However, these efforts mainly remained ineffective as most of the goals and targets of these Program of Actions were not met. For instance, one of the main targets of the Istanbul Program of Action set in 2011 was to enable 24 LDCs (i.e., half of the total at that time) to be able to meet the LDCs' graduation criteria by 2020; however, only 4 LDCs have been graduated to date since 2011 (Basnett, Keane, and te Velde 2014; United Nations 2022). In this context, it is worthwhile to examine the development progress of LDCs as a group and explore the factors that affect key development indicators.

The existing literature suggests both domestic and external factors are crucial for nation-building. The level of industrialization is widely cited as one of the key domestic determinants of the growth of income and progress in health and education (Lewis 2013; Aslam et al. 2021; Badarch 2003). Similarly, both theoretical and empirical literature cite domestic savings as a key determinant of economic growth and human development (Ciftcioglu and Begovic 2010; Białowolski, Węziak-Białowolska, and VanderWeele 2019; Ssewamala et al. 2010). Moreover, the empirical literature widely documents the harmful impacts of population growth on economic growth, health, education, and other aspects of development in less developed countries (McNicoll 1984; Kelley 1994; Goldthorpe 1996). As LDCs usually have a high population growth rate, it is also a crucial domestic predictor of various aspects of development in LDCs.

Similarly, as LDCs have limited economic resources, external factors, such as foreign aid and international trade, are also crucial for development (Srinivasan 2009). Theoretical literature suggests that international trade benefits all the trading partners as it leads to competition resulting in production efficiency (Smith 1986; Hume 1971; Ricardo 1951).

Empirical literature have also widely documented the growth impact of international trade (Donaldson 2019; Haberler 1968; Johnson 1956; Singh 2010) and its positive and significant impacts on health and education (Sapkota 2011; Friel, Schram, and Townsend 2020; Chuang 2000) in both the developed and developing World. Foreign aid, particularly official development assistance (ODA), is another one of the important catalysts for economic growth and social development (Asatullaeva et al. 2021; Dietrich 2013). While some literature emphasizes implementation of good public policies and good governance in recipient countries (Sumner and Glennie 2015), many others are critical towards donors to make aid more effective (Collier and Dollar 2002).

The remaining parts of this paper are organized as follows. The next section describes the materials and method of the study. Section 3 presents the results. Finally, the results are discussed in Section 4.

2. Materials and Methods

2.1 *The Data and Its Sources*

We used the following five variables to assess the aggregate development trend on income, health and education in the LDCs. First, Gross National Income (GNI) per capita (Atlas method (current US\$)) is used to measure the level of economic development. According to the World Bank (n.d.), GNI per capita is the gross national income, converted to U.S. dollars using the World Bank Atlas method, divided by the midyear population. Official exchange rate is usually used to convert the GNI in national currency to U.S. dollars for international comparisons.

The second and third variables, life expectancy at birth and the under-5 mortality rate, are used to account the health development trend. The World Bank (n.d.) defines life expectancy at birth as the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. Similarly, under-five mortality rate is the probability of death per 1,000 newborn babies before reaching age five.

The fourth and fifth variables, adult literacy (percentage of people ages 15 and above) and gross school enrollment at the secondary level, are used to account the education development trend. According to the World Bank (n.d.), “adult literacy rate is the percentage of people ages 15 and above who can both read and write with understanding a short simple statement about their everyday life.” Similarly, gross secondary enrollment ratio is the ratio of total enrollment in secondary level, regardless of age, to the population of the secondary school age group.

These five variables are the key indicators used to identify the LDCs inclusion or exclusion (see United Nations (2021) for the detailed criteria for LDCs over time). The data are taken from the World Development Indicators (WDI) database publicly available online from the World Bank (n.d.). The annual data cover from 1971, the establishment of the LDCs grouping, to 2021 as long as the data is available. The aggregated data for LDCs group of countries, middle-income countries, high-income countries, and the World are used to compare the development trends in income, health, and education. The World Bank classifies countries based on their income per capita, widely referred to as groups of countries based on their level of economic development. For details on the World Bank's classification of countries based on income, see World Bank (n.d.).

Similarly, country-level data for all the LDCs are used in regression analysis to find out the determinants of the LDCs. The list of the countries included in this study is shown in Table 1.

Table 1. List of countries included in the study (45 LDCs current and 7 past LDCs).

