

International Journal of Development and Sustainability
ISSN: 2186-8662 – www.isdsnet.com/ijds
Volume 14 Number 3 (2025): Pages 269-310
https://doi.org/10.63212/IJDS23042101

Empirics of industrialisation club convergence and their drivers: Regional evidence

Charles Shaaba Saba *, Nicholas Ngepa, Abieyuwa Ohonba

School of Economics, College of Business and Economics, University of Johannesburg, Auckland Park Kingsway Campus, PO Box 524 Auckland Park, Johannesburg, South Africa

Abstract

Industrialisation remains a fundamental driver of economic growth and development, yet the convergence patterns of industrialisation across regions have received limited empirical attention. Therefore, this study investigates club convergence in industrialisation from 2000 to 2018 using a convergence algorithm developed by Phillips and Sul. We analysed data from 183 countries, which were further divided into five regions: Sub-Saharan Africa (SSA), the Middle East and North Africa (MENA), Europe and Central Asia (ECA), East and South Asia and the Pacific (ESAP), and the Americas. Additionally, we examined potential factors contributing to the formation of convergence and divergence clubs within these regions. The results indicate a lack of panel convergence, with a negative speed of convergence across the five regions. However, the final club results obtained from the iteration procedure vary across regions. The determinants of industrialisation play both significant and insignificant roles in determining the likelihood of a country belonging to a particular convergence club within each region. This study found that, at the regional level, the convergence process in industrialisation has yet to reflect the desirable outcomes of industrial and manufacturing policies with similar characteristics. However, the narrative changes when the algorithm forms clubs for each region.

Keywords: Industrialisation; Convergence Club; Transition Paths; Panel Data; Regional Analysis

JEL classification: C23, O14, O50

Published by ISDS LLC, Japan | Copyright © 2025 by the Author(s) | This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.



Cite this article as: Saba, C.S., Ngepah, N. and Ohonba, A. (2025), "Empirics of industrialisation club convergence and their drivers: Regional evidence", *International Journal of Development and Sustainability*, Vol. 14 No. 3, pp. 269-310.

* Corresponding author. *E-mail address:* sabacharlesshaaba@yahoo.com

1. Introduction

In economics, the term "club convergence" refers to a situation where different groups or clubs of countries or regions converge to different steady states or equilibria, rather than all converging to a common equilibrium and vice versa for divergence club. Phillips and Sul (2007) propose a new econometric test for club convergence that can identify whether different groups of countries converge to different steady states or to a common steady state. The test is based on a two-step procedure: first, they estimate the number of clubs and the steady state for each club, and second, they test whether there is any evidence of cross-club convergence or divergence. In their paper, Phillips and Sul (2007) argue that club convergence is a more realistic way to model economic growth and development than traditional convergence models that assume all countries converge to a single steady state. They show that their club convergence model fits the data better than the traditional models, and they use their model to analyze the convergence patterns of different groups of countries. The two research questions that have motivated this study are: (i) Is there evidence of an industrialisation convergence club at the regional levels? and (ii) What are the potential factors that could drive the final convergence club in industrialisation at the regional level? To answer these research questions, we adopted Phillips and Sul (2007, 2009) convergence club and multinomial logit econometric approaches to investigate industrialisation convergence club at the regional levels and the possible likely factors that could drive the final convergence club, respectively. Regional convergence in industrialisation implies countries within the same region that are less industrialised are gradually catching-up with the more industrialised ones. In other words, countries within the same region are moving towards attaining the same level of industrial development. Having insight on this particular theme that has suffered neglect in the literature is still an issue that must be answered empirically. This is because regionally, countries are confronted with numerous obstacles that slow down their process of industrialisation. For example, the study of Haraguchi et al. (2019) identifies economic, demographic and geographic as drivers/factors that could contribute to successful industrialisation in developing countries. These drivers include education, financial sector development, capital openness, investments, trade management, etc.

Despite these factors at play in the industrial/manufacturing sector, over the years the sector in countries have experienced some level of enormous change due to the above mentioned and even more drivers. As a result, the sector has made some significant progress (Haraguchi et al., 2019). Even though countries have experienced some level of industrialisation, many are still faced with the obstacle of it serving as an engine of economic growth (Kaldor, 1966, 1967). That is why a continuous investigation into the drivers of successful industrialisation for the purpose of policy direction cannot be over emphasized. This is due to the increasingly unstable economic, demographic, and political conditions across the globe. Due to the sector's importance to economies, researchers/policymakers and the international community/organisations continues to be attracted by it for policy discussion purposes and other related matters meant to promote the sector (*inter alia*: Weiss and Clara, 2016; Hallward-Driemeier and Nayyar, 2017; World Bank, 2017; UNIDO, 2018). As a result, Rodrik (2013) was motivated to examine the convergence in manufacturing industries for 118 countries.

Given the sector's role in an economy, the question of whether countries are regionally converging/ diverging in industrialisation attainment over time, ought to be a cogent matter for policymakers. This is

because the industrial/manufacturing sector is a key driver of growth (Kaldor, 1966, 1967). And that is why the repercussion of some countries being left behind at the regional level could also mean that they are not catching up with the advanced economies when it comes to growth, which can be dangerous for the economy. For this reason, countries regional levels need to make efforts in tackling the impediments to industrial development. The way countries across the regions undertake their industrial development programmes and policies differs. As a result, regional governments must be aware of those differences/gaps, as well as how well they have succeeded in comparison to others. Furthermore, identifying and comprehending the potential factors responsible for a country's convergence/divergence in industrialisation will inform scholars, the global community, and policymakers to promptly develop effective policies that can reduce the disparity between developed/highly industrialised and developing/less industrialised economies at the regional levels. This is why this article takes a distinct approach.

Regional convergence in industrialisation is crucial for achieving balanced economic development, reducing regional disparities, and promoting national cohesion (Ottaviano and Puga, 1998; Baldwin et al., 2001; Ottaviano and Thisse, 2004). This is because when industrialisation spreads evenly across regions, it prevents the overconcentration of industries in specific areas, leading to more uniform economic development (Ottaviano and Puga, 1998; Baldwin et al., 2001; Ottaviano and Thisse, 2004). This balance ensures that all regions contribute to and benefit from national economic growth. Converging industrial development across regions could help mitigate income and employment inequalities. By providing similar industrial opportunities nationwide, disparities in living standards between regions can be minimised. A country with multiple industrialised regions can better adapt to global market changes. Diversified industrial hubs reduce the risk of economic downturns affecting the entire nation, thereby enhancing overall economic resilience. For example, Oyelaran-Oyeyinka and Lal (2016) examines the effects of industrialisation on regional development in Africa, underscoring the significance of regional convergence for sustainable growth.

Therefore, testing for regional club convergence in industrialisation is long overdue and important for a variety of reasons. Firstly, it's inference can help to determine whether industrial development aims are being achieved or not. Secondly, it helps to determine factors responsible for disparities in industrialisation convergence among countries at the regional level. Thirdly, it helps to establish the concept of a security web, which implies that neighbouring countries serve as a source of motivation for other countries to attain industrial development. Therefore, any expansion and development in the industrial sector of a particular country challenges another country that can be either close by or far off. The tendency or potential for taking advantage, for instance, may be diminished in circumstances when countries attempt to compare or benchmark their levels of industrial growth to those of other countries. Studies on industrialisation convergence remain limited in the literature, and the exploration of advanced estimation techniques that yield more robust results is still incomplete. Based on these gaps and the following considerations, this study contributes to the empirical literature. (i) we utilised the Phillips and Sul (hereafter P&S) (2007, 2009) club convergence approach due to its advantages over methods used in studies such as Rodrik (2013) and others. For a detailed discussion on the significance of this method, readers are encouraged to consult P&S (2007, 2009) as well as related studies by Saba and Ngepah (2020), Saba and David (2020), Saba (2020, 2021), and Saba et al. (2021), which also employed this approach and highlight its strengths. (ii) while few studies such as that of Abegaz (2002) explore the leaders and latecomer's structural convergence in manufacturing industries, Rodrik (2013) examines manufacturing productivity convergence at the international level, while

Lemoine et al. (2015) utilise a similar approach used by Rodrik (2013) to test whether manufacturing convergence also operates in China. Erten and Schwank (2021) revisit unconditional convergence within manufacturing by focusing on technology intensity industries; Ortiz and Ruiz (2010) investigates convergence of manufacturing (in terms of added manufacturing value) in Sonora; Bénétrix et al. (2015) report industrial output growth around the poor periphery, while for the newly industrialised countries, Dong et al. (2021) focus on investigating how industrial convergence affects the energy efficiency of the manufacturing sector. To our own knowledge, no study has examined club convergence in industrialisation (defined as manufacturing value added as a percentage share of GDP) at the regional level. This is cogent because levels of industrial/ manufacturing development between countries *could* either widen or contract the existing poverty and social, employment and economic inequalities (Delgado et al., 2024; Yamada and Otchia, 2025). Therefore, if less industrialised countries are catching up with the industrialised nations, it means that the levels of industrialisation gaps are steadily closing, and consequently, this could reduce socio-economic challenges facing the countries. As the dataset used in this study comprised 183 countries with varying degrees of industrialisation, it is possible that none of them converged at the panel level (Abramovitz, 1986). However, it's also possible that a subset of countries within each region experienced convergence during the study period. This could be due to the fact that neighboring countries sometimes engage in direct competition and benefit from spillover effects. The countries in the dataset were further classified into five regions: Sub-Saharan Africa (SSA), Middle East and North Africa (MENA), Europe & Central Asia (ECA), East & South Asia and the Pacific (ESAP), and America, which encompasses Latin America & the Caribbean and North America. To address the issue of grouping and determine whether convergence in industrialisation is region-specific, we utilised regional panel data. Consequently, it is anticipated that the empirical convergence findings at the panel and club levels will lead to distinct policy recommendations and strategies for the various sub-clubs/panels that may emerge. Dividing the 183 countries into five regions is crucial because countries within the same region may exhibit similar economic and political behaviors. Previous studies neglected to examine convergence in industrialisation for each of the regions specified, rendering this study unique. (iii) to investigate a wide range of possible determinants of the convergence club of industrialisation, we employed a multinomial logit model, based on the convergence club of industrialisation tests. As the need for industrialisation convergence among countries grows more pressing, the literature on the potential drivers that may influence a country's probability of belonging to a convergence club is currently lacking. Therefore, this study is necessary. In identifying the possible determinants, we focused on factors that have been shown to drive levels of industrialisation, drawing from previous empirical research on the drivers of industrialisation (Haraguchi et al., 2019). The availability of the World Bank dataset assisted us in contributing to the empirical literature on convergence/divergence in industrialisation and its determinants by covering more countries compared to the previous studies of Abegaz (2002), Rodrik (2013), Lemoine et al. (2015), among others. With the World Bank dataset, scholars can obtain results, draw inferences, and conclude and recommend relevant policies. (iv) We examine the coupling and decoupling of the panel and club relative transition paths for each region to differentiate convergence clubs from "transition" clubs, i.e. groups of countries with similar transition dynamics. This expands on the article's main objective. The convergence relative transition paths provide a visual assessment of how countries exhibited comparable transition dynamics during the industrialisation study period.

In summary, this study aims to achieve the following objectives: (a) to investigate the existence of industrialisation convergence clubs at the regional level using the Phillips and Sul (2007, 2009) convergence

clustering algorithm; (b) to examine the determinants influencing a country's likelihood of belonging to a particular industrialisation convergence club through the application of a multinomial logit model; (c) to analyse the speed of convergence across different regional industrialisation clubs and assess the disparities in industrial development; (d) to explore the role of economic, demographic, geographic, and institutional factors in shaping industrialisation convergence patterns; and (e) to provide empirical insights that can inform policymakers on strategies to enhance industrialisation convergence and bridge the gap between less and more industrialised economies within each region.

The study findings suggest that industrialisation does not exhibit panel convergence in Sub-Saharan Africa (SSA), the Middle East and North Africa (MENA), Europe and Central Asia (ECA), East and South Asia and the Pacific (ESAP), and the Americas. This implies that countries within each region are not converging toward a common steady state. However, the clustering algorithm approach produced different results.

The remaining sections of this paper provide a brief overview and analysis of the patterns of the manufacturing share of GDP, followed by the literature review, methodology, results and discussion, and conclusions in Sections 2, 3, 4, 5, and 6, respectively.

2. A brief overview and trends in the manufacturing share of GDP across regions from 2000 to 2018

This section takes a brief look at the average trends of manufacturing share of GDP (MGDP) between 2000 and 2018 for the five regions, namely: Middle East and North Africa (MENA); Europe & Central Asia (ECA); East & South Asia and the Pacific (ESAP); and America (which comprises of Latin America & Caribbean and North America). The manufacturing share of Gross Domestic Product (MGDP) is a key indicator of industrialisation, representing the manufacturing sector's contribution to a nation's economic output (Statistics Division UNIDO, 2017). A higher MGDP share indicates a strong manufacturing sector, which is typically linked to advanced industrial development. This metric measures the extent to which an economy has shifted from primary sectors, such as agriculture, to higher value-added industrial activities. Manufacturing plays a crucial role in driving technological innovation and productivity growth. A robust manufacturing sector fosters the development and dissemination of new technologies, thereby improving overall economic efficiency (Wan et al., 2022). Consequently, this metric is used in this study.

Figure 1 shows that the ECA region had the highest manufacturing share of GDP during the study period. Although the region experienced a sharp decline between 2008 and 2010, likely due to the global economic recession during that period, it remained the leader. America had the second-highest manufacturing share of GDP after ECA. As shown in the graph, America followed a similar trend as MENA and ESAP from 2000 to 2005 before surpassing them again. Compared to other regions (MENA, ECA, ESAP, and America), SSA had the lowest manufacturing share of GDP between 2000 and 2011, indicating weak industrial performance. However, SSA later improved, surpassing ESAP between 2013 and 2018 and eventually moving above MENA. Analysing the performance patterns of each region provides insight into the collective performance of countries within them. Therefore, this study applies the convergence clustering algorithm of Phillips and Sul (2007, 2009) to investigate industrialisation convergence within each region.

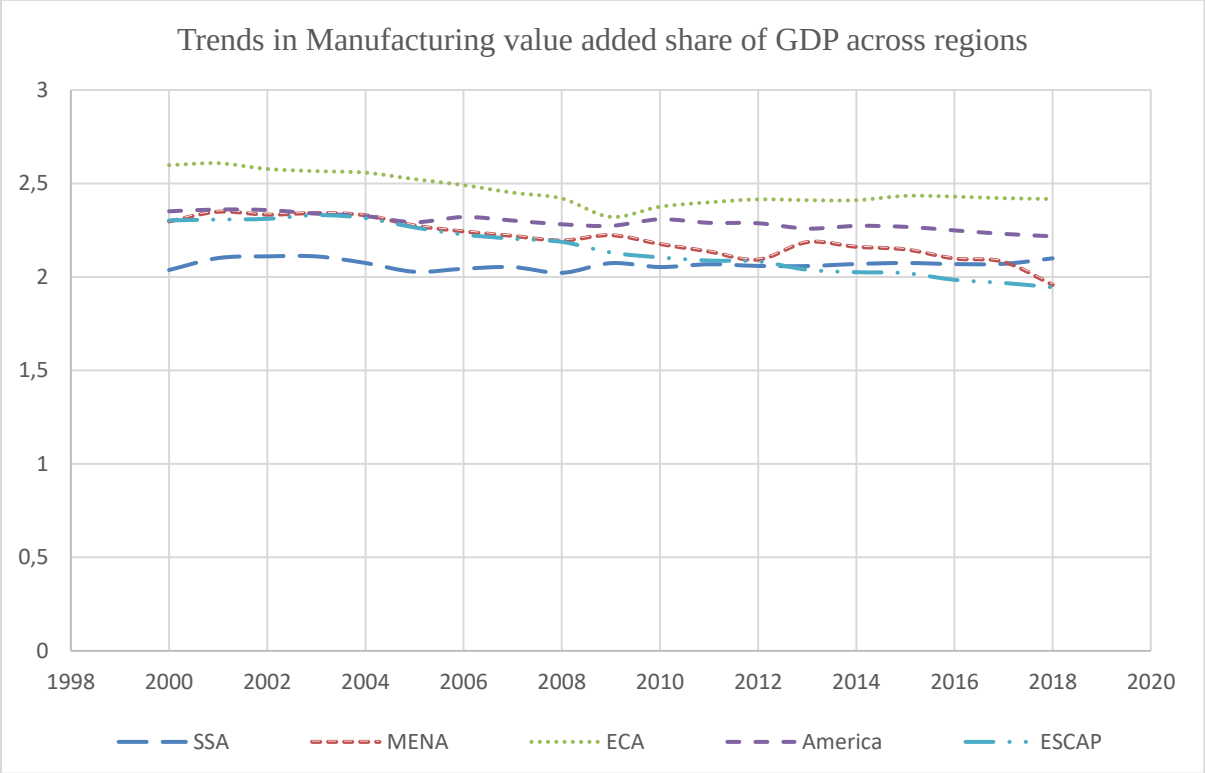


Figure 1. Average manufacturing value added share of GDP for each of the five regions (Source: Author's computations using WDI data).

