ISSN: 2029-4913 / eISSN: 2029-4921

Article in press

TECHNOLOGICAL and ECONOMIC DEVELOPMENT of ECONOMY

https://doi.org/10.3846/tede.2026.25410

VALUE-ADDED MANUFACTURING, GROWTH AND INFLATION: DYNAMIC PANEL THRESHOLD PERSPECTIVE

Emin Efecan AKTAŞ [1✉], Lokman Salih ERDEM [2]

[1]*Department of Accounting and Tax Practices, Kirsehir Ahi Evran University, Kirsehir, Türkiye*
[2]*Department of Foreign Trade, Kirsehir Ahi Evran University, Kirsehir, Türkiye*

Article History:
- received 24 January 2025
- accepted 17 November 2025
- first published online 28 January 2026

Abstract. This study pioneers the exploration of inflation's nonlinear role in the nexus between value-added manufacturing and economic growth, employing a dynamic panel threshold model for 38 Organisation for Economic Co-Operation and Development (OECD) countries from 1980 to 2023. Unlike prior research, it uniquely identifies an inflation threshold (4.4954%) that alters the manufacturing-growth relationship. Below this threshold, value-added manufacturing significantly boosts economic growth, while above it, growth declines despite manufacturing process, revealing a novel nonlinear dynamic. Utilizing advanced methodologies like System Generalized Method of Momemnts (GMM) and Diallo's (2020) dynamic panel threshold approach, the study addresses endogeneity and cross-sectional dependence, offering robust insights. These findings highlight inflation's critical influence on manufacturing's growth effects, urging policymakers to prioritize price stability to maximize manufacturing's economic contributions. This research enriches the literature by integrating inflation thresholds into growth models, providing fresh policy implications for sustainable economic strategies in OECD economies.

Keywords: value-added manufacturing, economic growth, inflation, threshold.

JEL Classification: C23, E31, L60, N60, O40.

✉Corresponding author. E-mail: *efecanaktas@yahoo.com*

1. Introduction

Economic growth has been a recurring subject in the literature and debated from various perspectives regarding how it can be rendered sustainable. To elaborate, it is natural for one country to grow faster than another or to approach macroeconomic issues that shape growth in distinct ways. This divergence arises from the unique dynamics, capabilities, strengths, and weaknesses of individual countries, leading to the emergence of various theories. The differences in resource endowments among nations also result in differing needs in their paths to growth. Factors such as technology, human capital, knowledge, and other manufacturing inputs exhibit varying degrees of necessity. Based on these differences, the development of diverse theories is an expected outcome. Consequently, countries that invest more heavily in capital stock or technology and utilize these resources efficiently – manufacturing more goods and services per unit of capital compared to others – may establish a fundamental dynamic for sustainable growth. Conversely, capital accumulation may not necessarily be the most critical driver of competitiveness. As capital stock continues to grow, the rate of economic growth may not increase proportionally. This is due to the diminishing marginal returns of capital; as more capital is added, the amount of raw material or resources available per unit of capital does not increase at the same rate. Over time, the diminishing marginal productivity of capital reduces its contribution to output. For instance, in rapidly growing economies such as China since the 1990s in labor-abundant countries like India, where the labor-to-capital ratio is relatively high, increases in manufacturing output have significantly boosted economic output. In countries with a high level of idle labor, the low cost of labor often reflects economic inertia. Hence, the effective utilization of both labor and capital becomes crucial for sustaining economic growth.