SN	Countries	Region	LDC + Group**	Year***
1	Afghanistan	South Asia	LLDC	1971
2	Angola	Sub-Saharan Africa	LDC only	1994
3	Bangladesh	South Asia	LDC only	1975
4	Benin	Sub-Saharan Africa	LDC only	1971
5	Burkina Faso	Sub-Saharan Africa	LLDC	1971
6	Burundi	Sub-Saharan Africa	LLDC	1971
7	Cambodia	East Asia and Pacific	LLDC	1971
8	Central African Republic	Sub-Saharan Africa	LLDC	1975
9	Chad	Sub-Saharan Africa	LLDC	1971
10	Comoros	Sub-Saharan Africa	SIDS	1971
11	Democratic Rep. of the Congo	Sub-Saharan Africa	LDC only	1991
12	Djibouti	Sub-Saharan Africa	LDC only	1982
13	Eritrea	Sub-Saharan Africa	LDC only	1994
14	Ethiopia	Sub-Saharan Africa	LLDC	1971
15	Gambia	Sub-Saharan Africa	LDC only	1975
16	Guinea	Sub-Saharan Africa	LDC only	1971
17	Guinea-Bissau	Sub-Saharan Africa	SIDS	1981
18	Haiti	Americas	SIDS	1971
19	Kiribati	East Asia and Pacific	SIDS	1986
20	Lao People's Dem. Republic	East Asia and Pacific	LLDC	1971
21	Lesotho	Sub-Saharan Africa	LLDC	1971

22	Liberia	Sub-Saharan Africa	LDC only	1990
23	Madagascar	Sub-Saharan Africa	LDC only	1991
24	Malawi	Sub-Saharan Africa	LLDC	1971
25	Mali	Sub-Saharan Africa	LLDC	1971
26	Mauritania	Sub-Saharan Africa	LDC only	1986
27	Mozambique	Sub-Saharan Africa	LDC only	1988
28	Myanmar	East Asia and Pacific	LDC only	1987
29	Nepal	South Asia	LLDC	1971
30	Niger	Sub-Saharan Africa	LLDC	1971
31	Rwanda	Sub-Saharan Africa	LLDC	1971
32	Sao Tome and Principe	Sub-Saharan Africa	SIDS	1982
33	Senegal	Sub-Saharan Africa	LDC only	2000
34	Sierra Leone	Sub-Saharan Africa	LDC only	1982
35	Solomon Islands	East Asia and Pacific	SIDS	1991
36	Somalia	Sub-Saharan Africa	LDC only	1971
37	South Sudan	Sub-Saharan Africa	SIDS	2012
38	Sudan	Sub-Saharan Africa	LDC only	1971
39	Timor-Leste	East Asia and Pacific	SIDS	2003
40	Togo	Sub-Saharan Africa	LLDC	1982
41	Tuvalu	East Asia and Pacific	SIDS	1986
42	Uganda	East Asia and Pacific	LLDC	1971
43	United Rep. of Tanzania	East Asia and Pacific	LDC only	1971
44	Yemen	South West Asia	LDC only	1971
45	Zambia	Sub-Saharan Africa	LLDC	1971
46	Bhutan*	South Asia	LLDC	1971 ~ 2023
47	Botswana*	Sub-Saharan Africa	LLDC	1971 ~ 1994
48	Cabo Verde*	Sub-Saharan Africa	SIDS	1977 ~ 2007
49	Equatorial Guinea*	Sub-Saharan Africa	LDC only	1982 ~ 2017
50	Maldives*	South Asia	SIDS	1971 ~ 2011
51	Samoa*	East Asia and Pacific	SIDS	1971 ~ 2014
52	Vanuatu*	East Asia and Pacific	SIDS	1985 ~ 2020

Data Source: United Nations (n.d.). Available online: <https://www.un.org/ohrrls/content/list-ldcs> (accessed on 10 September 2024). *Countries already graduated from LDCs group; **see (3) for detail about the LDC+ grouping of the United Nations; LLDC=Land Locked Developing Countries; SIDS=Small Island Developing States; *** year of inclusion to and graduation from LDCs group.

We have also included the past LDCs which are already graduated from the group. It helps to capture the factors that accelerate the development progress leading them to graduate from the LDCs group.

2.2 Model Specification

Most cross-country empirical studies use data at a particular time (Rodrik 1998). Such cross-sectional studies are useful for finding differences between countries; however, they fail to observe changes in structural features and their correlates over time. Cross-sectional studies also have relatively fewer observations, which usually leads to weak results. Thus, this study builds a panel of 52 present and past LDCs, covering 50 years (from 1971 to 2020) of annual data on key development indicators and their potential determinants. However, the data of some variables are limited for some countries for some years, especially in the early years of the study period.

The GNI per capita used in the aggregate trend analysis is the dependent variable in the regression analysis. We used domestic and external variables as independent or explanatory variables based on existing literature. The level of industrialization, usually measured by the manufacturing value added, remained one of the critical determinants of per capita income growth in recorded history (Lewis 2013; Aslam et al. 2021; Badarch 2003). According to the World Bank (n.d.), manufacturing refers to industries belonging to the International Standard Industrial Classification (ISIC) divisions 15-37 and value added is the net output of a sector which is measured as the percentage of GDP.