3. Literature review

The concept of convergence was first introduced in the Solow (1956) study and further expanded by Swan (1956), Barro (1991), Barro et al. (1991), and Barro and Sala-i-Martin (1992). The neoclassical growth model provides the foundation for this concept, which posits that poorer nations can catch up with wealthier nations in terms of per capita income (Solow 1956). Over time, various methodologies have been applied to test this hypothesis across different economic fields, including income, health, public spending, and environmental sustainability. Two widely used convergence measures in the literature are beta and sigma convergence (inter alia: Durlauf and Quah, 1999; Romer, 1996; Barro and Sala-i-Martin, 1995). Beta convergence examines the speed at which poorer economies catch up with wealthier ones, while sigma convergence evaluates the reduction in cross-sectional variance of economic growth over time (Rey and Montouri, 1999). These concepts have been extended beyond income to explore sectoral dynamics, including industrialisation.

Given the central role of industrialisation in economic development, applying the convergence concept to manufacturing output is critical, as less industrialised economies may have the potential to catch up with highly industrialised ones. However, the empirical application of convergence to industrialisation remains limited. A few studies, including Rodrik (2013), Bénétrix et al. (2015), Erten and Schwank (2021), and Dong et al. (2021), have attempted to fill this gap by examining industrial convergence. Rodrik (2013), for instance, analysed unconditional convergence in manufacturing productivity across 118 countries from 1965 to 2005

using a panel regression approach. His findings provided strong evidence of unconditional convergence in manufacturing industries' labor productivity, as well as sigma convergence when the sample was divided into smaller country groupings. However, aggregate convergence in low-income countries remained weak due to their small manufacturing employment shares, which slowed industrialisation.

Expanding on this, Erten and Schwank (2021) explored the role of technology intensity across industries in re-examining unconditional convergence within manufacturing. Using a panel regression approach, they found that low- and medium-technology-intensive industries in Sub-Saharan Africa and Latin America experienced slower convergence than high-technology-intensive industries. In developed countries, however, convergence was more uniform across medium- and high-technology industries, whereas low-technology industries exhibited slower convergence. The study attributed these variations to increased global integration, which has enabled developing countries to compete in the international market. Similarly, Dong et al. (2021) analysed the impact of industrial convergence on energy efficiency in manufacturing, applying a spatial autoregressive combined model. Their findings revealed that industrial convergence enhanced energy efficiency through spillover effects resulting from imitation and learning. Additionally, convergence fostered technological innovation, optimized factor structures, and supported industrial scale expansion.

Several studies have also sought to measure the degree and performance of industrial convergence. Fai and Von (2001), Xing et al. (2011), and Chen et al. (2019) employed the Herfindahl index, input-output analysis, and coupling evaluation methods to quantify the degree of industrial convergence. On the other hand, Garcia-Murillo and MacInnes (2001), Li et al. (2017), Gao and Lu (2018), and Cao et al. (2020) assessed the performance of industrial convergence, finding that it positively influences asset returns, metabolic efficiency, and local innovation efficiency. Abegaz (2002) examined structural convergence in manufacturing industries across developing and developed countries using cross-country panel data. His findings indicated that technological penetration and demand produced only weak convergence of industrial structures between industrialised and less industrialised nations. Ortiz and Ruiz (2010) provided further regional insights by analysing the convergence of manufacturing in Sonora at the inter-municipal level, finding that while the region experienced significant municipal-level manufacturing convergence, declining resource utilisation constrained long-term convergence. Lemoine et al. (2015) explored industrial convergence and spatial rebalancing in China, supporting Rodrik's (2013) assertion that industrial growth is highly context-dependent.

While previous research on industrial convergence has provided important insights, most studies have not utilised the P&S (2007, 2009) convergence test. This technique is particularly useful as it defines a convergence club as a group of economies with sufficiently similar structural characteristics that enable them to converge toward the same long-term equilibrium. From an industrial development perspective, convergence clubs can emerge when different regions follow distinct industrialisation pathways. Understanding such diversity is essential in addressing regional disparities in industrial development.

Industrialisation does not occur in isolation but is influenced by various economic, demographic, geographic, and governance factors. Both micro- and macro-level studies have explored these determinants. Micro-level research, such as studies by Fafchamps et al. (2008), Söderbom et al. (2006), Söderbom and Teal (2003), and Bigsten et al. (2003, 2004), has focused on manufacturing firms' performance, export success, and survival. At the macro level, Soludo et al. (2004), Marti and Ssenkubuge (2009), Dihn et al. (2012), Mijiyawa (2017), and Haraguchi et al. (2019) have examined how economic policies, governance, geography, and demographics shape industrialisation.

These macroeconomic factors are particularly relevant in the context of regional convergence, as they influence the ability of regions to industrialise at a similar pace. For instance, Dihn et al. (2012) identified key opportunities and obstacles to light manufacturing development in Sub-Saharan Africa, highlighting that resource availability and low labor costs could facilitate industrialisation. However, challenges such as poor infrastructure, limited access to credit, weak human capital, and inefficient input markets hinder industrial expansion. These constraints contribute to regional disparities in industrialisation, preventing certain regions from converging with others.

Similarly, Mijiyawa (2017) analysed the factors influencing manufacturing development across 53 African countries between 1995 and 2014 using the System GMM technique. The study found that urbanisation and FDI inflows did not necessarily promote manufacturing growth, while GDP per capita and manufacturing share of GDP exhibited a U-shaped relationship. Additionally, good governance, government effectiveness, and low corruption levels were found to enhance industrialisation. These findings underscore the role of governance in enabling or hindering convergence in industrialisation across regions.

Haraguchi et al. (2019) further examined the determinants of successful industrialisation by analysing two separate periods (1970-1990 and 1991-2014). Their results demonstrated that factor endowments, demographic conditions, and economic stability were critical to industrial success. The study emphasized the importance of institutional stability, investment in financial sector development, education, and the management of trade and capital openness as key policy recommendations. Given that industrialisation is a dynamic process that varies across regions, these factors directly influence the likelihood of a country belonging to a particular convergence club.

By integrating these factors into an analysis of regional convergence, this study seeks to contribute to the understanding of how industrialisation trajectories differ across regions and what conditions foster convergence. Examining both industrialisation and regional disparities through the lens of convergence allows for more informed policy decisions aimed at fostering balanced economic growth.

Our research departs from previous studies in several key aspects. Firstly, we employ the Phillips and Sul (2007, 2009) convergence test to assess the divergence or convergence of industrialisation across five regions. Unlike conventional convergence tests, such as beta or sigma convergence, which are limited in detecting group convergence within a series, the Phillips and Sul approach allows for the identification of convergence clubs and their members in an endogenous manner. To the best of our knowledge, this method has not yet been applied to industrialisation studies at regional levels. Secondly, we utilise a multinomial logit model to examine the determinants influencing a country's membership in a particular convergence club. Although industrialisation plays a crucial role in long-term economic development, empirical research remains limited in exploring the factors driving convergence clubs across regions. This study seeks to address this gap in the literature.

4. Methodology and data

This study employs the Phillips and Sul (P&S) (2007, 2009) methodology due to its advantages over conventional approaches. First, it does not assume variable stationarity or common factors. Second, it utilises a nonlinear time-varying factor model. Third, it accounts for transition heterogeneity and divergence. Fourth, it identifies club convergence, distinguishing different convergence paths among heterogeneous economies.

Lastly, the P&S (2009) method aids in merging clubs when the clustering procedure overestimates their number. These features make it an ideal framework for analysing industrialisation convergence across regions. This section outlines the steps involved in identifying industrialisation convergence clubs using the P&S (2007, 2009) club convergence approach and estimating the determinants of convergence clubs using a multinomial logit model.

4.1. The P&S log-t convergence test

The Phillips and Sul (2007, 2009) log-t test is used to determine whether industrialisation across different countries follows a common growth path (convergence) or whether groups of countries move toward different steady states (club convergence). The model assumes that each country's industrialisation level follows a common growth factor but may also be influenced by individual country-specific factors. It can be expressed as:

$$log\ X_{it} = \delta_{it}\mu_t \quad (1)$$

where:

- X_{it} is the industrialisation level (measured by manufacturing value added as a percentage of GDP),
- μ_t is the common growth factor that applies to all countries,
- δ_{it} is the idiosyncratic factor loading that varies across countries and over time.

If δ_{it} moves toward a constant value over time for all countries, then industrialisation is converging at a global level. Otherwise, subgroups (convergence clubs) exist

Step-by-Step Explanation of the Log-t Convergence Test

- Compute the Relative Transition Parameter:

  To measure how each country's industrialisation level evolves relative to the average across all countries, we compute the relative transition parameter:

$$h_{it} = \frac{log\ X_{it}}{\frac{1}{N}\sum_{i=1}^{N} logX_{it}} = \frac{\delta_{it}}{\frac{1}{N}\sum_{i=1}^{N}\delta_{it}} \quad (2)$$

Equation (2) This tells us whether a country's industrialisation is catching up or diverging from the average.

- Calculate the Cross-Sectional Variance:

  Next, we compute the cross-sectional variance of the relative transition parameter:

$$H_t = \frac{1}{N}\sum_{i=1}^{N}(h_{it} - 1)^2 \quad (3)$$

From Equation (3) if this variance decreases over time, the countries are converging. If not, there is no global convergence.

The testing procedure of the above equations involves the following three steps:

- To determine the cross-sectional variance ratio as captured by the ratio of the hypotheses:

  H_1/H_t (From point 3 above).

- Estimation of the following OLS regression:

$$\log\left(\frac{H_1}{H_t}\right) - 2logZ(t) = \hat{\varphi} + \hat{b}logt + \hat{\mu}_t, for\ t = [jT], [jT]+1, \dots, T \quad for\ some\ j > 0 \qquad (4)$$

- One-side t test for $\tau \geq$ using $\hat{b}(\hat{b} = 2\hat{\tau})$ and Heteroskedasticity and Autocorrelation Consistent (HAC) standard error. j ($j \in (0, 1)$) is a truncation parameter that shortens the regression by a certain fraction of the first observations. Monte Carlo simulations by P&S (2007) suggest the use of j = 0.3 and $Z(t) = log\ t$ for samples up to T = 183. The standard critical value to reject/accept the null hypothesis of convergence is at the 5% level if $t_{\hat{b}} < -1.65$. Where $\hat{b}$ *is equal to* $2\hat{\tau}$ and j indicates the fraction of the sample that needs to be discarded for the regression analysis.

4.2. Club clustering and merging algorithms

According to the P&S (2007) approach, the steps explain the club clustering algorithm procedures to identify the divergent/convergent clubs and they include *"Step 1: order the N members of the panel according to the last observation; Step 2: Use the k highest members (from Step 1) for all different values of k(i.e* $2 \leq K < N$*). They then estimate a sequence of* $log\ t$ *regression by choosing the highest generated convergence t-statistic* $t_{\hat{b},k}$ *(where* $t_{\hat{b},k} > -1.65$ *so that convergence was ensured for the corresponding club). The corresponding club then forms the core convergence club; Step 3: add one country at a time to the core club (if* $t_{\hat{b}} > c^*$*) and run the* $log\ t$ *regression; and Step 4: the second convergence club is formed (if* $t_{\hat{b}} > c^*$*) after running the* $log\ t$ *regression for all the countries that diverges in the previous step. In case it was rejected, the algorithm repeated steps 1-3 for the remaining countries to determine whether the group itself could be subdivided into convergence clusters. If there was no k in step 2 for which* $t_{\hat{b}} > -1.65$*, we concluded that the remaining countries displayed divergent behaviour."* We used the P&S (2009) technique to test the robustness of our analysis, because, according to P&S (2009), the P&S (2007) approach has a tendency to overstate the number of clubs compared to the actual number that it ought to be. The application of the P&S (2009) approach is therefore essential to avoid inaccurate results and analysis. Detailed explanations of this methodology are available in P&S (2009), Saba and Ngepah (2020), Du (2017), among others. We employed the updated STATA code provided by Du (2017).

4.3. Multinomial logit specification approach

The study used a multinomial logit regression technique to determine the possible drivers of industrialisation final club convergence. The details of the explanatory variables (that is, the conditioning vector of variables) are found in Table 1, and are the likely variables that drive countries belonging to different final club convergence. Let Z_i represent a variable that shows whether ith country belongs to a specific final club, while $Prob(Z_i = v)$ reveals the probability that ith country belongs to the vth final club. Let B_i be the $Kx1$ conditioning vector of variables which determines ith country to belong to a particular final club. Let Ω_v be the $Kx1$ parameter vector where v takes on the values of 1, 2, …, J. While J stands for the number of the final clubs. Therefore, the probability that ith country will belong to vth final club is as follows:

$$Prob(Z_i = v) = \frac{\exp\,(B_i^t \Omega_v)}{\sum_{k=1}^{J}(B_i^t \Omega_k)} \qquad (5)$$

For recognition purposes, there is a need to place a coefficient restriction on the base outcome (which is the reference class) Υ as $\Omega_{\Upsilon} = 0$. Therefore, the log odds ratio can be obtained as:

$$log\left(\frac{Prob(Z_i=v)}{Prob(Z_i=\Upsilon)}\right) = B_i^{\iota}(\Omega_v - \Omega_{\Upsilon}) = B_i^{\iota}\Omega_v \quad (6)$$

Ω_v is the parameter estimate based on the final club referent's values, therefore, we draw inference from the multinomial logit regression by making use of the explanatory variables. Putting other explanatory variables on hold, the logit of the final club v relative to the referent final club Υ is predicted to change by its respective parameter estimate. The study used final club 4 as the base outcome for the models below:

$$log\left(\frac{Prob(Z_i=1)}{Prob(Z_i=4)}\right) = \Omega_{1,1} + \Omega_{2,1}\sum_{i=1}^{n=10} W_i \quad (7)$$

$$log\left(\frac{Prob(Z_i=2)}{Prob(Z_i=4)}\right) = \Omega_{1,2} + \Omega_{2,2}\sum_{i=1}^{n=10} W_i \quad (8)$$

$$log\left(\frac{Prob(Z_i=3)}{Prob(Z_i=4)}\right) = \Omega_{1,3} + \Omega_{2,3}\sum_{i=1}^{n=10} W_i \quad (9)$$

where W_i is a vector of explanatory variables for the drivers of final club convergence in industrialisation, which can be found in Table 1. Where $\Omega_{1,1}$, $\Omega_{1,2}$ *and* $\Omega_{1,3}$ in Equation 7 to 9 are the constant parameters; and $\Omega_{2,1}, \Omega_{2,2}$ *and* $\Omega_{2,3}$ are the estimated parameters. $Prob$ stands for probability. In statistics, estimated parameter refers to a value that is obtained from a sample and is used to estimate an unknown panel parameter. Constant parameters in this study are fixed values that do not change in a given model or equation.

Based on the above approaches we test the following hypotheses:

- *Null hypothesis*: There is no evidence of industrialisation convergence club at the regional levels.
- *Alternative hypothesis*: There is evidence of industrialisation convergence club at the regional levels.
- *Null hypothesis*: There are no significant factors that could drive the final convergence club in industrialisation for the regions.
- *Alternative hypothesis*: There are significant factors that could drive the final convergence club in industrialisation for the regions.