Economic growth has been extensively discussed in the literature, with both endogenous and exogenous growth theories highlighting the effectiveness of various factors. The Solow-Swan model asserts that growth cannot rely solely on capital accumulation and that sustainable growth requires exogenous factors such as qualified human capital and technological progress (Solow, 1994). Mankiw et al. (1992) consider Solow's assumption of diminishing returns pivotal in explaining income disparities while emphasizing that heterogeneous parameters like culture, climate, and economic conditions should not be overlooked. Hahn (1989), countering Kaldor's acceptance of diminishing returns as a restrictive factor, argues that increasing returns in industrial manufacturing can sustain growth. The Ramsey-Cass-Koopmans (RCK) model provides a framework for long-term growth by integrating capital accumulation, labor growth, and technological advancement, and individuals optimize their consumption and savings decisions (Kónya, 2018). Rostow (1959) links the sustainability of economic growth to political and social transformations, arguing that every society progresses through a take-off stage towards maturity. Industrialization and technological innovations serve as key drivers of growth, particularly during the take-off stage, playing a critical role in sectoral transformation. Romer (1994) bases economic growth on endogenous factors, emphasizing the significance of research and development activities and the accumulation of human capital, noting that technological advancements generate positive externalities through innovation. Lucas (1988) highlights the impact of continuously accumulating human capital on manufacturing processes and social productivity while underscoring the importance of government incentives to prevent diminishing returns. Inspired by Romer (1994) and Lucas (1988), Rebelo (1991) explains growth under the assumption of constant returns to capital accumulation, advocating endogenous economic processes as the primary source of growth. Acemoglu and Robinson (2013) argue that sustainable growth hinges on the independence of institutional structures and adherence to meritocratic principles, emphasizing that strong institutions contribute to growth by safeguarding the general interests of society. While economic growth is often criticized as an incomplete measure of societal welfare, it remains a principal indicator, as increases in the production of goods and services have historically reflected long-term manufacturing capacity.

The manufacturing sector in any economy is generally stronger than other sectors and is directly and indirectly linked to the broader economy. A higher level of industrialization is closely associated with increased per capita income in developing countries, and more industrialized nations tend to achieve greater wealth compared to their less industrialized counterparts. This can be attributed to the superior productivity levels of the manufacturing sector. Moreover, capital accumulation in manufacturing is more centralized and manageable compared to the widely dispersed nature of agricultural capital. Capital accumulation serves as a hub for technological advancement and establishes strong linkages with other sectors, including services. In this context, manufacturing provides opportunities for access to global markets, in contrast to economies reliant on agriculture or primary manufacturing (Szirmai, 2013). The manufacturing economy is regarded as a driving force of economic growth. The manufacturing economy, as one of the fundamental dynamics of the economy, has increasingly had its impact and significance on growth discussed, particularly in the context of developing and emerging economies. A technological improvement in the manufacturing sector, in particular, would enhance value-added and productivity while exerting a positive impact on the labor market and contributing to an increase in societal welfare. The adoption of advanced and emerging technologies improves efficiency in production processes, leading to the development of more innovative, sophisticated, and high-value-added products. This process enhances the competitiveness of the manufacturing sector while contributing positively to economic growth and export performance. Moreover, by reducing the need for direct human involvement in production, these technologies help lower overall production costs (Şerban et al., 2022, p. 292). If economic stability is ensured, market conditions mature, and the economy becomes more predictable, especially in the absence of inflationary pressures or other economic constraints, potential increases in the manufacturing sector are likely to be observed.

Inflation can have both positive and negative effects on an economy. Achieving price stability is critical, as it allows central banks to establish a solid foundation for managing the relationship between growth and inflation. The link between growth and inflation has been widely discussed in the literature, with empirical findings indicating that inflation positively affects growth during periods of low inflation but negatively impacts growth during periods of high inflation. There exists a threshold, or tipping point, at which inflation begins to adversely affect growth. This threshold may vary depending on a country's level of development, as well as the methodology, dataset, and country studied in the research (Akıncı et al., 2023; Azam & Khan, 2022; Dinh, 2020;. Kremer et al., 2013; Seleteng et al., 2013; Vinayagathasan, 2013). It is essential for policymakers to thoroughly understand this relationship before making decisions. It is often emphasized that sustainable growth requires inflation to be maintained at a certain level (Aydin et al., 2016; Dholakia, 2020; Nar, 2025; Thanh, 2015; Yilmazkuday, 2012). Angadi (1998) argued that low and moderate inflation is positively associated with economic growth, whereas high inflation creates adverse effects on growth. The role of capital in growth and the soundness of financial policies must also be considered, since factors that disrupt price stability can undermine the effectiveness of growth theories. External factors, such as foreign capital and technology transfer, can influence price stability and consequently hinder the growth process. In endogenous growth theories, inflation must remain stable, while in exogenous growth theories, exceeding the inflation threshold can disrupt equilibrium, reduce factor productivity, and eventually diminish manufacturing output. Low inflation reduces production costs and increases productivity, whereas high inflation creates uncertainty in domestic markets, discouraging domestic and foreign investors due to unpredictability, ultimately leading to a decline in manufacturing output. The financial pressure induced by inflation increases production costs, thereby constraining investment and innovation capacity within the high-value-added manufacturing sector. This hampers productivity growth and exerts a negative influence on overall economic expansion. Inflation thresholds play a critical role in determining a country's capacity for value-added manufacturing and should be regarded as a significant boundary for economic growth.