Similarly, gross domestic saving is considered another determinant of development because both theoretical and empirical studies showed a significant positive impact of savings on the growth rate of income per capita (Ciftcioglu and Begovic 2010). The World Bank calculates gross domestic savings as the gross domestic product (GDP) minus final consumption expenditure (total consumption) (World Bank n.d.).

The population growth rate is another crucial domestic factor that potentially affects development in LDCs. The World Bank (n.d.) calculates, “annual population growth rate for year t as the exponential rate of growth of midyear population from year $t-1$ to t , expressed as a percentage.” The literature has long documented the harmful impacts of the rapid growth of population on economic growth, attenuated health and educational expenditures, and insufficient housing, sanitary, and water, mainly in the less developed World (Kelley 1994; Goldthorpe 1996).

External factors, such as international trade, are also critical for the development of any country; and such factors are even more crucial for LDCs where domestic resources are minimal (Srinivasan 2009). Theoretically, international trade ensures production

efficiency through efficient competition resulting in cheaper goods and services available to all trade partners (Smith 1986; Ricardo 1951). By focusing on the products and services which have comparative advantages against trade partners, all countries benefit from trade if the terms-of-trade is set rationally (Donaldson 2019; Haberler 1968). Empirically, numerous studies showed the income growth impact of international trade (Singh 2010) and its positive and significant effects on human development, including health and education (Friel, Schram, and Townsend 2020; Chuang 2000). In this study, we used merchandise trade as a share of GDP defined by the World Bank, which is the sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars (World Bank n.d.).

Similarly, foreign aid or official development assistance (ODA) is another potential determinant because ODA is supposed to help LDCs overcome development bottlenecks and accelerate economic and human development. According to the World Bank (Rodrik 2022) net official development assistance (ODA) per capita consists of both concessional loans and grants by official agencies of the developed and developing countries and multilateral institutions to promote economic development and welfare. While numerous studies found ODA as an essential catalyst for economic growth and human development (Asatullaeva et al. 2021, Dietrich 2013), many others argue that aid effectiveness in recipient countries depends on implementing good public policies, particularly fiscal, monetary, and trade policies (Sumner and Glennie 2015). Some others also claim that aid serves more to the donors and that aid-dependent countries tend to have a higher rate of poverty and other development challenges (Collier and Dollar 2002; Djankov, Montalvo, and Reynal-Querol 2008).

We follow the dynamic panel data approach to estimate the determinants of the LDCs development. The GNI per capita, the dependent variable of this study, of each country usually change gradually over time, indicating that current levels of each aspect of development depend on its past levels. Thus, a one year lagged dependent variable is included as one of the determinants in the model, which creates a dynamic structure for the model. Therefore, fixed country effects and the OLS estimator cannot be used as they cause the model to become biased and inconsistent (Nickell 1981; Haini 2019). To solve this problem, Arellano and Bover (1995), Blundell and Bond (1998) and many other scholars suggested a system GMM estimator. The model specification is as follows.

$$Y_{it} = \alpha + \beta_1 Y_{it-1} + \beta_2 X_{it} + \eta_i + \varepsilon_{it} \dots \dots \dots (1)$$

Here, Y_{it} on the left-hand side is the dependent variable, i.e. GNI per capita at

purchasing power parity (PPP). Y_{it-1} is the one-period lagged dependent variable. Similarly, X is the vector of explanatory variables. They are manufacturing value added (% of GDP), gross domestic savings (% of GDP), population growth (annual %), merchandise trade (% of GDP), and net ODA received per capita (current US\$). In addition, i represents the group identifier (i.e., current and past 52 LDCs), and t represents the time identifier (i.e., 50 years from 1971 to 2020).

Among parameters, α is the constant term, and β_1 and β_2 are the coefficients of independent variables, which are the parameters of our interest. Among the other parameters, ε_{it} is the error term, which follows a normal distribution, η_i is the country fixed effect. As dependent and independent variables have different units of measurement, all variables are used in the natural logarithm form in the model. Moreover, a dummy variable for the current LDCs group is included in the equation to control for the effect of the countries which are already graduated from the LDCs category.

We used the system GMM for the two main reasons. First, the estimated coefficients would be inconsistent and biased if the explanatory variables (X_{it}) are correlated with the error term ε_{it} . It is mainly due to the simultaneity, omitted bias or measurement errors. In particular, the lagged dependent variables in the model are endogenous. To address the problem of endogeneity, the system GMM uses a large matrix of available instruments and weighs them properly (Blundell and Bond 1998).