4.4. Data and variables description

This study used panel data for 183 countries between 2000 to 2018. The countries were further sub-divided into five regions, namely; Sub-Saharan Africa (SSA); Middle East and North Africa (MENA); Europe & Central Asia (ECA); East & South Asia and the Pacific (ESAP); and America (which comprises of Latin America & Caribbean and North America). The classification was based on that of the World Bank. The data for the variables were sourced mainly from the World Bank's World Development Indicator given that it is a reliable source of data for empirical analysis. The selection of countries was based on data availability. Regarding the determinants of final club convergence for industrialisation, we adopted variables commonly used in previous studies as potential factors influencing a country's probability of belonging to a specific convergence or divergence group. All control variables in this study are potential drivers of industrialisation, either positively or negatively. These variables can be broadly categorised into economic/macroeconomic, financial,

demographic, and governance indicators. Chandra (2003) defines industrialisation as *"the increase of the manufacturing value-added share of GDP,"* while Echaudemaison (2003) characterizes it as *"an increasing share of the secondary sector in terms of employment and GDP."* For an economy to be considered industrialising, both indicators should exhibit a significant increase or improvement over time. However, due to data constraints, we primarily used manufacturing value-added as a percentage of GDP (MGDP) as a proxy for industrialisation. MGDP is widely recognized in the literature as a reliable proxy for industrialisation and benefits from greater data availability (*inter alia*: Du and Xie, 2020; Gui-Diby and Renard, 2015; Rodrik, 2016; Haraguchi et al., 2019; Dodzin and Vamvakidis, 2004; Mijiyawa, 2017).

GDP per capita (GDPC) is included as a determinant of industrialisation based on prior literature. It serves two primary roles: (i) as a proxy for income levels (Gui-Diby and Renard, 2015) and (ii) as a measure of differences in development levels across countries (Haraguchi et al., 2019). According to Gui-Diby and Renard (2015), GDPC reflects a household's potential real purchasing power, while Haraguchi et al. (2019) argue that less industrialised countries have a higher probability of catching up with industrialised nations. This occurs because lower levels of economic development incentivize long-term industrialisation efforts. Moreover, poor countries can achieve unconditional convergence with the technological frontier due to higher productivity growth rates in their manufacturing sectors (Rodrik, 2013).

To assess the role of investment in the convergence or divergence process, we include gross fixed capital formation as a percentage of GDP (GFCF). Increased investment is a key driver of productive capacity and aggregate demand, thereby fostering industrialisation (Weiss & Clara, 2016; Haraguchi et al., 2019). Financial development is captured using domestic credit to the private sector as a percentage of GDP (FDV). Schumpeter was among the first scholars to highlight the financial sector's importance in economic production. The financial sector facilitates industrial and manufacturing activities by supporting individuals, entrepreneurs, and firms with access to capital, enabling innovation and technological advancements (Rajan and Zingales, 1998; Haraguchi et al., 2019). Given its widespread use in empirical studies, FDV is employed as a standard measure of financial development (inter alia: Haraguchi et al., 2019; Saba and Ngepah, 2020; Olaniyi, 2021; Olaniyi and Oladeji, 2021).

Agriculture, value added as a percentage of GDP (AGRI), is included because the expansion or contraction of one sector often corresponds to changes in another (Gui-Diby & Renard, 2015; de Souza, 2015). Structural transformation—the reallocation of resources from agriculture to industrial and manufacturing activities—is a fundamental characteristic of economic development (Lewis, 1954; Botta, 2009; Carmignani and Mandeville, 2014; Diao et al., 2017). Given that agricultural activities remain a significant component of the selected economies, AGRI is a relevant variable for understanding sectoral shifts in convergence clubs. Foreign direct investment (FDI), measured as net inflows as a percentage of GDP, is included due to its potential to promote industrialisation. Foreign investors contribute both financial capital and knowledge assets, fostering industrial expansion. Theoretically, Rodríguez-Clare (1996) and Markusen & Venables (1999) have demonstrated that FDI can act as a catalyst for industrialisation.

Geographical factors such as total population (POP) are also crucial for industrialisation (Easterly & Levine, 2003; Zhou, 2009; Haraguchi et al., 2019). Population size influences demand and shapes the domestic market for industrial goods (Guadagno, 2016). The literature suggests that larger populations increase demand for manufactured products, allowing firms to achieve economies of scale by lowering per-unit production costs (Mensah, 2020). Institutional and governance factors also play a critical role in industrialisation. Since

industrial and manufacturing activities operate within a governance framework, it is essential to assess their influence on regional industrialisation convergence clubs. Stable governance and institutional structures are vital for both public and private sector efficiency and are key determinants of economic and industrial development (Xu, 2010). Strong governance also ensures the effective implementation of short- and long-term industrial policies (Haraguchi et al., 2019). We include three governance indicators, detailed in Table 1. The list of selected countries for each convergence club is presented in Table 2.

Table 1. Variable description and sources

Variables	Description	Sources
MGDP	Manufacturing, value added (% of GDP)	WDI database
AGRI	Agriculture, value added (% of GDP)	WDI database
GDPC	GDP per capita (constant 2010 US$)	WDI database
GFCF	Gross fixed capital formation (% of GDP)	WDI database
FDV	Domestic credit to private sector (% of GDP) proxy for financial development	WDI database
FDI	Foreign direct investment, net inflows (% of GDP)	WDI database
FLA	Inflation, GDP deflator (annual %)	WDI database
POP	Population, total	WDI database
CRR	Control of Corruption	WGI database
POL	Political stability and absence of violence/terrorism	WGI database
REGQ	Regulatory quality	WGI database

Note: WDI represents World Bank's World Development Indicators. WGI represents World Bank's World Governance Indicators. We had the problem of missing data for some variables, but this was handled by means of interpolation and extrapolation of data. Studies that have used this technique include those by Saba and David (2020).

Table 2. List of countries classified into five regions

Country id (cid)	**Sub-Saharan Africa (SSA)**	**Middle East and North Africa (MENA)**	**Europe & Central Asia (ECA)**	**East & South Asia and the Pacific (ESAP)**	**America**
1	Angola	Algeria	Albania	Afghanistan	Antigua and Barbuda
2	Benin	Bahrain	Armenia	Australia	Argentina
3	Botswana	Djibouti	Austria	Bangladesh	Aruba
4	Burkina Faso	Egypt, Arab Rep.	Azerbaijan	Bhutan	Bahamas
5	Burundi	Iran, Islamic Rep.	Belarus	Brunei Darussalam	Barbados
6	Cabo Verde	Iraq	Belgium	Cambodia	Belize
7	Cameroon	Israel	Bosnia and Herzegovina	China	Bolivia
8	Central African Rep,	Jordan	Cyprus	Fiji	Brazil

Country id (cid)	Sub-Saharan Africa (SSA)	Middle East and North Africa (MENA)	Europe & Central Asia (ECA)	East & South Asia and the Pacific (ESAP)	America
9	Chad	Kuwait	Czech Republic	Hong Kong SAR, China	Chile
10	Congo (Rep. of the)	Lebanon	Denmark	India	Colombia
11	Cote d'Ivoire	Libya	Estonia	Indonesia	Costa Rica
12	Dem. Rep. of the Congo	Malta	Faroe Islands	Japan	Cuba
13	Equatorial Guinea	Morocco	Finland	Kiribati	Dominica
14	Eritrea	Oman	France	Korea, Rep.	Dominican Republic
15	Eswatini	Qatar	Georgia	Lao PDR	Ecuador
16	Ethiopia	Saudi Arabia	Germany	Macao SAR, China	El Salvador
17	Gabon	Syrian Arab Republic	Greece	Malaysia	Grenada
18	Gambia	Tunisia	Greenland	Maldives	Guatemala
19	Ghana	United Arab Emirates	Hungary	Micronesia, Fed. Sts.	Guyana
20	Guinea	Yemen, Rep.	Iceland	Mongolia	Haiti
21	Guinea-Bissau		Ireland	Myanmar	Honduras
22	Kenya		Italy	Nepal	Jamaica
23	Lesotho		Kazakhstan	New Caledonia	Mexico
24	Liberia		Kyrgyz Republic	New Zealand	Nicaragua
25	Madagascar		Latvia	Pakistan	Panama
26	Malawi		Lithuania	Philippines	Paraguay
27	Mali		Luxembourg	Samoa	Peru
28	Mauritania		Moldova	Singapore	Puerto Rico
29	Mauritius		Montenegro	Sri Lanka	Saint Kitts and Nevis
30	Mozambique		Netherlands	Thailand	Saint Vincent and the Grenadines
31	Namibia		North Macedonia	Timor-Leste	Suriname
32	Niger		Norway	Tonga	Uruguay
33	Nigeria		Poland	Tuvalu	Venezuela, RB
34	Rwanda		Portugal	Vanuatu	Bermuda
35	Sao Tome and Principe		Romania	Vietnam	Canada
36	Senegal		Russian Federation		United States
37	Seychelles		Serbia		
38	Sierra Leone		Slovak Republic		
39	South Africa		Slovenia		

Country id (cid)	Sub-Saharan Africa (SSA)	Middle East and North Africa (MENA)	Europe & Central Asia (ECA)	East & South Asia and the Pacific (ESAP)	America
40	Sudan		Spain		
41	Tanzania		Sweden		
42	Togo		Tajikistan		
43	Uganda		Turkey		
44	Zambia		Turkmenistan		
45	Zimbabwe		Ukraine		
46			United Kingdom		
47			Uzbekistan		

5. Empirical results and discussions

5.1. Descriptive statistics results analysis

Table 3 presents the summary statistics for the manufacturing value-added share of GDP (MGDP), the primary variable of interest for each region. The mean (median) MGDP values are approximately 2.067 (2.226) for SSA, 2.203 (2.383) for MENA, 2.465 (2.540) for ECA, 2.152 (2.479) for ESAP, and 2.294 (2.566) for America. The variable's minimum and maximum values range from approximately -2.181 to 3.913, respectively. The standard deviation (SD) values are around 0.879 for SSA, 0.888 for MENA, 0.514 for ECA, 1.072 for ESAP, and 0.775 for America, indicating variations in the dataset across regions. The presence of negative skewness in the series suggests a negatively skewed distribution of the variable. Additionally, the Jarque-Bera statistics, along with their corresponding probability values from the normality test, indicate that the residuals of the variable's distribution deviate from normality, at least at the 10% significance level.

Table 3. Summary statistics results

	SSA	MENA	ECA	ESAP	America
Mean	2.067	2.203	2.465	2.152	2.294
Median	2.226	2.383	2.540	2.479	2.566
Maximum	3.561	3.913	3.543	3.480	3.880
Minimum	-2.181	-2.082	-0.268	-1.233	-0.842
Std. Dev.	0.879	0.888	0.514	1.072	0.775
Skewness	-2.405	-1.403	-1.163	-1.120	-1.272
Kurtosis	11.609	5.849	5.258	3.586	4.976
Jarque-Bera	3465.192	253.150	391.139	148.622	295.795
Probability	0.000	0.000	0.000	0.000	0.000
Observations	855	380	893	665	684

5.2. Convergence analysis

This section focuses on the convergence analysis of industrialisation for each of the regions. Table 4 presents the results for the panel and club convergence in industrialisation for the countries. For SSA, the result for the overall sample shows that we cannot accept the null hypothesis of panel convergence, which indicates that the countries in the region are not converging to the same steady state. We reject the null hypothesis of panel convergence because the $t_{\hat{b}}$<-1.65, that is, -59.850<-1.65. For the speed of adjustment, the sign of the point estimate is negative (since $\hat{b} = 2\hat{\sigma}$ = $\hat{\sigma}$= $\hat{b}/2$ = -0.893/2). This implies that in SSA, the speed of convergence is weak. This result further reveals that countries in the region are not at the same level of industrial development. Hence, the possible reason for the formation of the clubs. Figure 2A shows the panel relative transition curves for the countries in the region, which was calculated from Equation 2 in section 3. These curves depict the behavior of the countries in comparison to the panel average during the sample period. According to P&S (2007, 2009) and based on the assumption of convergence for the overall sample, the relative transition path tends to be in unity for all countries. Under the concept of club convergence, however, the relative transition paths of members of each club converge into separate constants (i.e. when groups of countries converge to different equilibria). A visual examination of these curves gave us some insight into the results, and to trace each country's industrialisation path relative to the sample average. In summary, the panel transition paths within the study period, showed that these countries exhibited both divergence and convergence at some point. Although, the countries were at different levels of industrial development, the results from this study suggest that they are not converging, and that the speed of nonconvergence is a weak one. But the narrative changes when the algorithm tends to group the countries into final clubs.

The overall sample for SSA suggests evidence of no conditional/relative convergence towards the average, as the value of the log t parameter is -59.850. The countries exhibited both transition paths above 1 and those below 1. This implies that at one point or another, SSA governments appear to have chosen both similar and dissimilar paths for their manufacturing/industrial development policy measures. The P&S (2007) approach which is used to estimate the convergence club algorithm results show that the countries can be grouped into 7 clubs. But we did not rely on the results because according to the same scholars who developed the algorithm, the P&S (2007) technique have the tendencies of overestimating the true number of clubs. Hence, we relied on the P&S (2009) club convergence merging algorithm to obtain the true/final convergence clubs. After applying the P&S (2009) club merging algorithm technique, the clubs reduced from 7 clubs to 4 clubs. The club convergence merging algorithm results shows that clubs 2+3, 3+4, 4+5 and 5+6 can be merged because the $t_{\hat{b}}$>-1.65 (that is, 4.602>-1.65, 2.798>-1.65, 1.333>-1.65 and 0.508>-1.65). While clubs 1+2 and 6+7 cannot be merged because the $t_{\hat{b}}$<-1.65 (that is, -13.780<-1.65 and -22.282<-1.65). Therefore, our clubs reduced from 7 clubs to 4 clubs as mentioned earlier.

The club clustering algorithm results for the final club show that the null hypothesis of club convergence is accepted for final clubs 1, 2, 3 and 4 (since their $t_{\hat{b}}$>-1.65, that is, -1.506>-1.65, -0.312>-1.65, 1.704>-1.65 and 15.256>-1.65). This implies that countries in final clubs 1, 2, 3 and 4 are moving towards convergence even though their levels of industrial/manufacturing development may differ. For the speed of adjustment, the sign of the point estimate for the final clubs 1, 2, 3 and 4 are -0.091, -0.025, 4.106 and 5.010 respectively (they have both negative and positive coefficients (since $\hat{b} = 2\hat{\sigma}$ = $\hat{\sigma}$= $\hat{b}/2$)). This implies that the speed of convergence for countries in final clubs 3 and 4 is strong and vice versa for countries in final clubs 1 and 2. It is interesting to note that final club 4 has the highest speed of convergence.