As discussed above and in the literature review section, numerous studies have explored the relationship between growth and inflation, as well as that between manufacturing and growth. The primary objective of these studies is to propose alternative models that address the shortcomings of previous research, if any, and produce more refined results, thereby enabling the formulation of stronger and more effective policies. The current study aims to contribute to this body of research by employing an updated methodology – dynamic panel threshold analysis (as developed by Diallo, 2020) – to examine the interrelationships among macroeconomic variables such as growth, manufacturing, and inflation, which are inherently interconnected and mutually influential. To the best of our knowledge, no prior study has enquired the impact of value-added manufacturing on economic growth by defining a threshold for inflation. This study examines how value-added manufacturing impress economic growth under and above the inflation threshold for the period 1980–2023, across 38 OECD member countries. By doing so, it seeks to highlight the applicability of price stability to growth theories and underscore the importance of manufacturing under varying inflation conditions. The primary hypotheses tested in this study are as follows:

H1: *A critical inflation threshold significantly influences the linkage between value-added manufacturing and economic growth.*

H2: *Below this threshold, value-added manufacturing positively influences economic growth whereas above this threshold, although value-added manufacturing continues, its impact on growth changes direction.*

The subsequent portions of the study encompass theoretical and empirical literature, data, research methods, findings, and discussion. The final section comprises the conclusion and implications.

2. Literature review

Value-added manufacturing is a key concept frequently discussed in both theoretical and empirical studies on economic growth. These discussions focus on how value creation impacts economic growth through elements such as Total Factor Productivity (TFP) growth, intersectoral synergies, innovation, and labor productivity. In classical growth theory, manufacturing is based on the combination of fundamental manufacturing factors, such as capital, labor, and land. However, the notion of value-added manufacturing is not directly addressed in this theory. Smith (1776) emphasized productivity gains through division of labor and specialization, indirectly highlighting the importance of value creation. According to Smith, the increase in the division of labor results in higher manufacturing, thereby supporting growth. The Solow model (1956) contends that long-term economic growth is influenced by capital accumulation, workforce expansion, and technical advancement. In this framework, value-added manufacturing is indirectly considered through technological progress and TFP growth. TFP growth facilitates the manufacturing of higher value-added goods by enhancing the efficiency of manufacturing processes. Particularly, the integration of technological innovations into manufacturing processes enables the production of low-cost, high-value-added goods, thereby accelerating growth. Endogenous growth theory, originated by economists such as Romer (1990) and Lucas (1988), discloses the effects of invention, fund of knowledge, and human capital on growth. Within this theory, value creation is associated with innovative manufacturing processes and the accumulation of knowledge. For instance, R&D investments in high-value-added sectors drive technological innovation, thereby accelerating economic growth. Moreover, the effective utilization of human capital in high-value-added manufacturing ensures the sustainability of growth. The theory of structural transformation reiterates the transition of economies from low-value-added sectors, like agriculture, to high-value-added sectors, such as industry and services. This transition not only enhances labor productivity but also creates greater opportunities for investment and innovation. In this context, Kuznets (1955) discusses a transformation process where economic growth initially correlates with inequality. Over time, however, the expansion of high-value-added sectors reduces inequality and fosters growth during this phase.

Kaldor (1968) conducted research across 12 OECD countries on output growth, employment growth, and productivity, establishing manufacturing as the primary driver of economic growth. Furthermore, Kaldor's second law proposes an alternative perspective to the Verdoorn law, which posits that increases in labor productivity enhance output growth. According to Kaldor's law, improvements in labor productivity within manufacturing are positively correlated with manufacturing output growth through economies of scale, with this contribution attributed to advancements in technology (Felipe et al., 2014). Industrial policies aim to promote high-value-added manufacturing to stimulate growth. The nations referred to as the Asian Tigers (South Korea, Taiwan, Singapore, and Hong Kong) have exhibited swift economic expansion via export-driven strategies centered on high-value-added goods. This process is also linked to international trade theory. Krugman (1991) argues that achieving competitive advantages in international trade through economies of scale is possible with high-value-added manufacturing. The impact of value-added manufacturing on sustainable development is another significant area of debate. High-value-added manufacturing can support sustainable growth by reducing environmental costs. Porter and Van Der Linde (1995) contend that environmental laws can stimulate innovation, resulting in enhanced value-added manufacturing. On this theoretical basis, value-added manufacturing as a means of achieving economic development is a crucial driver of structural transformation, which is the transition from a traditional economy dominated by primary activities to a modern economy characterized by high-productivity manufacturing activities. Manufacturing is historically seen as a key sector that fosters economic growth, structural change, and catch-up development. Manufacturing not only contributes to GDP but also facilitates technological progress, economies of scale, and job creation across various skill levels. Without a robust manufacturing sector, economies may face limited growth prospects and increased vulnerability to external shocks and the challenges associated with the "natural resource curse" (Naudé & Szirmai, 2012).