Second, system GMM is appropriate to control individual fixed effects and to address the problem of heteroscedasticity and serial autocorrelation (Roodman 2009). While estimating the system GMM in Stata, lag values are used as instruments for all endogenous variables. The Sargan test of overidentifying restrictions and the autocorrelation tests are carried out, which confirmed the validity of the instruments used. The summary statistics and the correlation matrix of all the dependent and independent variables are shown in Appendix 1 and 2, respectively.

3. Results

3.1 Development Trend

3.1.1 Economic Development Trend

Figure 1 illustrates the trajectory of economic development in the LDCs, as measured by Gross National Income (GNI) per capita, in comparison with the global average and middle-income countries. Since the majority of LDCs fall under the World Bank's low-income country classification, their economic progress is juxtaposed with that of middle-income countries and the global average to provide a broader context of development

trends.

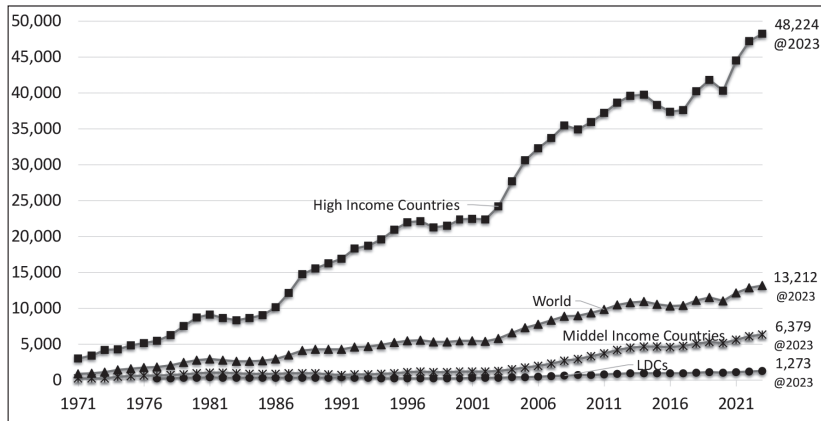


Figure 1. GNI per capita, Atlas method (current US\$), 1971-2023

Source: Author's calculation using the data from World Development Indicators database of the World Bank (accessed on 10 September 2024). The LDCs' data are available only from 1977.

Over the past decades, the economic progress of LDCs has been notably sluggish. From 1977 to 2023, the average GNI per capita for LDCs grew incrementally from a mere \$268 to \$1,273—an increase that underscores the persistent challenges these countries face in advancing their economic standing. In stark contrast, middle-income countries witnessed a dramatic rise in GNI per capita, surging from \$236 in 1971 to \$6,379 by 2023, reflecting their more robust integration into the global economy.

The global average followed a similarly robust trajectory, with GNI per capita increasing from \$864 in 1971 to \$13,212 in 2023. Notably, high-income countries experienced the most significant growth, with their GNI per capita skyrocketing from \$3,019 in 1971 to an impressive \$48,224 in 2023. This growing divergence between LDCs and other income groups highlights the widening global economic inequality, further emphasizing the need to explore the structural factors limiting LDCs' growth and their ability to catch up with wealthier nations.

3.1.2 Health Development Trend

Two indicators are used to examine the trend in health development. Figure 2 presents a comparative analysis of health development by examining two key indicators, with life expectancy at birth serving as a central measure of progress. The data reveals a marked improvement in health outcomes for LDCs, where average life expectancy rose from 40

years in 1971 to 65 years in 2022. While this progress is significant, it highlights the ongoing health challenges faced by LDCs in narrowing the gap with more developed nations.

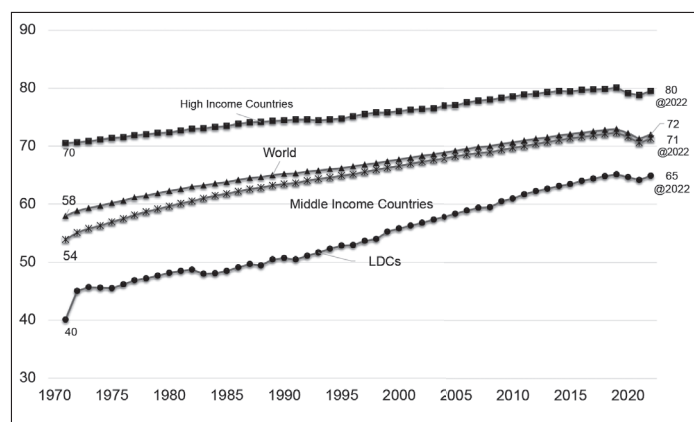


Figure 2. Life expectancy at birth (years), 1971-2022

Source: Author's calculation using the data from World Development Indicators database of the World Bank (accessed on 10 September 2024).