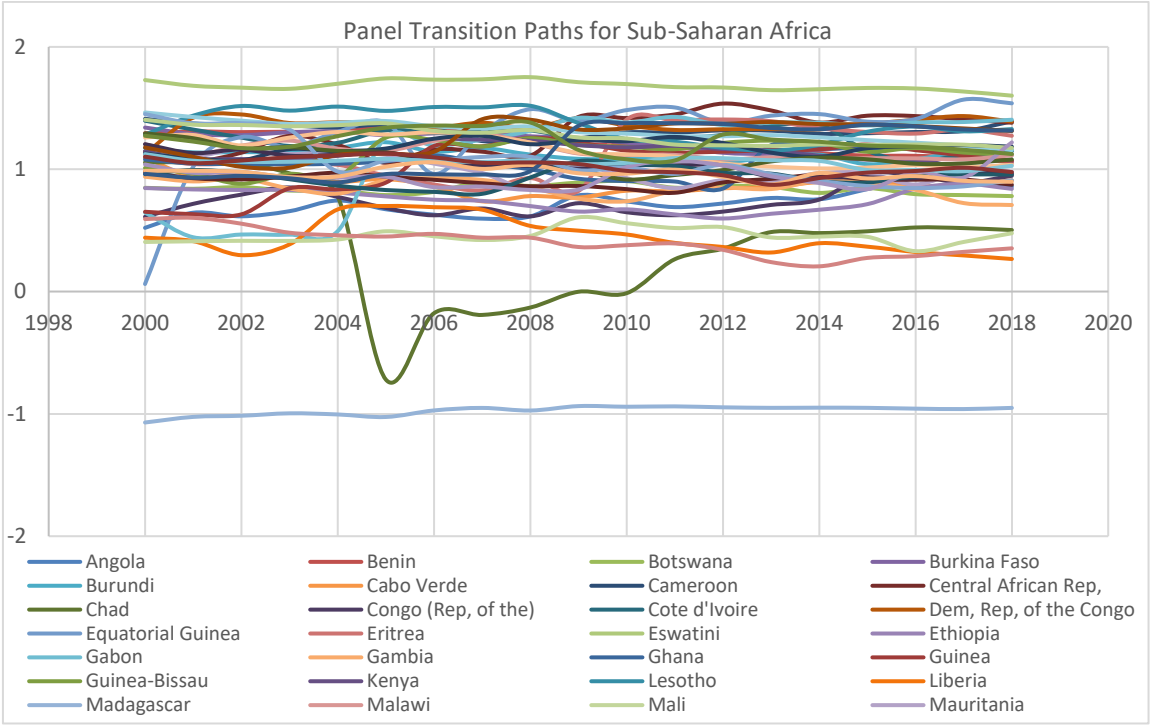


Figure 2A. Panel Transition Paths for Sub-Saharan Africa (SSA)

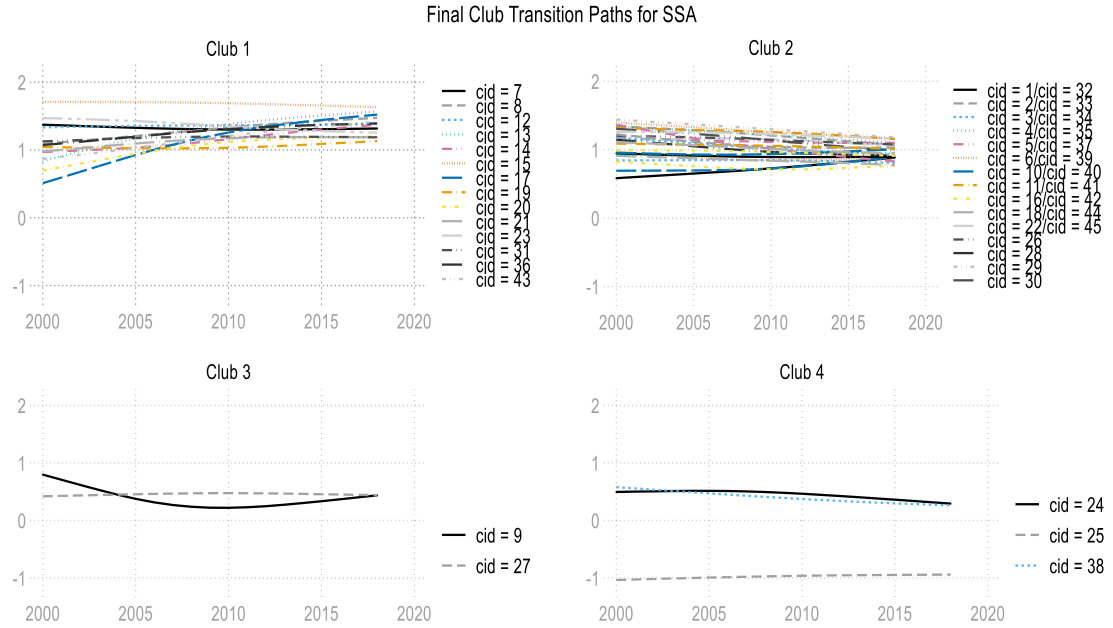


Figure 2B. Final Club Transition Paths for Sub-Saharan Africa (SSA)

Figures 2B depict the transition paths for the final clubs 1, 2, 3 and 4 calculated from Equation 2. These curves show the behaviour of the process of convergence in industrialisation for the 4 final clubs relative to the panel average. A visual inspection of these curves shows the trajectories of each country's industrialisation path relative to the sample average. In summary, an inspection of the transition curves for the final clubs 1 to 4 shows that countries in them exhibited gradual convergence patterns over the study period. Although there was decoupling and coupling of the curves within the periods under study for these final clubs. The final club transition curves tend to support the clustering club algorithm results, which makes the findings of this study valid for the countries under study most especially at the club level.

For Middle East and North Africa (MENA), Europe & Central Asia (ECA), East & South Asia and the Pacific (ESAP) and America (which comprises of Latin America & Caribbean and North America) the result for the overall sample shows that we cannot accept the null hypothesis of panel convergence, which indicates that the countries in each of the regions are not converging to the same steady state. We reject the null hypothesis of panel convergence for the regions because the $t_{\hat{b}}$<-1.65, that is, -29.857<-1.65 (MENA), -28.883<-1.65 (ECA), -245.719<-1.65 (ESAP), -103.543<-1.65 (America). For the speed of adjustment, the sign of the point estimate is negative (since $\hat{b} = 2\hat{\sigma}$ = $\hat{\sigma}$ = $\hat{b}/2$ = -0.978/2 (MENA), -1.029/2 (ECA), -1.540/2 (ESAP) and -1.103/2 (America)). This implies that for MENA, ECA, ESAP and America the speed of convergence is weak. These results further reveal that countries in the regions are not at the same level of industrial development. Figures 3A, 4A, 5A and 6A presents the panel transition curves for MENA, ECA, ESAP and America, respectively. Similar to what was observed in SSA panel transition curves, countries in MENA, ECA, ESAP and America exhibited both transition curves above 1 and those below 1. This implies that at one point or another, MENA, ECA, ESAP and America governments appear to have chosen both similar and dissimilar paths for their manufacturing/industrial development policy measures. Hence, this reflects in the panel nonconvergence results obtained from the algorithm estimation for each of the regions.

The club merging algorithm results for MENA reveals that the clubs cannot be merged since $t_{\hat{b}}$<-1.65. Therefore, we still maintain the initial estimation. The convergence club results for MENA reveals that countries in clubs 1, 2 and 3 converges to the same steady state (since $t_{\hat{b}}$>-1.65, that is, 0.873>-1.65, 5.794>-1.65 and 0.075>-1.65). For the clubs in MENA, club 2 has the highest speed of convergence (since $\hat{b} = 2\hat{\sigma}$ = $\hat{\sigma}$= $\hat{b}/2$ = 0.125/2 (club 1), 0.364/2 (club 2) and 0.225/2 (club 3)). For ECA, we could merge clubs 1+2, 3+4 and 6+7 by following the same rule of thumb in merging clubs (that is, when $t_{\hat{b}}$>-1.65). Therefore, our clubs reduced from 8 to 3. The results of the final club classifications for ECA show that countries in clubs 1 and 2 converges, while countries in club 3 diverges (since -356.979<1.65). For the clubs in ECA, final club 2 has the highest speed of convergence (since $\hat{b} = 2\hat{\sigma}$ = $\hat{\sigma}$= $\hat{b}/2$ = -0.008/2 (club 1), 0.521/2 (club 2) and -2.302/2 (club 3)). For ESAP, we could not merge clubs 1+2, 2+3, 3+4, 4+5 and 5+6 due to the rule of thumb in merging clubs (since $t_{\hat{b}}$<-1.65). Therefore, we still maintain the initially estimated convergence club results which show that all the countries in the clubs converges (since $t_{\hat{b}}$>-1.65, that is, -0.255>-1.65, 1.952>-1.65, 7.884>-1.65, 4.362>-1.65, 0.485>-1.65) except club 6 that diverges (since $t_{\hat{b}}$<-1.65, that is, -42.475<-1.65). For the clubs in ESAP, club 5 has the highest speed of convergence (since $\hat{b} = 2\hat{\sigma}$ = $\hat{\sigma}$= $\hat{b}/2$ = -0.018/2 (club 1), 0.200/2 (club 2), 0.131/2 (club 3), 0.458/2 (club 4), 0.801/2 (club 5) and -1.637/2 (club 6)). For America, we could merge clubs 1+2, 3+4 and 5+6 by using the rule of thumb in merging clubs (that is, when $t_{\hat{b}}$>-1.65). Therefore, the clubs reduced from 7 to 4 clubs. The results of the final club classifications for America show that countries in clubs 1, 2 and 3 converges (since $t_{\hat{b}}$>-1.65, that is, 1.066>-1.65, 6.515>-1.65 and 0.459>-1.65), while countries in

club 4 diverges (since -4.914<1.65). Also, for the clubs in America, club 2 has the highest speed of convergence (since $\hat{b} = 2\hat{\sigma} = \hat{\sigma} = \hat{b}/2$ = 0.047/2 (club 1), 0.076/2 (club 2), 0.045/2 (club 3) and -8.987/2 (club 4)).

Figures 3A & B, 4A & B, 5A & B, and 6A & B illustrate the transition curves for panel/clubs in the MENA, ECA, ESAP, and America regions, respectively. A visual inspection of the club transition curves for MENA region (see Figures 3A & B shows that the countries in clubs 1 and 2 are seen to be moving towards convergence. The transition paths for the two countries in club 3 (that is, Libya and Syrian Arab Republic) shows that they experienced catching up with each other between year 2012 and 2015, and then a gradual decoupling began to emerge again. A visual inspection of the club transition curves for ECA region (see Figures 4A & B) shows that the countries in clubs 1 and 2 can be seen moving towards convergence. In summary, the club transition curves for the final clubs of the remaining regions (see Figures 5A & B and 6A & B) for ESAP and America, respectively) strongly support the results obtained from the convergence club algorithm approach. Although there was decoupling and coupling of the curves within the periods under study for these final clubs. The final club transition curves tend to support the clustering club algorithm results, which makes the findings of this study valid for the regions under study most especially at the club levels.

Table 4. Industrialisation convergence results for the regions

Sample	Countries	$\hat{b}$ *Coeff*	SE	$t - Stat$
Sub-Saharan African countries (SSA)				
Overall	All 45 countries used for the region	-0.893	0.015	-59.850
Club 1	| Cameroon | Central African Rep, | Dem. Rep. of the Congo | Equatorial Guinea | Eritrea | Eswatini | Gabon | Ghana | Guinea | Guinea-Bissau | Lesotho | Namibia | Senegal | Uganda |	-0.091*	0.060	-1.506
Club 2	| Angola | Burundi | Cote d'Ivoire | Mauritius | South Africa | Sudan | Zimbabwe	0.710*	0.150	4.731
Club 3	| Benin | Burkina Faso | Congo (Rep. of the) | Kenya | Malawi | Sao Tome and Principe | Tanzania |	0.981*	0.207	4.747
Club 4	| Botswana | Cabo Verde | Mauritania | Mozambique | Niger | Nigeria | Rwanda | Togo | Zambia |	0.296*	0.077	3.848
Club 5	| Ethiopia | Gambia | Seychelles |	2.081*	0.395	5.273
Club 6	| Chad | Mali |	4.106*	2.410	1.704
Club 7	| Liberia | Madagascar | Sierra Leone |	5.010*	0.328	15.256
Club Merging for SSA				
Club 1+2		-0.434	0.032	-13.780
Club 2+3		0.699**	0.152	4.602
Club 3+4		0.325**	0.116	2.798
Club 4+5		0.097**	0.073	1.333
Club 5+6		0.088**	0.173	0.508
Club 6+7		-1.480	0.066	-22.282

Sample	Countries	$\widehat{b}$ Coeff	SE	$t-Stat$
Final club classifications for SSA				
Club 1	| Cameroon | Central African Rep, | Dem. Rep. of the Congo | Equatorial Guinea | Eritrea | Eswatini | Gabon | Ghana | Guinea | Guinea-Bissau | Lesotho | Namibia | Senegal | Uganda |	-0.091*	0.060	-1.506
Club 2	| Angola | Benin | Botswana | Burkina Faso | Burundi | Cabo Verde | Congo (Rep. of the) | Cote d'Ivoire | Ethiopia |Gambia | Kenya | Malawi | Mauritania | Mauritius | Mozambique |Niger | Nigeria | Rwanda | Sao Tome and Principe | Seychelles |South Africa | Sudan | Tanzania | Togo | Zambia | Zimbabwe |	-0.025*	0.080	-0.312
Club 3	| Chad | Mali |	4.106*	2.410	1.704
Club 4	| Liberia | Madagascar | Sierra Leone |	5.010*	0.328	15.256
MENA				
Overall		-0.978	0.033	-29.857
Club 1	| Algeria | Bahrain | Djibouti | Egypt, Arab Rep. | Iran, Islamic Rep. | Israel | Jordan | Morocco | Oman | Saudi Arabia | Tunisia | (11 countries)	0.125*	0.143	0.873
Club 2	| Iraq | Kuwait | Lebanon | Malta | Qatar | United Arab Emirates |Yemen, Rep. | (7 countries)	0.364*	0.063	5.794
Club 3	| Libya | Syrian Arab Republic | (2 Countries)	0.225*	3.000	0.075
Club Merging for MENA				
Club 1+2		-0.164	0.085	-1.929
Club 2+3		-1.709	0.174	-9.799
Europe & Central Asia (ECA)				
Overall		-1.029	0.036	-28.883
Club 1	| Armenia | Belarus | Bosnia and Herzegovina | Czech Republic | Germany | Hungary | North Macedonia | Poland | Romania | Slovenia | Uzbekistan | (11)	1.405	0.253	5.546
Club 2	| Austria | Kyrgyz Republic | Lithuania | Slovak Republic | Turkey | (5)	0.036	0.075	0.477
Club 3	| Albania | Belgium | Denmark | Estonia | Finland | Greece| Iceland | Italy | Latvia | Moldova | Netherlands | Portugal | Russian Federation | Serbia | Sweden | (15)	0.039	0.059	0.656
Club 4	| France | Kazakhstan | Spain | Ukraine | (4)	0.219	0.151	1.446
Club 5	| Georgia | Tajikistan | United Kingdom | (3)	1.415	0.546	2.591
Club 6	| Faroe Islands | Norway | Turkmenistan | (3)	1.007	0.661	1.524
Club 7	| Azerbaijan | Cyprus | Greenland | Luxembourg | (4)	0.130	0.284	0.457
Club 8	| Ireland | Montenegro | (2)	-2.302	0.006	-356.979

Sample	Countries	$\hat{b}$ Coeff	SE	$t-Stat$
Club Merging for ECA				
Club 1+2		1.362**	0.247	5.506
Club 2+3		-0.400	0.028	-14.398
Club 3+4		0.014**	0.058	0.242
Club 4+5		-1.091	0.027	-40.032
Club 5+6		-1.025	0.294	-3.486
Club 6+7		0.521**	0.264	1.970
Club 7+8		-2.209	0.043	-50.877
Final club classifications for ECA				
Club 1	| Albania | Armenia | Austria | Belarus | Belgium | Bosnia and Herzegovina | Czech Republic | Denmark | Estonia | Finland | France | Georgia | Germany | Greece | Hungary | Iceland | Italy | Kazakhstan | Kyrgyz Republic | Latvia | Lithuania | Moldova | Netherlands | North Macedonia | Poland | Portugal | Romania | Russian Federation | Serbia | Slovak Republic | Slovenia | Spain | Sweden | Tajikistan | Turkey | Ukraine | United Kingdom | Uzbekistan | (38)	-0.008	0.081	-0.099
Club 2	| Azerbaijan | Cyprus | Faroe Islands | Greenland | Luxembourg | Norway | Turkmenistan | (7)	0.521	0.264	1.970
Club 3	| Ireland | Montenegro | (2)	-2.302	0.006	-356.979
East & South Asia and the Pacific (ESAP)				
Overall		-1.540	0.006	-245.719
Club 1	| Bangladesh | China | Indonesia | Japan | Korea, Rep. | Malaysia | Myanmar | Philippines | Singapore | Thailand | (10)	-0.018*	0.071	-0.255
Club 2	| Brunei Darussalam | Cambodia | India | Mongolia | Pakistan | Sri Lanka | (6)	0.200*	0.102	1.952
Club 3	| Bhutan | Fiji | New Zealand | (3)	0.131*	0.017	7.884
Club 4	| Afghanistan | Australia | Kiribati | Lao PDR | Nepal | Samoa | Tonga | (7)	0.458*	0.105	4.362
Club 5	| Hong Kong SAR, China | Macao SAR, China | Micronesia, Fed. Sts. | Timor-Leste | Tuvalu | (5)	0.801*	1.652	0.485
Club 6	| Maldives | New Caledonia | Vanuatu | Vietnam | (4)	-1.637	0.039	-42.475
Club Merging for ESAP				
Club 1+2		-0.292	0.023	-12.907
Club 2+3		-0.345	0.044	-7.793
Club 3+4		-0.502	0.058	-8.594
Club 4+5		-2.193	0.039	-56.952
Club 5+6		-3.601	0.154	-23.390