Recent empirical studies are focused on examining these challenges in the value-added manufacturing and economic growth nexus. Only a few closely related empirical studies directly probe the relation between value-added manufacturing and economic growth. The nexus between the two variables is empirically focused primarily on the connections among the manufacturing sector, firms, and economic growth, as well as output growth and productivity. As far as we know, no erstwhile search has assessed the relationship between the two variables while including inflation. Understanding and empirically analyzing the impact of manufacturing on economic growth below and above the threshold inflation level is a subject that has been contested since ancient times, and presumed to contribute to the literature by offering methodological upsides and empirical novelty. The previous empirical studies are aligned with this study's assertion.

Szirmai (2012) emphasizes the significance of industrial enhancement and policy in the development strategies of countries following World War II. The development path could initially be found through a transition from agriculture to industry. Countries investing in human and physical capital have achieved economic growth through increased output. Value-added manufacturing remains critical in late-developing regions such as Asia, India, and Latin America. Additionally, it is impressive that economies of scale and scope, technological innovation, and industrial advancement will continue to enhance value-added manufacturing and contribute to economic growth. Rodrik (2013) emphasizes the theoretical connection between manufacturing and economic growth. The role of the employment share of manufacturing, which is a key conditioning factor for economy-wide growth, is highlighted. An increase in the manufacturing employment share raises growth, as indicated by the reallocation term in the growth equation. Manufacturing sectors demonstrate robust unconditional convergence in labor productivity, this does not result in cumulative divergence owing to the minimal proportion of manufacturing employment in low-income nations and the sluggish rate of modernization. Timmer et al. (2014) analyze structural changes and productivity growth in developing countries from 1960 to 2010, focusing on shifts in value-added manufacturing and employment across sectors using data from the Groningen Growth and Development Centre (GGDC). Trends of de-industrialization in Africa and Latin America are examined and compared with stable manufacturing shares in Asia . The low productivity in agriculture compared to services and manufacturing may slow growth.

Szirmai and Verspagen (2015) examine how manufacturing influenced the economic growth of 88 developing countries between 1950 and 2005. Manufacturing had a moderately positive impact on growth, particularly compared to services. However, its importance has declined since 1990. The study reinforces the essential significance of human capital and the interplay between manufacturing and education in fostering growth, and it advocates for additional research to enhance comprehension of these connections. Haraguchi et al. (2017) tackle the vital role of manufacturing in emerging nations' economic development between 1950 and 2005, with an eye on patterns in manufacturing value added and employment shares in relation to GDP per capita. The analysis utilizes data from the United Nations and World Bank, presenting regression analyses and historical case studies to support the argument that industrialization remains essential for economic growth, particularly in low-income countries. Despite accusations of premature deindustrialization, the paper also underlines the stability of manufacturing's contributions and pinpoints the concentration of manufacturing operations in a few populous countries. Su and Yao (2017) analyze the role of the manufacturing sector in driving economic growth from 1950 to 2013 for 158 economies; particularly in middle-income economies. The paper highlights the significant interconnections between manufacturing and other sectors, such as services and agriculture, emphasizing the importance of manufacturing for increasing gross private savings and technological accumulation. The findings suggest that effective industrial policies are essential to prevent premature deindustrialization, which could hinder long-term economic growth, especially in developing regions.