Globally, life expectancy at birth increased from 58 years in 1971 to 72 years by 2022, showcasing steady advancements in global health systems and living conditions. Middle-income countries saw comparable improvements, with life expectancy rising from 54 years to 71 years during the same period, nearly aligning with the global average. High-income countries, however, continued to lead in health outcomes, with life expectancy advancing from 70 years in 1971 to 80 years in 2022, reflecting their more robust healthcare systems and socio-economic stability.

The trends illustrated in Figure 2 underscore the considerable strides LDCs have made in improving health outcomes. Yet, they also expose the enduring disparities between these nations and their wealthier counterparts, raising critical questions about access to healthcare, the distribution of health resources, and the broader socio-economic determinants that drive health development.

Figure 3 highlights the significant progress made in reducing under-5 child mortality rates between 1990 and 2022, an important indicator of health development. Although data for this variable is only available starting in 1990, the trends reveal a remarkable decline in child mortality within LDCs. Over this period, the under-5 mortality rate in LDCs dropped sharply from 174 deaths per 1,000 live births in 1990 to 59 in 2022, reflecting substantial improvements in healthcare access and interventions aimed at

reducing preventable child deaths.

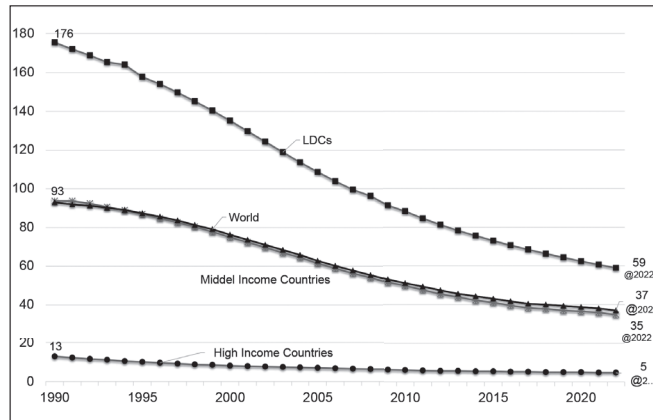


Figure 3. Mortality rate, under-5 (per 1,000 live births), 1990-2022

Source: Author's calculation using the data from World Development Indicators database of the World Bank (accessed on 10 September 2024).

Globally, the under-5 mortality rate also saw significant declines, falling from 93 per 1,000 live births in 1990 to 37 in 2022, indicating progress in child health across a wide range of countries. Middle-income countries experienced a similar reduction, with their under-5 mortality rate decreasing from 93 in 1990 to 35 in 2022, nearly aligning with the global average. High-income countries, which already had a low under-5 mortality rate of 13 per 1,000 live births in 1990, saw further improvements, with the rate decreasing to just 5 in 2022.

The data depicted in Figure 3 underscores the considerable advances made in reducing child mortality across all income groups, particularly in LDCs. However, the persistent disparity in under-5 mortality rates between LDCs and wealthier countries highlights ongoing challenges related to healthcare infrastructure, nutrition, and broader socio-economic factors in the world's poorest nations. These trends emphasize the importance of sustained efforts to address the root causes of child mortality and ensure more equitable health outcomes globally.

3.1.3 Education Development Trend

There are two indicators used to examine the trend in education development. First, Figure 4 shows the progress in literacy rates from 1990 to 2022, a key indicator of educational development. Over this period, the average literacy rate in LDCs improved substantially, rising from 45 % in 1990 to 67 % in 2022. This notable increase highlights the

strides made by LDCs in expanding access to education and promoting basic literacy among their populations, though challenges remain in fully bridging the gap with more developed nations.

By comparison, the global average literacy rate rose from 74% in 1990 to 87% in 2022, reflecting a broader trend of educational advancement worldwide. Middle-income countries exhibited similar progress, with their literacy rates increasing from 71% to 87% over the same period, reaching parity with the global average by 2022.

The trends displayed in Figure 4 emphasize the educational gains made across all country groups, particularly within LDCs. However, the persistent gap between LDCs and wealthier nations underscores ongoing challenges related to access to quality education, infrastructure, and educational resources. As literacy serves as a foundation for further human capital development, these figures suggest the need for continued investment in educational systems to support long-term development goals in the LDCs.

Similarly, Figure 5 illustrates the progress in gross secondary school enrollment from 1971 to 2022, providing insight into the expansion of educational opportunities at the secondary level across different country groups. In LDCs, secondary school enrollment increased significantly, rising from a low 14% in 1971 to 47% in 2022. While this growth represents meaningful strides in improving access to secondary education, LDCs still lag considerably behind global averages.