Sample	Countries	$\widehat{b}$ Coeff	SE	$t-Stat$
America				
Overall		-1.103	0.011	-103.543
Club 1	| Aruba | Barbados | El Salvador | Haiti | Honduras | Mexico | Paraguay | Puerto Rico |(8)	0.578	0.073	7.889
Club 2	| Argentina | Cuba | Dominican Republic | Ecuador | Guatemala | Nicaragua | Peru | Suriname | Venezuela, RB |(9)	0.850	0.270	3.147
Club 3	| Bolivia | Colombia | Costa Rica | Guyana | Uruguay | United States |(6)	0.257	0.012	21.452
Club 4	| Brazil | Chile | Jamaica | Saint Kitts and Nevis | Canada | (5)	0.009	0.019	0.463
Club 5	| Antigua and Barbuda | Belize | Panama | Saint Vincent and the Grenadines |(4)	0.249	0.110	2.265
Club 6	| Bahamas | Grenada |(2)	1.080	0.186	5.811
Club 7	| Dominica | Bermuda |(2)	-8.987	1.829	-4.914
Club Merging for America				
Club 1+2		0.047**	0.044	1.066
Club 2+3		-0.107	0.010	-10.356
Club 3+4		0.076**	0.012	6.515
Club 4+5		-0.144	0.056	-2.556
Club 5+6		0.045**	0.097	0.459
Club 6+7		-3.339	0.109	-30.528
Final club classifications for America				
Club 1	| Argentina | Aruba | Barbados | Cuba | Dominican Republic | Ecuador | El Salvador | Guatemala | Haiti | Honduras | Mexico | Nicaragua | Paraguay | Peru | Puerto Rico | Suriname | Venezuela, RB | (17)	0.047*	0.044	1.066
Club 2	| Bolivia | Brazil | Chile | Colombia | Costa Rica | Guyana | Jamaica | Saint Kitts and Nevis | Uruguay | Canada | United States | (11)	0.076*	0.012	6.515
Club 3	| Antigua and Barbuda | Bahamas | Belize | Grenada | Panama | Saint Vincent and the Grenadines | (6)	0.045*	0.098	0.459
Club 4	| Dominica | Bermuda | (2)	-8.987*	1.829	-4.914

*Note: * and ** respectively indicate acceptance of the null hypothesis of convergence and club convergence merging at the 5% level. SE = standard error. Source: Author's Calculations.*

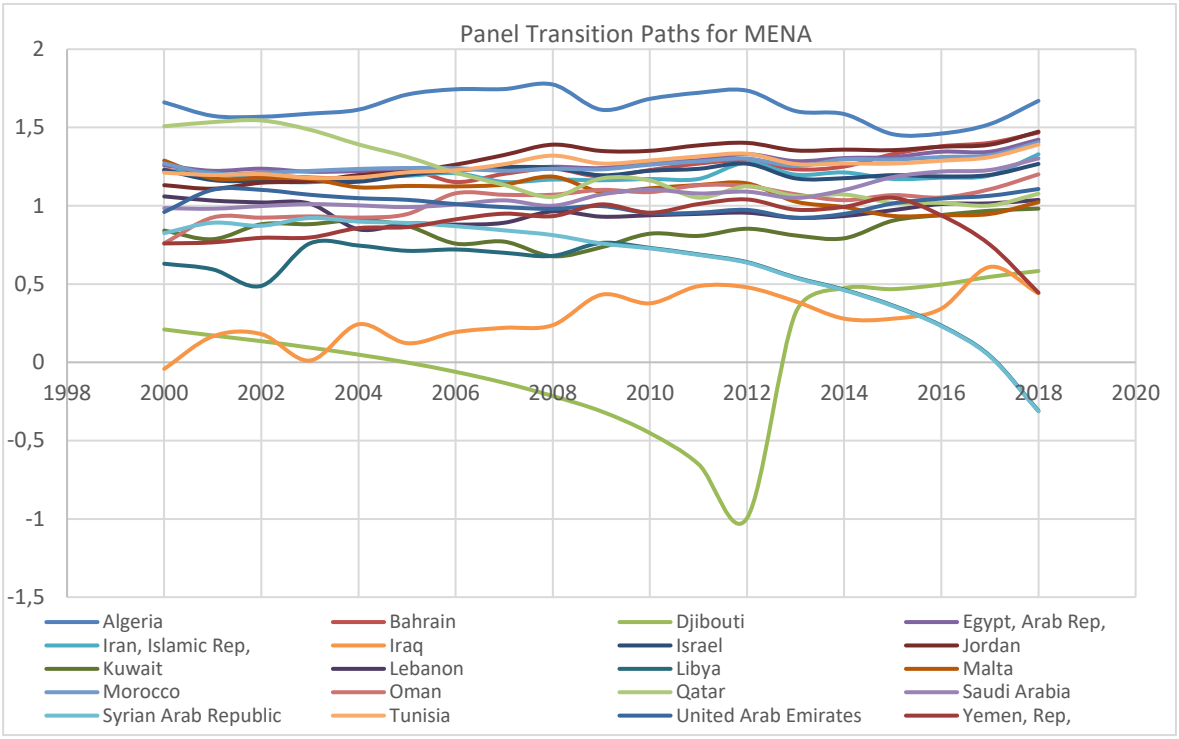


Figure 3A. Panel Transition Paths for Middle East and North Africa (MENA)

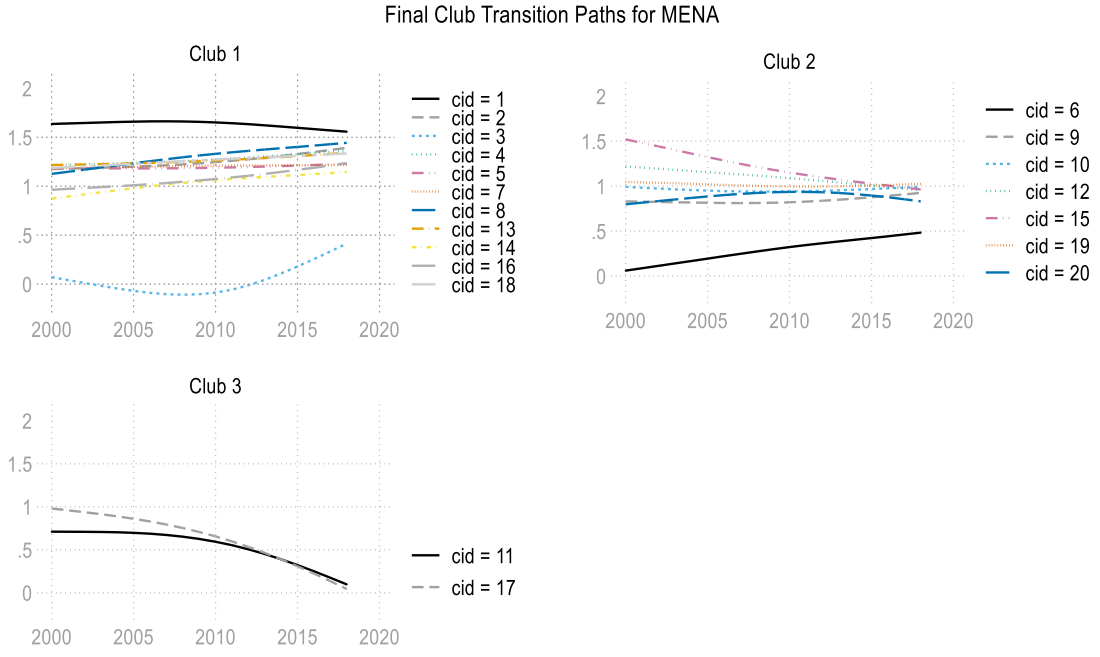


Figure 3B. Final Club Transition Paths for Middle East and North Africa (MENA)

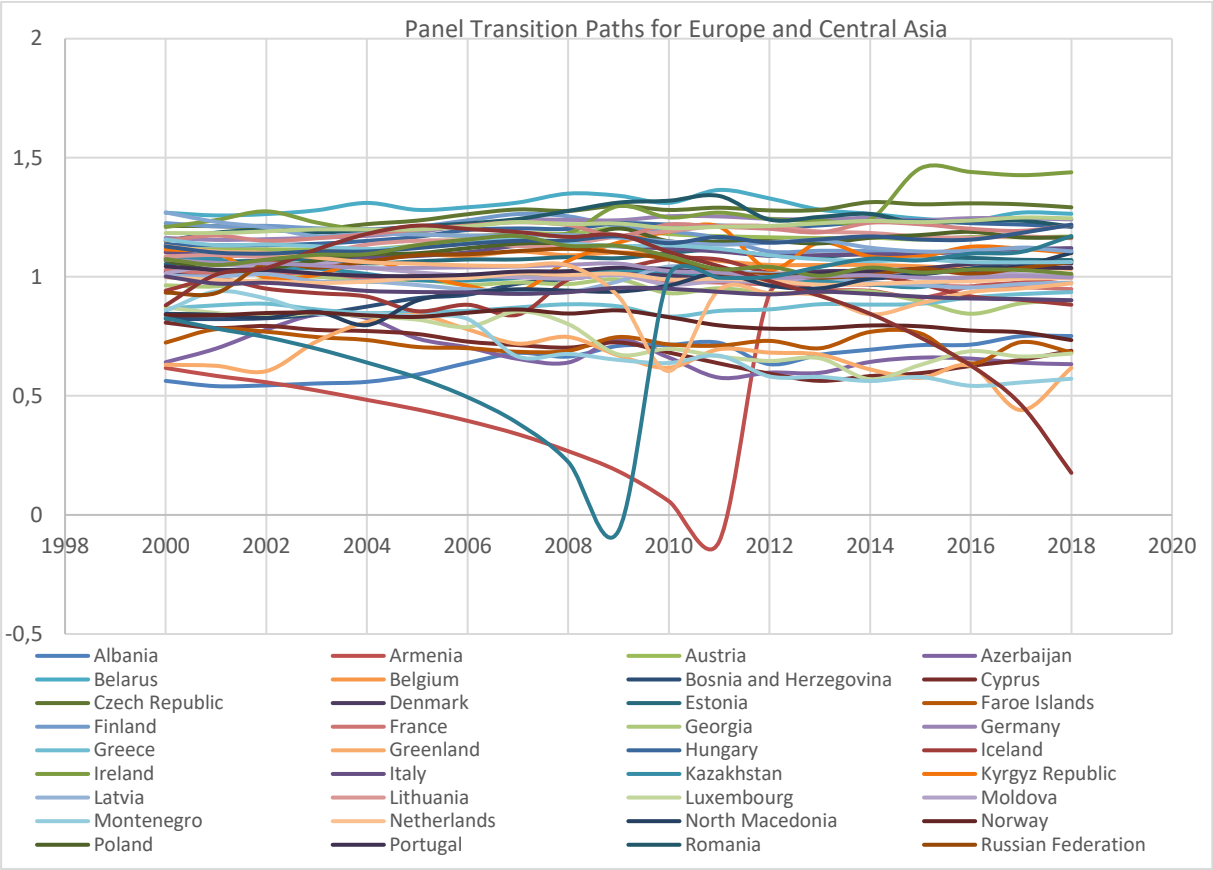


Figure 4A. Panel Transition Paths for Europe and Central Asia (ECA)

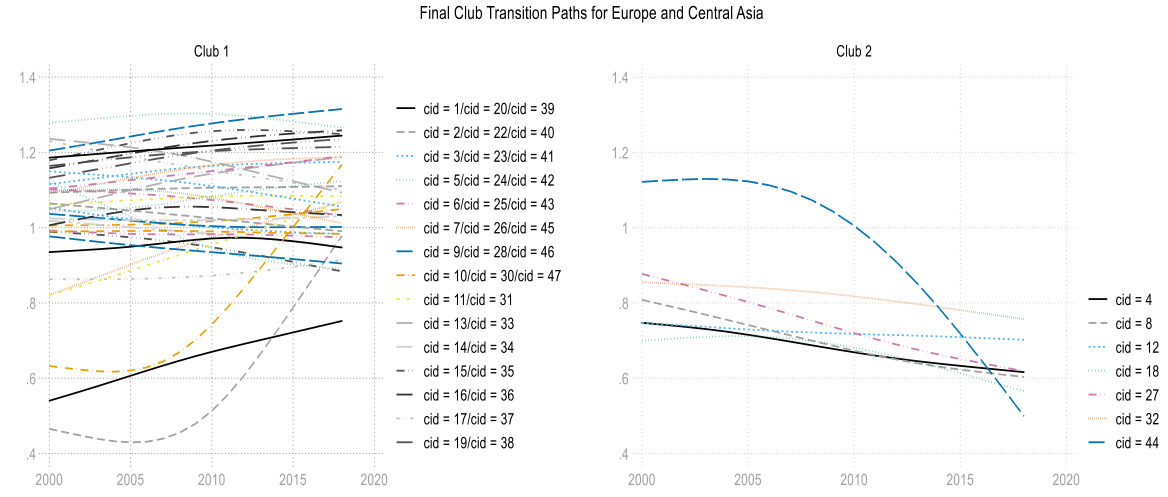


Figure 4B. Final Club Transition Paths for Europe and Central Asia (ECA)

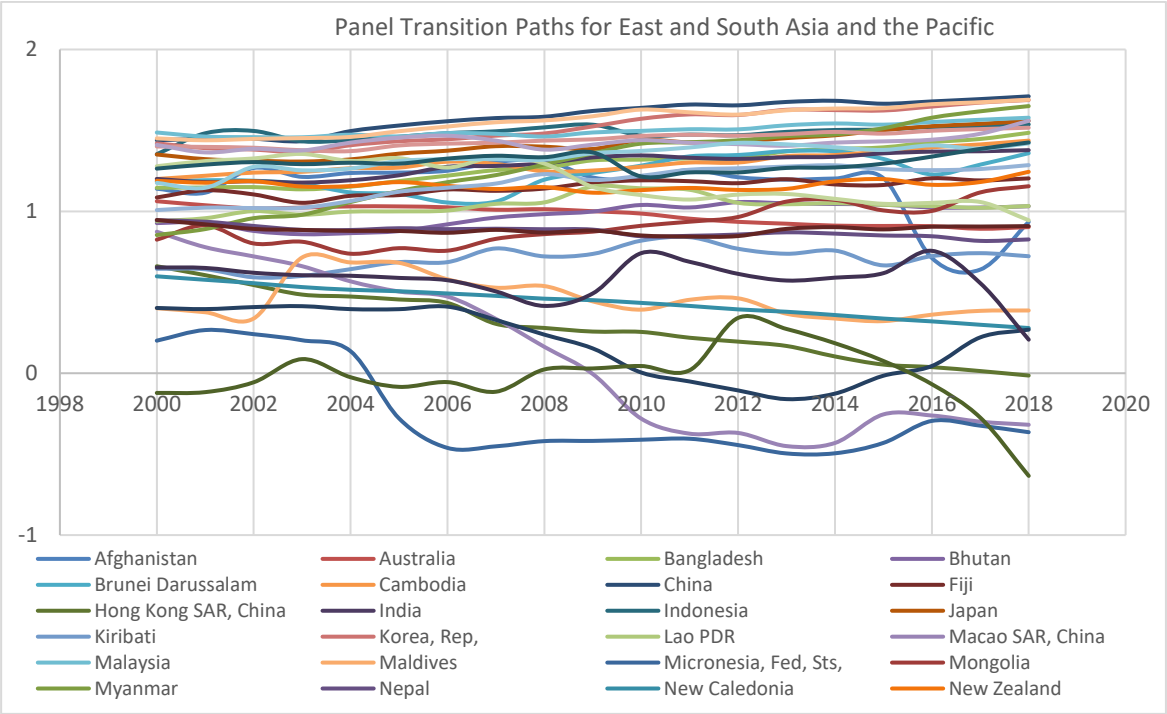


Figure 5A. Panel Transition Paths for East & South Asia and the Pacific (ESAP)