Karami et al. (2019) investigate the factors influencing economic growth in 25 competitive European economies from 1995 to 2016, focusing on the roles of manufacturing value added, gross fixed capital formation, employment, and high-tech exports in GDP. Key findings indicate that three factors positively influence GDP, while gross fixed capital formation has a negative effect, leading to the rejection of the hypothesis that investment positively impacts GDP. The research emphasizes the importance of enhancing the manufacturing sector, creating job opportunities, and fostering technological innovation for sustainable economic growth. Sallam (2021) discusses the role of the manufacturing sector in economic growth, particularly in the context of Kaldor's laws. A research of Saudi Arabia from 1980 to 2018 uncovers a causal connection in both directions between manufacturing and economic growth, underlining the necessity of increasing productivity and selecting productive industries to assist economic diversification and accomplish Vision 2030. Wan et al. (2022) query the nexus among manufacturing development, exports, and economic growth in 130 developing countries from 1996 to 2019. While manufacturing generally contributes positively to economic growth, export-led growth policies can lead to deindustrialization, particularly in lower-income countries, contradicting the export-led growth hypothesis. The importance of human capital and the require for a nuanced comprehending of the dynamics between exports, manufacturing, and economic growth are accentuated, suggesting that the goals of export-led development may conflict with industrialization objectives. Abdulrazzaq (2024) scrutinizes the impact of manufacturing value added on economic development in Gulf Cooperation Council (GCC) countries from 1980 to 2020, utilizing panel data analysis and econometric methods. Principal results prove a significant positive association between manufacturing value added, labor force, technology exports, gross fixed capital formation, and economic growth. The evidence reaffirms that these characteristics might promote resilient economic progress.

3. Data

The analysis examines the impact of Value-Added Manufacturing (MVA) on Economic Growth (GDP) below the Inflation (INF) threshold in OECD member countries. To mitigate omitted variable bias, a set of control variables is employed. All data are consistent with the previous literature. Since growth, manufacturing, and inflation are often linked to Labor Force Participation (LFP) in the literature, this variable is included in the model. Additionally, both the data and the literature indicate that expectations related to welfare are significant determinants of economic growth and development in manufacturing. To capture this effect, Life Expectancy (LFE) is incorporated into the model. Population (POP) is also a fundamental determinant of growth. While the availability of greater opportunities in firms and industries and the diversity of economic activities in rural and urban areas may influence both economic growth and manufacturing, these effects are not uniform due to country-specific socioeconomic differences. Furthermore, exports of goods and services (EXP) and gross fixed capital formation (INV) are key drivers of economic growth. Increased manufacturing and sales contribute to the growth of a country's Gross Domestic Product (GDP). Economic growth helps improve living standards and enhances overall welfare. Rising exports facilitate growth driven by external demand. (Abdulrazzaq, 2024; Haraguchi et al., 2017; Karami et al., 2019; Su & Yao, 2017; Wan et al., 2022). Table 1 contains brief information regarding variables.

Table 1. Data information (source: own edited)

Variables	Definitions	Sources
Dependent variable: Economic growth (lnGDP)	Real gross domestic per capita (current US$)	World Bank Open Data (n.d.)
Threshold variable: Inflation (INF)	Annual inflation rate based on consumer price index	
Threshold regime-dependent variable: Manufacturing value-added (lnMVA)	The manufacturing sector's value-added as a percentage of GDP represents its net output.	
Threshold regime-independent variables		
Exports of goods and services (lnEXP)	The price of all commodities and other market services given to the rest of the globe (current US$)	
Population (lnPOP)	Sum of population	
Gross fixed capital formation (lnINV)	Gross fixed capital creation refers to the procurement of manufacturing assets measured in (current US$).	
Labor force participation (lnLFP)	The rate of participation in the labor force indicates the percentage of the population within a specific age group.	OECD (n.d.)
Life expectancy (lnLFE)	Life expectancy at birth (total) is quantified in years for the overall population and disaggregated by gender.	

The dataset involves 44 years of data from all 38 OECD member nations, spanning the years 1980 to 2023. All variables are expressed in natural logarithms, except for inflation rates, which have negative quantities. Researchers use accessible data to select countries and periods for analysis with a well-balanced panel. However, some countries continue to have missing values. We also provide several statistical descriptions of the data in the Appendix, Table A1.

4. Research methodology

The data have been subjected to certain pre-estimation diagnostic tests before threshold estimation. These include the cross-sectional dependence test developed by Pesaran (2015) and the cross-sectionally augmented Dickey-Fuller (CADF) test developed by Pesaran (2007). This test is based on the cross-sectionally augmented Im, Pesaran, and Shin (CIPS) test proposed by Im et al. (2003). The existence of a cointegration relationship between the variables has been examined using the test developed by Westerlund (2007). Due to word constraints, methodological details regarding these tests have not been included in this section.