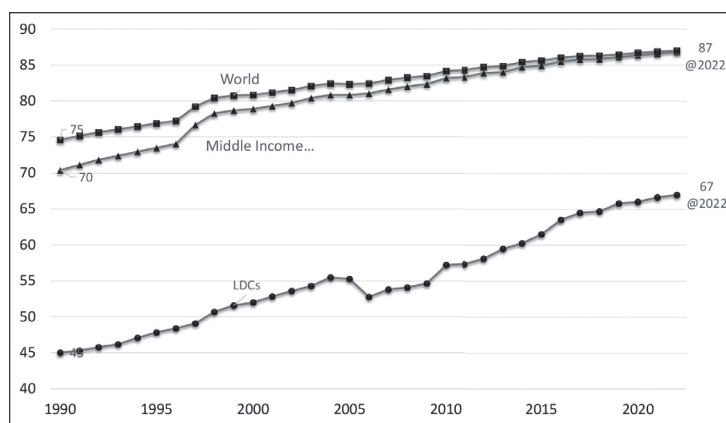


Figure 4. Literacy rate, adult (% of people ages 15 and above), 1990-2022

Source: Author's calculation using the data from World Development Indicators database of the World Bank (accessed on 10 September 2024).

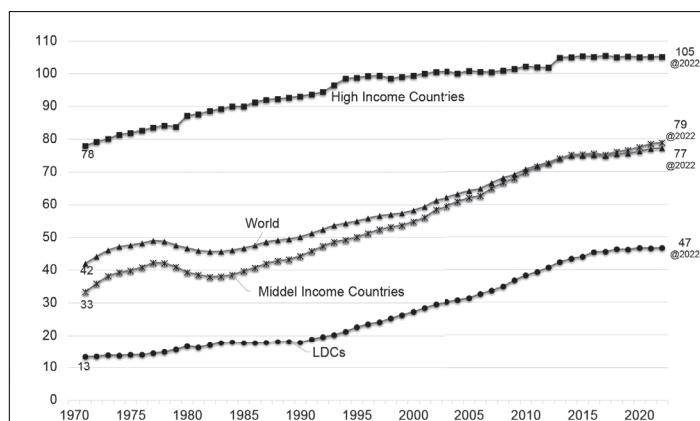


Figure 5. School enrollment, secondary (% gross), 1971-2022

Source: Author's calculation using the data from World Development Indicators database of the World Bank (accessed on 10 September 2024).

Globally, gross secondary school enrollment rose from 43% in 1971 to 77% in 2022, reflecting the broader expansion of educational systems worldwide. Middle-income countries also demonstrated substantial progress, with their enrollment rates growing from 35% to 79% over the same period, nearly reaching parity with the global average. Meanwhile, high-income countries, which already had a relatively high enrollment rate of 77% in 1971, saw further growth, with gross secondary enrollment reaching 106% in 2022, indicative of universal access to secondary education and some level of over-enrollment due to factors like grade repetition.

The data presented in Figure 5 underscores the considerable progress made by LDCs in expanding secondary education but also highlights the significant disparity that remains when compared to middle- and high-income countries. The wide gap in enrollment rates emphasizes the continued need for targeted investments in educational infrastructure, teacher training, and policy reforms to ensure that more children in LDCs.

3.2 Determinants of Development

Table 2 presents the dynamic panel data estimates of the key determinants influencing economic development in the LDCs, with the coefficients reflecting both the direction and magnitude of each variable's impact on GNI per capita. The number of asterisks (*) next to each coefficient denotes the level of statistical significance, where * indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level. Coefficients without asterisks suggest no statistically significant effect.

The results highlight two domestic factors—manufacturing value added and gross

domestic savings, both as a percentage of GDP—that have a positive and statistically significant impact on GNI per capita in LDCs. Manufacturing value added is significant at the 5% level, while gross domestic savings is significant at the 1% level. The beta coefficients indicate that a 1% increase in manufacturing value added leads to a 0.0109% increase in GNI per capita, holding all other factors constant. Similarly, a 1% rise in gross domestic savings is associated with a 0.0206% increase in GNI per capita, underscoring the importance of both industrial development and domestic capital accumulation in driving economic growth in LDCs.

Conversely, the population growth rate exhibits a negative and statistically significant effect on GNI per capita, significant at the 10% level. The findings suggest that a 1% reduction in population growth could lead to a 0.0104% increase in GNI per capita, indicating that slower population growth may contribute to higher per capita income levels, likely due to reduced pressures on resources and infrastructure.

These results underscore the critical role of domestic savings and industrialization in fostering economic development in LDCs, while also highlighting the potential challenges posed by high population growth rates.

Table 2. Determinants of LDCs development.