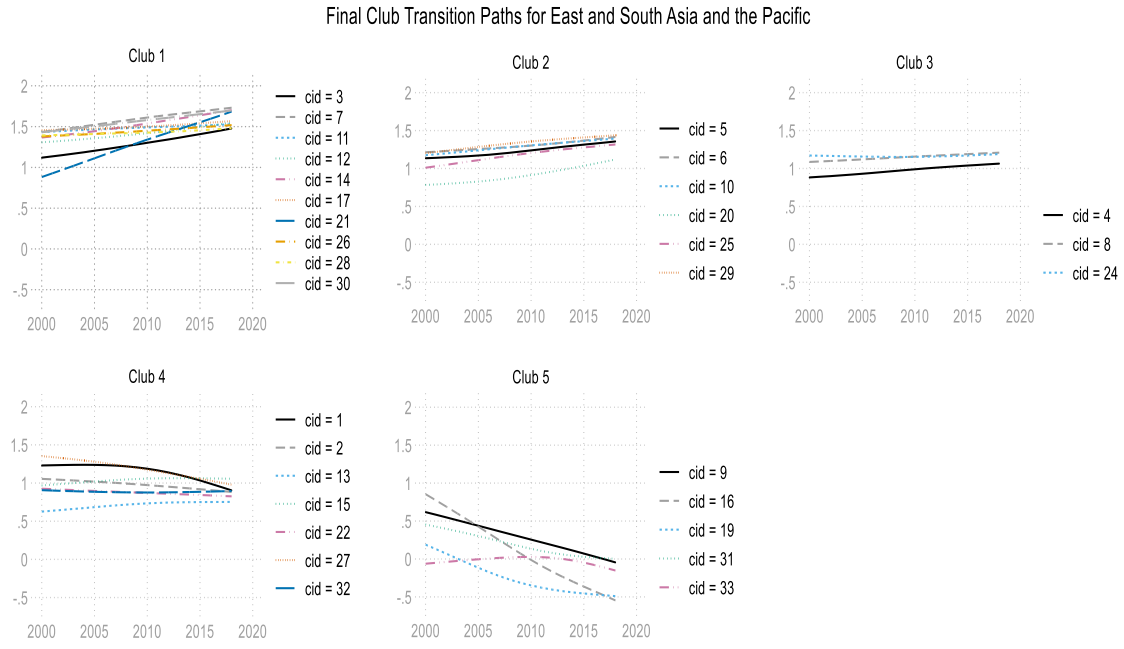


Figure 5B. Final Club Transition Paths for East & South Asia and the Pacific (ESAP)

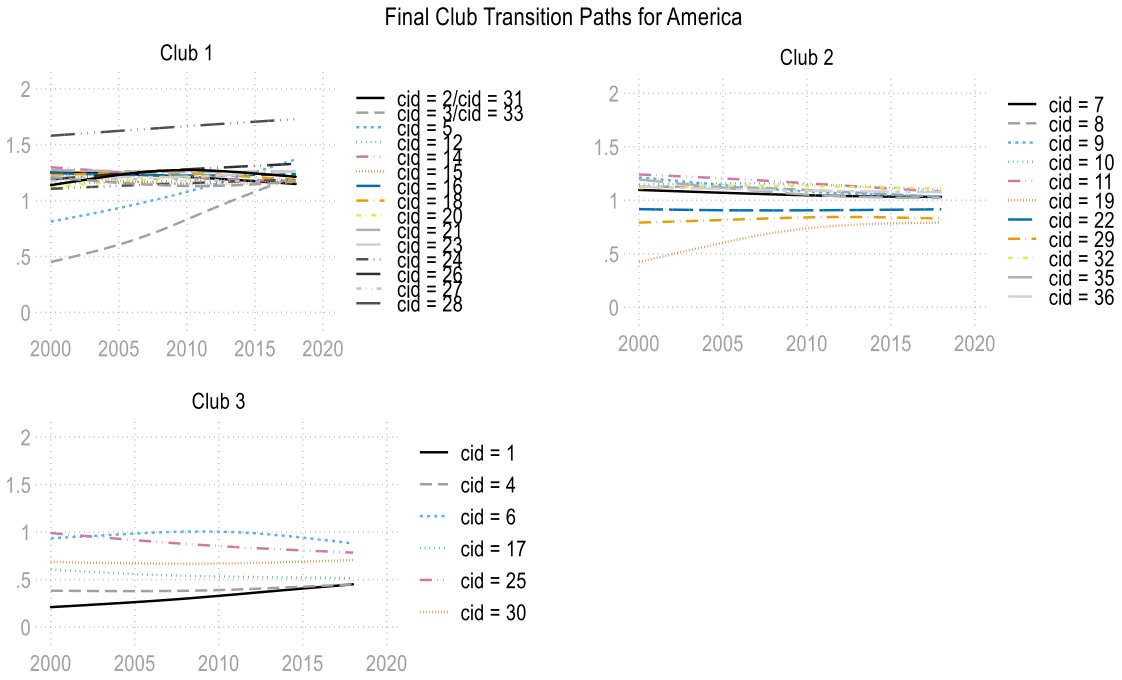


Figure 6A. Panel Transition Paths for America

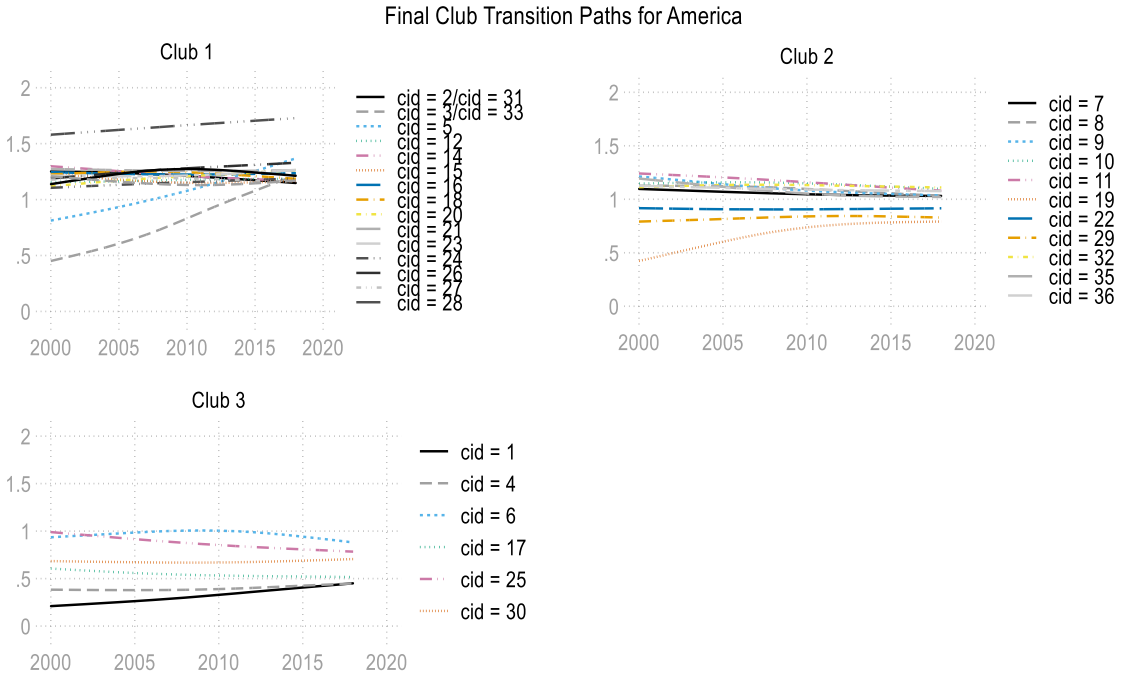


Figure 6B. Final Club Transition Paths for America

From the results, it is clear that there is absence of convergence at the panel level for the five regions. This implies that at the regional level, countries that are less industrialised are not catching-up with the countries that are more industrialised. This could be as a result of industrialised economies not sharing and spreading new industrial approaches and know-how with less industrialised economies. The absence of convergence in industrialisation at the regional level could also be echoing the gap in economic growth between the more industrialised and less industrialised economies because industrial/manufacturing sector is seen as one of the key drivers of growth (Kaldor, 1966, 1967). The findings of this study suggest that when the algorithm form clubs, the countries tend to be moving towards becoming more homogeneous with different speed of convergence regarding the MGDP of their industrial/manufacturing sector irrespective of their industrial development levels. However, there is still much to be accomplished. The results also suggest that less industrialised countries have tried in one way or another to utilise their resources and capabilities to catch up with more industrialised countries at the club levels.

This study found that the speed of final club convergence differs from club to club, and also at the panel levels. This point to the fact that the speed of less industrialised countries are using to catch-up with the more industrialised economies cannot be generalised. Hence, less industrialised countries in the final clubs needs to double their efforts in catching up with the more industrialised ones. Although our empirical findings at the final club levels differ, the algorithm did not establish/explicitly identify the likely/possible driving forces/factors behind the countries belonging to a particular final club. And this leads us to the next analysis.

5.3. Multinomial logit analysis for the determinants of convergence club in industrialisation across regions

This study also identifies factors that could drive a country's industrialisation convergence level most especially at the final club levels. Beginning with Equation 7 to 9 (see section 3), we used 10% significance level for the results obtained in Table 5 for SSA. For final clubs 1, 2 and 3, we can find real GDP per capita (proxy for the level of income (GDPC)) and government regulatory quality (REGQ) variables to be significant with positive coefficients, while FDI, population (POP), control of corruption (CRR) and political stability & absence of violence/terrorism (POL) to be significant but with negative coefficient. On the one hand, the positive significant coefficients of GDPC and REGQ show that, other things held constant, the larger the values of GDPC and REGQ, the higher is the probability/likelihood that a country would belong to the final convergence clubs 1, 2 and 3 as opposed to the final convergence club 4 which has the highest speed of convergence. This implies that the levels of income and government regulatory quality played a crucial role in some countries belonging to clubs 1, 2 and 3 as opposed to the club 4. While on the other hand, the higher the percentage of FDI, POP, CRR and POL, the lower is the probability/likelihood that a country would belong to clubs 1, 2 and 3 as opposed to club 4 where highest speed of convergence is present in industrialisation process irrespective of the level of industrial development. A similar interpretation holds for significant negative coefficient of agriculture value added share of GDP (AGRI) and gross fixed capital formation share of GDP (GFCF) for club 1 and 2. While a similar interpretation also holds for significant positive coefficient of financial development (FDV) for club 2 and 3 like we have explained above.

Table 5. Multinomial logistic regression results for Sub-Saharan Africa (SSA) final clubs

	(1)	(2)	(3)
Variables	(Final Club 1) (Reference class = Final Club 4)	(Final Club 2)	(Final Club 3)
AGRI	-8.577***	-8.313***	1.484
	(1.461)	(1.455)	(1.843)
GDPC	3.184***	3.104***	4.179***
	(0.577)	(0.588)	(0.628)
GFCF	-0.978*	-1.279**	0.678
	(0.506)	(0.507)	(0.695)
FDV	0.483	1.441***	1.185***
	(0.293)	(0.316)	(0.421)
FDI	-0.188***	-0.078**	-0.053*
	(0.041)	(0.031)	(0.029)
FLA	0.023	0.022	-0.091*
	(0.021)	(0.021)	(0.052)
POP	-1.345***	-0.967***	-0.996***
	(0.284)	(0.284)	(0.321)
CRR	-4.189***	-4.061***	-5.880***
	(1.090)	(1.073)	(1.153)
POL	-2.355***	-2.228***	-2.281***
	(0.383)	(0.388)	(0.576)
REGQ	3.863***	4.193***	7.971***
	(0.818)	(0.771)	(1.101)
Constant	33.303***	26.132***	-20.142**
	(7.190)	(7.092)	(9.834)
Observations	651	651	651

*Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Source: Author's Calculations.*

For the case of MENA (see Table 6), the variables GDPC and FDI has positive significant coefficients for final club 1, while POL and FDV has positive significant coefficients for final club 3. The positive significant coefficients of GDPC and FDI show that, other things held constant, the larger the values of GDPC and FDI, the higher is the probability/likelihood that a country would belong to the final convergence club 1 as opposed to club 2. While the positive significant coefficients of POL and FDV show that, other things held constant, the larger the values of POL and FDV, the higher is the likelihood that a country would belong to the final convergence club 3 as opposed to club 2. This implies that GDPC & FDI and POL & FDV plays a positive significant role in countries belonging to club 1 and 3, respectively, as opposed to club 2. The negative significant coefficients of GFCF and FLA show that, other things held constant, the larger the values of GFCF and FLA, the lower is the probability/likelihood that a country would belong to the final convergence club 1 as opposed to club 2. While the negative significant coefficients of POP and CRR show that, other things held constant, the higher the percentage of POP and CRR, the lower is the probability/likelihood that a country would belong to the final convergence club 1 and 3 as opposed to club 2. A similar interpretation also holds for club 3 when it comes to variable REGQ.

Table 6. Multinomial logistic regression results for Middle East and North Africa (MENA) final clubs

	(1)	(2)
Variables	(Final Club 1) (Reference class = Final Club 2)	(Final Club 3)
AGRI	1.055	-1.201
	(0.730)	(0.946)
GDPC	2.251***	-1.959
	(0.575)	(1.354)
GFCF	-3.791*	-0.046
	(1.948)	(0.902)
FDV	-0.596	0.600**
	(0.558)	(0.305)
FDI	0.011**	-0.261
	(0.005)	(0.164)
FLA	-0.048**	-0.001
	(0.021)	(0.042)
POP	-1.467**	-0.824*
	(0.604)	(0.451)
CRR	-5.174***	-3.026*
	(1.259)	(1.572)
POL	-0.118	1.939***
	(0.310)	(0.415)
REGQ	1.673	-2.232**
	(1.425)	(0.989)
Constant	12.974	27.225*
	(9.691)	(16.479)
Observations	215	215

*Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Source: Author's Calculations.*

For ECA (see Table 7), the negative significant coefficients of AGRI, POP and CRR show that, other things held constant, the larger the values of AGRI, POP and CRR, the lower is the probability/likelihood that a country would belong to the final club 1 and 3, as opposed to club 2. The negative significant coefficients of POL and REGQ show that, other things held constant, the larger the values of POL and REGQ, the lower is the probability/likelihood that a country would belong to the final club 1, as opposed to club 2. This implies that AGRI, POP, CRR, POL and REGQ plays a negative significant role in countries belonging to club 1, as opposed to club 2. The positive significant coefficients of GDPC & FDI (for club 1), GFCF (for club 1 and 3) and FDV & POL (for club 3) show that, other things held constant, the larger the values of these variables, the higher is the likelihood that a country would belong to the final convergence club 1 and 3 as opposed to club 2.