4.1. Baseline model

Unlike static panel models, dynamic panel models can offer greater insights into variations in economic performance. According to Arellano and Bond (1991), the General Method of Moments (GMM) estimators utilize exogenous or endogenous variables with one or more time lags as instruments. This paper adopts the System GMM method, which addresses the limitations of the difference GMM method, including the elimination of individual effects and potential issues with weak instrumental variables. Nonetheless, conventional static models are incapable of analyzing this relationship. As a result, this paper uses both static and dynamic panel models to estimate the results of basic regression analysis before threshold forecasting.

$$\ln GDP_{it} = \beta_1 + \beta_2 \ln GDP_{it-1} + \beta_3 \ln MVA_{it} + \beta_4 lMVA_{it}^2 + \sum_{it=1}^{6} \alpha_i control_{it} + \varepsilon_{it}. \quad (1)$$

4.2. Dynamic panel threshold model

The concept of threshold effects suggests that the influence of certain independent variables on the dependent variable is not entirely linear. This implies that when a variable reaches a specific value, external factors may induce a nonlinear effect of the independent variable on the dependent variable. In statistical analysis, the use of some unconventional parameters often leads to a non-standard distribution. To address this issue, Hansen (1999) proposed a panel threshold model approach that incorporates individual effects. This model eliminates subjectivity by internally grouping the data, dividing the sample range according to the threshold variable, and estimating the threshold value based on the observed values . This facilitates the effective determination of the threshold value. The single-threshold model, which serves as the foundation for models with multiple threshold values, is represented by Eq. (1) in this estimation strategy.

$$y_{it} = \eta_i + \vartheta_1' I(\rho_{it} \le \gamma) x_{it} + \vartheta_2' I(\rho_{it} > \gamma) x_{it} + u_i + \varepsilon_{it}. \quad (2)$$

In the model, y_{it} represents the dependent variable; η_i denotes individual effects; x_{it} is the independent variable; $I(.)$is the indicator function; ρ_{it} is the threshold variable; γ is the threshold value; ϑ_1, ϑ_2 are the slope parameters; u_i represents the control variables; and ε_{it} is the error term. The subscripts i and t refer to cross-sectional units and time, respectively. When the conditions within the parentheses are satisfied, $I(.) = 1$; otherwise $I(.) = 0$ Observations are divided into two regimes based on whether the threshold variable ρ_{it} is less than or greater than the threshold value γ. Under these circumstances, Eq. (1) can be rewritten as shown in Eq. (2).

$$y_{it} = \begin{cases} \eta_i + \vartheta_1' x_{it} + \varepsilon_{it} & (\rho_{it} \le \gamma), \\ \eta_i + \vartheta_2' x_{it} + \varepsilon_{it} & (\rho_{it} > \gamma). \end{cases} \quad (3)$$

Additionally, Eq. (2) can also be expressed as shown in Eq. (3).

$$y_{it} = \vartheta' x_{it}(\gamma) + \eta_i + \varepsilon_{it}. \tag{4}$$

We account for endogenous regressors (such as the lagged dependent variable) using the threshold model developed by Caner and Hansen (2004) and further refined by Kremer et al. (2013). This approach extends Hansen's (1999) original framework to accommodate endogeneity. The main challenge lies in adapting the panel threshold model to remove country-specific fixed effects (Hansen, 1999, pp. 4–5). Ensuring that the error terms are free from autocorrelation is critical. Consequently, the conventional elimination of fixed effects in dynamic panels through first differencing is not suitable. This issue is addressed by employing the advanced orthogonal deviation transformation introduced by Arellano and Bover (1995), which effectively removes fixed effects. Moreover, this method minimizes the risk of serial correlation in the transformed error terms (Caner & Hansen, 2004, pp. 826–827; Kremer et al., 2013, pp. 17–18).

$$Var(\varepsilon_i) = \sigma^2 I_T \text{ and } Var(\varepsilon_i^*) = \sigma^2 I_{T-1}. \tag{5}$$

The transformation of the error term is underlined in Eq. (5).