Determinants	Dependent variable GNI per capita
Lag dependent variable	0.939*** (0.0068)
Manufacturing, value added (% of GDP)	0.0109** (0.0044)
Gross domestic savings (% of GDP)	0.0172*** (0.0023)
Population growth (annual %)	-0.0104* (0.0056)
Merchandise trade (% of GDP)	0.0335*** (0.0041)
Net ODA received per capita (current US\$)	0.0052*** (0.0019)
Dummy for current LDCs	-0.0494*** (0.0147)
Constant	0.274*** (0.0544)
Observations	980

Data Source: World Development Indicators Database of the World Bank (accessed on 7 July 2024). Note: (1)=GNI per capita, Atlas method (current US\$); (2)=Life expectancy at birth (years); (3)=Mortality rate, under-5 (per 1,000 live births); (4)=Adult (15 yrs~) literacy rate (%); (5)=Secondary school enrollment (% gross). All variables are in logged form. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In addition to domestic factors, the analysis identifies two external factors—merchandise trade as a percentage of GDP and net Official Development Assistance (ODA)

received per capita—as highly significant in boosting GNI per capita, both at the 1% significance level. The results suggest that increased engagement in international trade and higher levels of foreign aid contribute meaningfully to economic growth in LDCs. Specifically, a 1% increase in merchandise trade as a percentage of GDP is associated with a 0.0335% rise in GNI per capita, underscoring the critical role of trade in enhancing economic activity and integration into the global market. Likewise, a 1% increase in net ODA per capita leads to a 0.0052% increase in GNI per capita, indicating the positive, albeit smaller, impact of foreign aid on economic development.

The coefficient of the lagged dependent variable, representing the existing level of economic development, is also positive and highly significant. This finding suggests that a higher baseline level of GNI per capita has a reinforcing effect on current economic development, reflecting the momentum of prior growth in influencing present outcomes. In other words, countries that have achieved higher levels of development are more likely to continue along a positive trajectory.

Conversely, the dummy variable for current LDCs exhibits a highly significant negative coefficient at the 1% level. This indicates that the current cohort of LDCs experiences significantly slower development progress compared to former LDCs, pointing to persistent structural challenges that may be more pronounced or difficult to overcome in the present group of LDCs. This result underscores the growing divergence between countries that have graduated from LDC status and those that remain within this category, highlighting the need for tailored strategies to address the unique obstacles faced by current LDCs.

4. Discussion and Conclusion

This study examines the historical trend of the key development indicators of the LDCs in comparison to the global average and high and middle-income countries. It also finds out the significant determinants of the economic development indicator of the current and past LDCs.

The comparative trend of GNI per capita showed the weakest progress of LDCs compared to middle-income countries, the World average, and high-income countries. Notably, the progress of higher income groups is much higher than the LDCs. It implies the international community's failure in their pledge to accelerate the LDCs development process and to ensure their sustainable and irreversible graduation from the LDCs category. The Istanbul Program of Action for the LDCs set the goal of half of the least developed countries, of which there were 24 at the time, meeting graduation criteria by

2020. However, only 5 LDCs have graduated since 2011 (United Nations 2024). It seems to be a huge challenge to achieve the target set by the recently adopted Doha Program of Action for LDCs by the first part of the 5th United Nations Conference on the Least Developed Countries (LDC5), which aimed to enable an additional 15 LDCs to meet the criteria for graduation from the group by 2031 (United Nations 2022). Given the tremendous progress of science and technology and the accumulation of global wealth, it is possible to bring LDCs into the global mainstream of progress and prosperity if the international community not only sets goals and targets but also acts honestly to achieve them.

Interestingly, the trends of health development indicators are relatively fast for LDCs. There are two reasons behind the faster progress. First, average life expectancy at birth was far lower in LDCs than in the countries with higher income groups at the beginning, which leaves room for faster progress of LDCs. Second, LDCs benefitted significantly from the rapid progress of science and technology during this period. The effort of the international community and global trade in health services is reflected in this rapid progress in health development in LDCs.

Contrary to health development, the education sector in LDCs could not tap the benefits of a far lower level of education development at the beginning. Still, the progress rates remain somewhat similar to those of higher-income countries. It implies that there is still a huge room for education development in LDCs. If they, together with the international community, could tap this potential shortly by educating people rapidly in the LDCs, it would ensure the faster progress and prosperity of LDCs and the whole World at large.

The system GMM estimation results from the panel data of LDCs reaffirm the importance of domestic and external determinants of economic development. One of the key external factors, international trade, is crucial as it significantly impacted on improving GNI per capita. Although World Trade Organization (WTO) trade negotiations include the tools that can promote meaningful LDC participation in the global value chain (GVCs) and other multilateral, as well as bilateral donor communities provide support to building the trading capacity of LDCs (Flentø and Ponte 2017; Gnanon 2018), LDCs trading capacity is still critically weak causing their share of global export remain about 1 percent, far below the SDGs target of increasing to 2 percent by 2020 (United Nations 2022). Arguably, developed nations should be more open toward goods and services from LDCs and more supportive of building LDCs' trading capacity so that LDCs can actively participate in GVCs.