For ESAP (see Table 8), the positive significant coefficients of AGRI and CRR show that, *ceteris paribus*, the larger the values of AGRI and CRR the higher is the probability/likelihood that a country would belong to the final clubs 1, 2, 3, 4 and 6, as opposed to club 5. Other variables that have positive significant coefficients include GFCF (for club 4 & 6), FDV (for club 3 & 6), FLA (for clubs 1, 2 & 3), POL (for clubs 2 & 6) and REGQ (for club 2). This implies that the larger the values of these variables, the higher is the probability/likelihood that a country would belong to the final clubs mentioned in the bracket, as opposed to club 5. While the negative

significant coefficients of GDPC and POP show that, *ceteris paribus*, the larger the values of GDPC and POP, the lower is the probability/likelihood that a country would belong to the final clubs 1, 2, 3, 4 and 6, as opposed to club 5. Other variables that have negative significant coefficients include GFCF (for club 1), FDV (for club 2), FLA (for club 6), POL (for club 1) and REGQ (for clubs 1, 3 and 6). This implies that the larger the values of these variables, the lower is the probability/likelihood that a country would belong to the final clubs mentioned in the bracket, as opposed to club 5. For America (see Table 9), the positive significant coefficients of GDPC, FDV, FLA and POL show that, *ceteris paribus*, the larger the values of GDPC, FDV, FLA and POL the higher is the probability/likelihood that a country would belong to the club 3, as opposed to club 2. A similar interpretation holds for the positive significant coefficients of POL and REGQ for club 1. While the negative significant coefficients of GDPC, FDV, FDI, FLA and CRR show that, *ceteris paribus*, the larger the values of GDPC, FDV, FDI, FLA and CRR, the lower is the probability/likelihood that a country would belong to the final clubs 1, as opposed to club 2. A similar interpretation holds for the negative significant coefficients of FDV and CRR for club 4 and 3, respectively.

Table 7. Multinomial logistic regression results for Europe & Central Asia (ECA) final clubs

	(1)	(2)
Variables	(Final Club 1) (Reference class = Final Club 2)	(Final Club 3)
AGRI	-2.074***	-0.752*
	(0.453)	(0.411)
GDPC	5.638***	-0.519
	(0.802)	(0.684)
GFCF	3.508***	2.389*
	(1.115)	(1.283)
FDV	0.568	1.801**
	(0.721)	(0.717)
FDI	0.069***	0.000
	(0.015)	(0.006)
FLA	-0.006	-0.072
	(0.034)	(0.104)
POP	-2.293***	-0.713***
	(0.236)	(0.183)
CRR	-3.699***	-2.317***
	(0.649)	(0.547)
POL	-1.742**	2.688***
	(0.714)	(0.755)
REGQ	-1.830***	0.209
	(0.664)	(0.638)
Constant	-29.715***	-1.788
	(10.249)	(8.245)
Observations	617	617

*Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Source: Author's Calculations.*

Table 8. Multinomial logistic regression results for East & South Asia and the Pacific (ESAP) final clubs

	(1)	(2)	(3)	(4)	(5)
Variables	(Final Club 1)	(Final Club 2)	(Final Club 3)	(Final Club 4)	(Final Club 6)
	(Reference class = Final Club 5)				
AGRI	0.795***	1.421***	3.125***	4.683***	3.441**
	(0.271)	(0.239)	(0.470)	(0.759)	(1.558)
GDPC	-1.028*	-2.677***	-5.678***	-2.157***	-2.998**
	(0.613)	(0.485)	(0.969)	(0.751)	(1.522)
GFCF	-2.170*	0.600	0.460	3.354***	6.872***
	(1.161)	(0.744)	(2.130)	(1.297)	(2.639)
FDV	2.141***	-2.144***	3.183***	-0.867	3.666***
	(0.740)	(0.412)	(1.078)	(0.571)	(1.025)
FDI	-0.006	-0.038	-0.114	-0.150	-0.043
	(0.055)	(0.037)	(0.109)	(0.144)	(0.052)
FLA	0.114**	0.081**	0.139*	0.036	-0.125**
	(0.052)	(0.036)	(0.080)	(0.042)	(0.059)
POP	-1.070***	-0.746***	-2.827***	-2.038***	-1.400***
	(0.335)	(0.182)	(0.603)	(0.243)	(0.241)
CRR	5.924***	1.352**	16.912***	7.634***	7.445***
	(1.026)	(0.664)	(2.188)	(1.167)	(1.592)
POL	-1.495*	0.807*	0.157	-0.331	5.971***
	(0.860)	(0.417)	(1.763)	(0.668)	(1.182)
REGQ	-2.309***	4.185***	-6.350***	0.226	-6.681***
	(0.731)	(0.913)	(1.651)	(1.139)	(1.894)
Constant	16.722**	38.574***	67.656***	34.584***	0.980
	(8.368)	(6.345)	(14.705)	(9.304)	(21.720)
Observations	428	428	428	428	428

*Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Source: Author's Calculations.*

Table 9. Multinomial logistic regression results for America final clubs

	(1)	(2)	(3)
Variables	(Final Club 1)	(Final Club 3)	(Final Club 4)
	(Reference class = Final Club 2)		
AGRI	-0.750	-2.127	-0.533
	(0.627)	(2.618)	(0.774)
GDPC	-0.973***	2.579***	-0.677
	(0.371)	(0.771)	(0.825)
GFCF	0.069	-2.304	0.813
	(0.628)	(1.402)	(1.498)
FDV	-2.869***	5.482***	-1.089**
	(0.507)	(1.360)	(0.551)
FDI	-0.197***	-0.004	-0.229
	(0.057)	(0.071)	(0.163)
FLA	-0.032*	0.155***	-0.048
	(0.019)	(0.041)	(0.067)
POP	0.111	-3.192	0.496

	(1)	(2)	(3)
Variables	(Final Club 1) (Reference class = Final Club 2)	(Final Club 3)	(Final Club 4)
	(0.163)	(2.007)	(0.499)
CRR	-3.933***	-8.980*	-0.713
	(0.976)	(4.677)	(1.058)
POL	1.461***	3.943*	2.812
	(0.303)	(2.336)	(1.946)
REGQ	1.023**	0.747	0.628
	(0.459)	(1.519)	(1.521)
Constant	18.368***	9.412	-2.823
	(6.884)	(37.474)	(10.863)
Observations	418	418	418

*Note: *** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses. Source: Author's Calculations.*

6. Concluding remarks and policy recommendations

6.1. Summary of key findings

Industrialisation remains a fundamental driver of economic growth and development, yet the convergence patterns of industrialisation across regions have received limited empirical attention. Therefore, this study contributes to the limited empirical literature on industrialisation convergence by applying the Phillips and Sul (2007, 2009) club convergence framework to a dataset of 183 countries from 2000 to 2018, categorised into five regions: Sub-Saharan Africa (SSA), Middle East and North Africa (MENA), Europe & Central Asia (ECA), East & South Asia and the Pacific (ESAP), and America (Latin America & the Caribbean and North America). The study also investigates the key determinants influencing the likelihood of a country belonging to a specific convergence club.

6.1.1. Absence of panel convergence

Our findings indicate that at the panel level, industrialisation does not exhibit convergence in any of the five regions. This suggests that countries within each region are not converging towards a common industrialisation steady state but rather diverging.

6.1.2. Club Convergence Dynamics by Region

Despite the lack of overall panel convergence, the club clustering algorithm identifies multiple final convergence clubs within each region. The iteration procedure reveals the following regional club convergence patterns:

- SSA**:** All countries in the four final clubs exhibit convergence.
- MENA**:** Countries in Clubs 1, 2, and 3 converge.
- ECA**:** Countries in Clubs 1 and 2 converge, while those in Club 3 diverge.
- ESAP**:** All clubs except Club 6 exhibit convergence.

- America**:** Countries in Clubs 1, 2, and 3 converge, whereas those in Club 4 diverge.

The speed of convergence analysis shows that Final Club 2 has the highest convergence rate in MENA, ECA, and America, while Final Club 4 and Club 5 show the highest speed of convergence in SSA and ESAP, respectively.

6.1.3. Determinants of convergence club membership

Several economic, financial, demographic, and governance factors significantly influence the probability of a country belonging to a particular convergence club. While these variables influence convergence club membership, their significance and magnitude vary across clubs and regions. A summary of the determinants for each region is presented in Table 10.

Table 10. Summary of the results for the determinants/drivers

Regions	Club 1	Club 2	Club 3	Club 4	Club 6
SSA					
Positive and significant variables	GDPC, REGQ	GDPC, REGQ, FDV	GDPC, REGQ, FDV		
Negative and significant variables	FDI, POP, CRR, POL, AGRI, GFCF	FDI, POP, CRR, POL, AGRI, GFCF	FDI, POP, CRR, POL, FLA		
Positive insignificant variables	FDV, FLA	FLA	AGRI, GFCF		
MENA					
Positive and significant variables	GDPC, FDI		POL, FDV		
Negative and significant variables	GFCF, FLA, POP, CRR		POP, CRR, REGQ		
Positive insignificant variables	AGRI, REGQ				
Negative insignificant variables	FDV, POL		AGRI, GDPC, GFCF, FDI, FLA		
ECA					
Positive and significant variables	GDPC, FDI, GFCF		FDV, POL, GFCF		
Negative and significant variables	POL, REGQ, AGRI, POP, CRR,		AGRI, POP, CRR,		

Regions	Club 1	Club 2	Club 3	Club 4	Club 6
Positive insignificant variables	FDV		FDI, REGQ		
Negative insignificant variables	FLA		GDPC, FLA		
ESAP					
Positive and significant variables	AGRI, CRR	AGRI, CRR	AGRI, CRR	AGRI, CRR	AGRI, CRR
Negative and significant variables	GDPC, POP, GFCF, POL, REGQ	GDPC, POP, FDV	GDPC, POP, REGQ	GDPC, POP	GDPC, POP, FLA, REGQ
Positive insignificant variables		GFCF	GFCF, POL	FLA, REGQ	
Negative insignificant variables	FDI	FDI	FDI	FDV, FDI, POL	FDI
America					
Positive and significant variables	POL, REGQ		GDPC, FDV, FLA, POL		
Negative and significant variables	GDPC, FDV, FDI, FLA, CRR		CRR	FDV	
Positive insignificant variables	GFCF, POP		REGQ	GFCF, POP, POL, REGQ	
Negative insignificant variables	AGRI		AGRI, GFCF, FDI, POP	AGRI, GDPC, FDI, FLA, CRR	

Note: AGRI (Agriculture, value added (% of GDP); GDPC (GDP per capita (constant 2010 US$)) GFCF (Gross fixed capital formation (% of GDP)); FDV (Domestic credit to private sector (% of GDP) proxy for financial development); FDI (Foreign direct investment, net inflows (% of GDP); FLA (Inflation, GDP deflator (annual %)); POP (Population, total); CRR (Control of Corruption); and POL (Political stability and absence of violence/terrorism); REGQ (Regulatory quality). Source: Author's Compilations

6.2. Policy recommendations

Based on the findings, we propose the following specific and actionable policy recommendations tailored to each region, focusing on leveraging key determinants to enhance industrialisation convergence:

6.2.1. Sub-Saharan Africa (SSA):

- (i) Policy: Strengthen regulatory quality (REGQ) and financial development (FDV) by improving access to credit for small and medium enterprises (SMEs) and streamlining business regulations.
- (ii) Action: Establish government-backed loan programs with low interest rates and simplify licensing processes.
- (iii) Challenge: Limited fiscal capacity and weak institutional frameworks may hinder implementation, requiring external donor support and capacity-building initiatives.

6.2.2. Middle East and North Africa (MENA):

- (i) Policy: Boost political stability (POL) and FDI by creating investor-friendly environments, such as tax incentives and stable governance structures.
- (ii) Action: Implement bilateral trade agreements and strengthen anti-corruption measures to attract foreign investors.
- (iii) Challenge: Regional conflicts and political instability could deter FDI, necessitating diplomatic efforts and security reforms.

6.2.3. Europe & Central Asia (ECA):

- (i) Policy: Enhance financial development (FDV) and political stability (POL) by expanding banking services and fostering transparent governance.
- (ii) Action: Develop microfinance institutions for rural industries and enforce anti-corruption laws rigorously.
- (iii) Challenge: Bureaucratic resistance and economic disparities between countries may slow policy adoption, requiring regional cooperation.

6.2.4. East & South Asia and the Pacific (ESAP):

- (i) Policy: Reduce reliance on agriculture (AGRI) and improve regulatory quality (REGQ) by promoting industrial diversification and simplifying trade regulations.
- (ii) Action: Offer subsidies for manufacturing startups and harmonize regional trade standards.
- (iii) Challenge: High population pressures (POP) and varying economic development levels could complicate uniform policy rollout, needing phased approaches.

6.2.5. America:

- (i) Policy: Improve political stability (POL) and financial development (FDV) by enhancing governance frameworks and increasing credit availability for industrial projects.
- (ii) Action: Launch public-private partnerships to fund infrastructure and enforce regulatory oversight.
- (iii) Challenge: Economic inequality between North and Latin America may lead to uneven policy impact, requiring targeted interventions for lagging areas.

6.3. Implementation considerations

While the above recommendations are crucial for fostering industrialisation convergence, several challenges may hinder their implementation, which policymakers and regional governments should be aware of:

- (i) Resource constraints: Many countries, especially in SSA and ESAP, face limited budgets, necessitating prioritisation and external funding from organisations like the World Bank.
- (ii) Institutional weakness: In regions like MENA and SSA, corruption (CRR) and poor governance (POL, REGQ) could undermine reforms, requiring long-term institutional strengthening.
- (iii) Global economic factors: Fluctuations in FDI and inflation (FLA) due to global market volatility may disrupt progress, suggesting the need for adaptive economic strategies.

By addressing these challenges, policymakers can enhance the effectiveness of the proposed measures, aligning industrialisation trajectories with convergence goals. This study underscores the importance of region-specific policies to address industrialisation convergence and divergence. By focusing on key determinants such as GDP per capita, financial development, and governance indicators, policymakers can design targeted interventions to promote industrialisation. However, addressing institutional weaknesses, resource constraints, and political instability will be critical to overcoming implementation challenges and achieving sustainable industrialisation across regions.

6.4. Limitations and areas for future research

While this study offers valuable insights into industrialisation convergence across various regions, it has several limitations: (i) The analysis covers the period from 2000 to 2018, and extending the dataset to include more recent data could provide deeper insights into post-pandemic industrialisation trends. (ii) Although the study considers key economic, financial, demographic, and governance factors, future research could incorporate additional variables, such as environmental sustainability and energy efficiency, to explore their impact on industrialisation convergence. And (iii) future studies could also apply ESTAR nonlinear unit root and co-integration techniques to different global regions to assess whether convergence patterns vary under alternative econometric approaches. Addressing these areas in future research will enhance our understanding of industrialisation convergence and offer more targeted policy insights for regional economic development.

Declaration of generative AI and AI-assisted technologies in the writing process

The author(s) used ChatGPT for proofreading during the preparation of this work. Following its use, the content was reviewed and edited as necessary, and the author(s) take full responsibility for the final publication.

References

Abegaz, B. (2002), "Structural convergence in manufacturing industries between leaders and latecomers", *Journal of Development Studies*, Vol. 38 No. 4, pp. 69-99. https://doi.org/10.1080/00220380412331322421

Abramovitz, M. (1986), "Catching up, forging ahead, and falling behind", *Journal of Economic History*, Vol. 46 No. 2, pp. 385-406. https://doi.org/10.1017/S0022050700046209

Baldwin, R.E., Martin, P. and Ottaviano, G.I. (2001), "Global income divergence, trade, and industrialization: The geography of growth take-offs", *Journal of Economic Growth*, Vol. 6 No. 1, pp. 5-37. https://doi.org/10.1023/A:1009876310544

Barro, R.J. (1991), "Economic growth in a cross section of countries", *Quarterly Journal of Economics*, Vol. 106 No. 2, pp. 407-443. https://doi.org/10.2307/2937943

Barro, R.J. and Sala-i-Martin, X. (1992), "Convergence", *Journal of Political Economy*, Vol. 100 No. 2, pp. 223-251. https://doi.org/10.1086/261816

Barro, R.J. and Sala-i-Martin, X. (1995), Economic Growth, McGraw-Hill, New York.

Barro, R.J., Sala-i-Martin, X., Blanchard, O.J. and Hall, R.E. (1991), "Convergence across states and regions", Brookings Papers on Economic Activity, Vol. 1991 No. 1, pp. 107-182. https://doi.org/10.2307/2534639

Bénétrix, A.S., O'Rourke, K.H. and Williamson, J.G. (2015), "The spread of manufacturing to the poor periphery 1870–2007", *Open Economies Review*, Vol. 26 No. 1, pp. 1-37. https://doi.org/10.1007/s11079-014-9324-x

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Oduro, A., Oostendorp, R., Patillo, C., Söderbom, M. and Teal, F. (2003), "Credit constraints in manufacturing enterprises in Africa", *Journal of African Economies*, Vol. 12 No. 1, pp. 104-125. https://doi.org/10.1093/jae/12.1.104

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Willem Gunning, J., Oduro, A., Oostendorp, R., Pattillo, C., Söderbom, M. and Teal, F. (2004), "Do African manufacturing firms learn from exporting?", *Journal of Development Studies*, Vol. 40 No. 3, pp. 115-141. https://doi.org/10.1080/0022038042000213229

Botta, A. (2009), "A structuralist North–South model on structural change, economic growth and catching-up", *Structural Change and Economic Dynamics*, Vol. 20 No. 1, pp. 61-73. https://doi.org/10.1016/j.strueco.2008.12.001

Cao, L., Li, L., Wu, Y. and Zeng, W. (2020), "Does industrial convergence promote regional metabolism? Evidence from China", *Journal of Cleaner Production*, Vol. 273, 123010. https://doi.org/10.1016/j.jclepro.2020.123010

Carmignani, F. and Mandeville, T. (2014), "Never been industrialized: A tale of African structural change", *Structural Change and Economic Dynamics*, Vol. 31, pp. 124-137. https://doi.org/10.1016/j.strueco.2014.09.002

Chandra, R. (2003), Industrialization and Development in the Third World, Routledge, London. https://doi.org/10.4324/9780203169247

Chen, W., Huang, X., Liu, Y. and Song, Y. (2019), "Does Industry Integration Improve the Competitiveness of China's Electronic Information Industry? —Evidence from the Integration of the Electronic Information Industry and Financial Industry", *Sustainability*, Vol. 11 No. 9, 2695. https://doi.org/10.3390/su11092695

de Souza, J.P.A. (2015), "Evidence of growth complementarity between agriculture and industry in developing countries", *Structural Change and Economic Dynamics*, Vol. 34, pp. 1-18. https://doi.org/10.1016/j.strueco.2015.05.001

Delgado, A., Caldas, P. and Varela, M. (2024), "Economic Development, Industrialization, and Poverty Eradication: A Benchmarking Analysis of Developing, Emerging, and Developed Countries", *Highlights of Sustainability*, Vol. 3 No. 1, pp. 84-103. https://doi.org/10.54175/hsustain3010007

Diao, X., McMillan, M. and Rodrik, D. (2017), "The recent growth boom in developing economies: a structural change perspective", *National Bureau of Economic Research*, No. w23132. https://doi.org/10.3386/w23132

Dihn, H.T., Palmade, V., Chandra, V. and Coassar, F. (2012), Light Manufacturing in Africa: Targeted Policies to Enhance Private Investment and Create Jobs, A co-publication of Agence Française de Développement and the World Bank.

Dodzin, S. and Vamvakidis, A. (2004), "Trade and industrialization in developing economies", *Journal of Development Economics*, Vol. 75 No. 1, pp. 319-328. https://doi.org/10.1016/j.jdeveco.2003.08.006

Dong, F., Li, Y., Zhang, X., Zhu, J. and Zheng, L. (2021), "How does industrial convergence affect the energy efficiency of manufacturing in newly industrialized countries? Fresh evidence from China", *Journal of Cleaner Production*, Vol. 316, 128316. https://doi.org/10.1016/j.jclepro.2021.128316

Du, X. and Xie, Z. (2020), "Occurrence of turning point on environmental Kuznets curve in the process of (de)industrialization", *Structural Change and Economic Dynamics*, Vol. 53, pp. 359-369. https://doi.org/10.1016/j.strueco.2019.06.003

Durlauf, S. and Quah, D.T. (1999), "The new empirics of economic growth", In J. Taylor and M. Woodford (Eds.), *Handbook of Macroeconomics* (Part A), pp. 235–308, North Holland: Elsevier. https://doi.org/10.1016/S1574-0048(99)01007-1

Easterly, W. and Levine, R. (2003), "Tropics, germs, and crops: how endowments influence economic development", *Journal of Monetary Economics*, Vol. 50 No. 1, pp. 3-39. https://doi.org/10.1016/S0304-3932(02)00200-3

Echaudemaison, C.-D. (2003), Dictionnaire d'économie et de sciences sociales (6e ed.), Nathan, Paris.

Erten, B. and Schwank, O. (2021), "Rethinking Unconditional Convergence in Manufacturing in the Age of New Technologies", *Journal of Globalization and Development*. https://doi.org/10.1515/jgd-2020-0011

Fafchamps, M., El Hamine, S. and Zeufack, A. (2008), "Learning to export: Evidence from Moroccan manufacturing", *Journal of African Economies*, Vol. 17 No. 2, pp. 305-355. https://doi.org/10.1093/jae/ejm008

Fai, F. and Von Tunzelmann, N. (2001), "Industry-specific competencies and converging technological systems: evidence from patents", *Structural Change and Economic Dynamics*, Vol. 12 No. 2, pp. 141-170. https://doi.org/10.1016/S0954-349X(00)00035-7

Gao, Z. and Lu, Z. (2018), "The impact of industrial convergence on innovation efficiency of equipment manufacturing industry. Based on the perspective of converged development of equipment manufacturing industry and high-tech service industry", *Contemporary Economic Research*, Vol. 8, pp. 71–81 (in Chinese).

Garcia-Murillo, M.A. and MacInnes, I. (2001), "FCC organizational structure and regulatory convergence", *Telecommunications Policy*, Vol. 25 No. 6, pp. 431-452. https://doi.org/10.1016/S0308-5961(01)00015-5

Guadagno, F. (2016), "The determinants of industrialisation in developing countries, 1960-2005", MERIT Working Papers 2016-031, United Nations University-Maastricht Economic and Social Research Institute on Innovation and Technology (MERIT). https://unu-merit.nl/publications/wppdf/2016/wp2016-031.pdf (Accessed 7 May 2025).

Gui-Diby, S.L. and Renard, M.F. (2015), "Foreign direct investment inflows and the industrialization of African countries", *World Development*, Vol. 74, pp. 43-57. https://doi.org/10.1016/j.worlddev.2015.04.005

Hallward-Driemeier, M. and Nayyar, G. (2017), Trouble in the Making: The Future of Manufacturing-Led Development, World Bank Publications. https://doi.org/10.1596/978-1-4648-1174-6

Haraguchi, N., Martorano, B. and Sanfilippo, M. (2019), "What factors drive successful industrialization? Evidence and implications for developing countries", Structural Change and Economic Dynamics, Vol. 49, pp. 266-276. https://doi.org/10.1016/j.strueco.2018.11.002

Kaldor, N. (1966), Causes of the Slow Rate of Growth of the United Kingdom, Cambridge University Press.

Kaldor, N. (1967), Strategic Factors in Economic Development, New York State School of Industrial and Labor Relations, Cornell University.

Lewis, W.A. (1954), "Economic development with unlimited supplies of labour", Manchester School of Economic and Social Studies, Vol. 22, pp. 139–191. https://doi.org/10.1111/j.1467-9957.1954.tb00021.x

Li, X., Chen, H. and Zhang, X. (2017), "Research on the performance of the integration of information industry and manufacturing industry. Based on the data of Zhejiang Province", *Chinese Soft Science*, Vol. 2, pp. 21–31 (in Chinese).

Lemoine, F., Poncet, S. and Ünal, D. (2015), "Spatial rebalancing and industrial convergence in China", *China Economic Review*, Vol. 34, pp. 39-63. https://doi.org/10.1016/j.chieco.2015.03.007

Markusen, J.R. and Venables, A.J. (1999), "Foreign direct investment as a catalyst for industrial development", *European Economic Review*, Vol. 43 No. 2, pp. 335-356. https://doi.org/10.1016/S0014-2921(98)00048-8

Marti, D.F. and Ssenkubuge, I. (2009), "Industrialisation and industrial policy in Africa: is it a policy priority?", South Centre Research Paper No. 20. https://www.econstor.eu/bitstream/10419/232138/1/south-centre-rp-020.pdf (Accessed 07 May 2025).

Mensah, E.B. (2020), "Is sub-Saharan Africa deindustrializing?", UNU-MERIT Working Papers 2020-045, Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT). Available at: https://www.academia.edu/63020311/Is_sub_Saharan_Africa_deindustrializing (Accessed 07 May 2025).

Mijiyawa, A.G. (2017), "Drivers of structural transformation: The case of the manufacturing sector in Africa", *World Development*, Vol. 99, pp. 141-159. https://doi.org/10.1016/j.worlddev.2017.07.007

Olaniyi, C.O. (2021), "On the transmission mechanisms in the finance–growth nexus in Southern African countries: Does institution matter?", *Economic Change and Restructuring*, pp. 1-39. https://doi.org/10.1007/s10644-020-09313-5

Olaniyi, C.O. and Oladeji, S.I. (2021), "Moderating the effect of institutional quality on the finance–growth nexus: insights from West African countries", *Economic Change and Restructuring*, Vol. 54 No. 1, pp. 43-74. https://doi.org/10.1007/s10644-020-09275-8

Ortiz Ávalos, L. and Ruiz Ochoa, W. (2010), "Inter-municipal Convergence of Manufacturing in Sonora: The Role of State Investment", *Frontera Norte*, Vol. 22 No. 44, pp. 79-107.

Ottaviano, G.I. and Puga, D. (1998), "Agglomeration in the global economy: A survey of the new economic geography", *World Economy*, Vol. 21 No. 6. https://doi.org/10.1111/1467-9701.00160

Ottaviano, G. and Thisse, J.F. (2004), "Agglomeration and economic geography", In J. Vernon Henderson and Jacques-François Thisse (Eds.), *Handbook of Regional and Urban Economics* (Vol. 4), pp. 2563-2608, Elsevier. https://doi.org/10.1016/S1574-0080(04)80015-4

Oyelaran-Oyeyinka, B. and Lal, K. (2016), Structural Transformation and Economic Development: Cross-regional Analysis of Industrialization and Urbanization, Routledge. https://doi.org/10.4324/9781315560885

Phillips, P.C. and Sul, D. (2007), "Transition modeling and econometric convergence tests", *Econometrica*, Vol. 75 No. 6, pp. 1771–1855. https://doi.org/10.1111/j.1468-0262.2007.00811.x

Phillips, P.C. and Sul, D. (2009), "Economic transition and growth", *Journal of Applied Econometrics*, Vol. 24 No. 7, pp. 1153–1185. https://doi.org/10.1002/jae.1080

Rajan, R.G. and Zingales, L. (1998), "Power in a Theory of the Firm", *Quarterly Journal of Economics*, Vol. 113 No. 2, pp. 387-432. https://doi.org/10.1162/003355398555630

Rey, S.J. and Montouri, B.D. (1999), "US regional income convergence: a spatial econometric perspective", *Regional Studies*, Vol. 33 No. 2, pp. 143-156. https://doi.org/10.1080/00343409950122945

Rodriguez-Clare, A. (1996), "The division of labor and economic development", *Journal of Development Economics*, Vol. 49 No. 1, pp. 3-32. https://doi.org/10.1016/0304-3878(95)00051-8

Rodrik, D. (2013), "Unconditional convergence in manufacturing", *Quarterly Journal of Economics*, Vol. 128 No. 1, pp. 165-204. https://doi.org/10.1093/qje/qjs047

Rodrik, D. (2016), "Premature deindustrialization", *Journal of Economic Growth*, Vol. 21 No. 1, pp. 1–33. https://doi.org/10.1007/s10887-015-9122-3

Romer, D. (1996), *Advanced Macroeconomics*, McGraw-Hill, New York.

Saba, C.S. (2020), "Convergence or divergence patterns in global defence spending: further evidence from a nonlinear single factor model", *Peace Economics, Peace Science and Public Policy*. https://doi.org/10.1515/peps-2020-0012

Saba, C.S. (2021), "Convergence and Transition Paths in Transportation: Fresh Insights from a Club Clustering Algorithm", *Transport Policy*, Vol. 112, pp. 80-93. https://doi.org/10.1016/j.tranpol.2021.08.008

Saba, C.S. and David, O.O. (2020), "Convergence patterns in global ICT: Fresh insights from a club clustering algorithm", *Telecommunications Policy*, Vol. 44 No. 10. https://doi.org/10.1016/j.telpol.2020.102010

Saba, C.S. and Ngepah, N. (2020), "Empirical analysis of military expenditure and industrialisation nexus: A regional approach for Africa", *International Economic Journal*, Vol. 34 No. 1, pp. 58-84. https://doi.org/10.1080/10168737.2019.1641541

Saba, C.S. and Ngepah, N. (2021), "ICT Diffusion, Industrialisation and Economic Growth Nexus: An International Cross-country Analysis", *Journal of the Knowledge Economy*, pp. 1-40. https://doi.org/10.1007/s13132-021-00795-w

Saba, C.S., Ngepah, N. and Odhiambo, N.M. (2021), "Analysis of convergence in transport infrastructure: a global evidence", *European Journal of Transport and Infrastructure Research*, Vol. 21 No. 2, pp. 137-160. https://doi.org/10.18757/ejtir.2021.21.2.5368

Solow, R.M. (1956), "A contribution to the theory of economic growth", *Quarterly Journal of Economics*, Vol. 70 No. 1, pp. 65-94. https://doi.org/10.2307/1884513

Soludo, C. and Ogbu, O. (2004), "A synthesis of major themes in the political economy of trade and industrialization in Africa", *The Politics of Trade and Industrial Policy in Africa: Forced Consensus*, pp. 1-41.

Söderbom, M. and Teal, F. (2003), "Are manufacturing exports the key to economic success in Africa?", *Journal of African Economies*, Vol. 12 No. 1, pp. 1-29. https://doi.org/10.1093/jae/12.1.1

Söderbom, M., Teal, F. and Harding, A. (2006), "The determinants of survival among African manufacturing firms", *Economic Development and Cultural Change*, Vol. 54 No. 3, pp. 533-555. https://doi.org/10.1086/500030

Statistics Division UNIDO (2017), Statistical Indicators Of Inclusive And Sustainable Industrialization, Accessed on 3rd January 2024, available at: https://stat.unido.org/sites/default/files/2023-01/170302_UNIDO_Statistical-indicators-of-inclusive-and-sustainable-industrialization_ebook.pdf (Accessed 07 May 2025).

Swan, T.W. (1956), "Economic growth and capital accumulation", Economic Record, Vol. 32 No. 2, pp. 334-361. https://doi.org/10.1111/j.1475-4932.1956.tb00434.x

UNIDO (2018), Structural Change for Inclusive and Sustainable Industrial Development, UNIDO, Vienna.

Wan, X., Kazmi, S.A.A. and Wong, C.Y. (2022), "Manufacturing, exports, and sustainable growth: Evidence from developing countries", *Sustainability*, Vol. 14 No. 3, 1646. https://doi.org/10.3390/su14031646

Weiss, M. and Clara, M. (2016), "Unlocking Domestic Investment for Industrial Development", UNIDO: Vienna, Department of Policy, Research and Statistics Working Paper 12/2016.

World Bank (2017), "Trouble in the Making? The Future of Manufacturing-Led Development", The World Bank, Washington, DC.

Xu, L.C. (2011), "The effects of business environments on development: Surveying new firm-level evidence", *World Bank Research Observer*, Vol. 26 No. 2, pp. 310-340. https://doi.org/10.1093/wbro/lkq012

Xing, W., Ye, X. and Kui, L. (2011), "Measuring convergence of China's ICT industry: An input–output analysis", *Telecommunications Policy*, Vol. 35 No. 4, pp. 301-313. https://doi.org/10.1016/j.telpol.2011.02.003

Yamada, T. and Otchia, C. (2025), "Industrial Development, Poverty Reduction, and Inequality: A Robustness Test using Nighttime Lights in Vietnam", Poverty Reduction, and Inequality: A Robustness Test using Nighttime Lights in Vietnam, Available at SSRN: https://ssrn.com/abstract=5162185. http://dx.doi.org/10.2139/ssrn.5162185

Zhou, H. (2009), "Population growth and industrialization", *Economic Inquiry*, Vol. 47 No. 2, pp. 249-265. https://doi.org/10.1111/j.1465-7295.2008.00151.x