Although aid effectiveness is widely discussed and criticized by many scholars in the

existing literature (Asatullaeva et al. 2021; Dietrich 2013; Sumner and Glennie 2015, Djankov and Montalvo 2008; Jakupec 2018), we found highly significant impacts of ODA on increasing GNI per capita. However, the volume of aid is critically worsening recently because bilateral aid and other financial flows to LDCs declined significantly after the outbreak of Covid-19 (Development Initiatives 2021). On the other hand, LDCs comprised about 50 percent global share of people with extreme poverty (i.e., living below \$2.15 per day) before the pandemic (Development Initiatives 2022), and that this proportion reached 53 percent after the pandemic (Valensisi 2022). Therefore, the international community should focus more on increasing the amount and improving the quality of aid to LDCs.

Our estimation results further confirm that domestic factors, such as manufacturing value added, gross domestic savings, and the reduction of population growth, are crucial determinants of economic development in LDCs. While the relationship between reduced population growth appears relatively weak, manufacturing value added, and gross domestic savings are both found to have a positive and highly significant impact on improving GNI per capita.

Although domestic factors should serve as the foundation for development and thus be prioritized in public policy, external factors must not be overlooked, as they play a catalytic role in accelerating development. In this context, fostering a balanced approach that strengthens domestic capacity while leveraging external support is essential for driving sustainable development in LDCs.

5. Limitations

This study has several limitations. First, we were unable to account for certain variables, such as maternal mortality and gender parity in education, which are used as criteria for LDC inclusion and graduation. This omission is due to the lack of comparable data for other country groups. Nonetheless, we believe our analysis effectively captures the key dimensions of development in LDCs compared to more advanced groups of countries.

Second, data availability is limited for some countries. For instance, manufacturing value-added data for Afghanistan is only available from 2002 onward, while adult literacy data begins in 1979. Despite these gaps, the results of the panel data econometrics remain valid and reliable.

Finally, this study is based on cross-country and regional data, offering a broad overview of the issue. To gain more nuanced insights, future research could benefit from deeper analysis through case studies using household-level data, focusing on one or a few LDCs to complement the findings of this research.

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Appendix A: Summary Statistics

Variables	No. of observation	Mean	Std. Dev.	Min	Max
GNI per capita (constant 2015 US\$)	2,586	1275.403	1526.193	100	16438.64
Life expectancy at birth (years)	2,550	54.434	8.937	18.91	79.21
Mortality rate, under-5 (per 1,000 live births)	2,554	136.554	75.724	6.50	372.80
Adult (15 yrs.~) literacy rate (%)	2,331	50.467	23.382	5.30	99.10
Secondary school enrollment (% gross)	2,565	28.106	21.582	1.01	96.66
Manufacturing, value added (% of GDP)	1,668	8.976	5.074	0	33.35
Gross domestic savings (% of GDP)	1,585	7.116	21.394	-136.86	83.29
Population growth (annual %)	2,591	2.462	1.291	-6.77	11.53
Merchandise trade (% of GDP)	2,155	49.213	28.282	2.72	263.33
Net ODA received per capita (current US\$)	2,536	97.702	235.758	0	4473.38

Data Source: World Development Indicators Database of the World Bank (accessed on 7 July 2024).

Appendix B: Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) GNI per capita, (constant 2015 US\$)	1									
(2) Life expectancy at birth (years)	0.336	1								
(3) Mortality, under-5 (per 1,000 live birth)	-0.338	-0.902	1							
(4) Adult (15 yrs.~) literacy rate (%)	0.502	0.611	-0.741	1						
(5) Secondary school enrollment (% gross)	0.392	0.722	-0.727	0.594	1					
(6) Manufacturing, value added (% of GDP)	-0.021	0.037	-0.058	0.058	-0.086	1				
(7) Gross domestic savings (% of GDP)	0.413	0.241	-0.215	0.255	0.181	0.023	1			
(8) Population growth (annual %)	0.091	-0.057	0.118	-0.106	-0.27	-0.165	0.150	1		
(9) Merchandise trade (% of GDP)	0.338	0.243	-0.323	0.411	0.325	-0.101	0.137	-0.075	1	
(10) Net ODA received per capita (current US\$)	0.247	0.427	-0.406	0.321	0.405	-0.243	-0.036	-0.134	0.2	1

Data Source: World Development Indicators Database of the World Ban (accessed on 7 July 2024).