$$\varepsilon_{it}^* = \sqrt{\frac{T-t}{T-t+1}}\left[\varepsilon_{it} - \frac{1}{T-t}(\varepsilon_{i(t+1)} + \ldots + \varepsilon_{iT}\right]; \tag{6}$$

$$\widehat{\Upsilon} = \min(\Upsilon \in \Gamma) S_n(\Upsilon). \tag{7}$$

Υ is chosen as the one connected with the smallest sum of squared residuals. $\widehat{\Upsilon}$ depictures the threshold estimate. This is accompanied by a confidence interval indicating the level of confidence as follows:

$$\Gamma = \{\Upsilon : LR(\Upsilon) \le C\}. \tag{8}$$

C portrays the 95% percentage of the asymptotic distribution of the likelihood ratio statistic $LR(\Upsilon)$ (Hansen, 2000, p. 584; Caner & Hansen, 2004, p. 822; Kremer et al., 2013, p. 18). Finally, the estimated dynamic threshold model is shown in Eq. (8).

$$z_{it} = \alpha_i + \partial z_{it-1} + \gamma_1 X_{it-1} + \varnothing_1 f_{it-1} + I(q_{it-1} \le c) + \ldots + \varnothing_1 f_{it-1} + I(q_{it-1} > c) + v_{it}, \tag{9}$$

where, *z* is the real GDP per capita, α shows the value-added manufacturing, ∂ is the lagged value of real GDP per capita, *X* denotes the explanatory variables, *q* demonstrates the inflation threshold variable, and *c* is the inflation threshold level. This paper employs the Stata program xtendothresdpd command, developed by Diallo (2020), to forecast a dynamic panel threshold model.

5. Estimation results

5.1. Preliminary estimation results

The study includes 38 cross-sections and 44 time-series dimensions. Therefore, due to the possibility of cross-sectional dependence among units, the Pesaran (2015) cross-sectional dependence test and the Pesaran (2007) unit root test have been employed. The findings are presented in the Appendix (Table A2) due to word count limitations. Evidence of cross-sectional dependence among the series has been identified. Consequently, the Pesaran (2007) unit root test, which provides efficient results in cases where at least one of the series is non-stationary, has been applied. The results confirm that the series become stationary when their first differences are taken. Finally, the panel cointegration test proposed by Westerlund (2007), which is valid in the presence of cross-sectional dependence, has been conducted. As shown in Appendix Table A3, the null hypothesis of no cointegration is rejected based on both group and panel statistics. The results are significant at the 1% level, indicating that the variables are cointegrated.

5.2. Baseline estimation results

Table 2 shows that the Hansen test findings affirm the validity of the instrumental variables. The AR(2) test exhibits no second-order serial correlation; a lagged first-order coefficient of economic growth (GDP) is 0.1473 at the 1% significance level. The lagged value of economic growth is statistically significant and positive. The evidence suggests that fluctuations in economic growth exhibit a lagged influence over subsequent periods. Considering the nonlinear connection between value-added manufacturing and economic growth, all value-added manufacturing coefficients are strongly positive according to Model 1 and Model 2 findings. There is an inflection point (0.410) where below this point, the connection between value-added manufacturing and economic growth is in the same direction.

Table 2. Static and dynamic panel estimation results (source: Edited by the author(s) by using Stata).

Variables (Dependent variable: lnGDP)	(Model 1) Fixed-effect	(Model 2) System GMM	(Model 3) System GMM
L. lnGDP	–	0.1473 (0.0052)*	0.1338 (0.0044)*
lnMVA	0.0007 (0.0001)*	0.0005 (0.0002)*	–
$lnMVA^2$	0.0009 (0.0004)**	0.0008 (0.0003)**	–
lnMVA x INF	–	–	0.0038 (0.0011)*
$lnMVA^2$x INF	–	–	–0.0048 (0.0007)*
lnINV	0.0083 (0.0004)*	0.0105 (0.0038)**	0.0072 (0.0006)*
lnEXP	0.0126 (0.0038)**	0.0208 (0.0022)**	0.0375 (0.0081)**
lnPOP	–0.0003 (0.0002)*	–0.0007 (0.0013)**	–0.0062 (0.0407)**
lnLFE	–0.0366 (0.0054)*	–0.0454 (0.0057)*	–0.0471 (0.0066)**
lnLFP	0.0092 (0.0004)**	0.0038 (0.0004)*	0.0055 (0.0008)**
Constant	0.0023 (0.0005)**	0.0017 (0.0005)**	0.0008 (0.0002)*
Inflection point	0.410	0.4101	0.5032
AR(1)	–	–5.4483**	–7.7152***
AR(2)	–	–1.0948	–2.3657
Sargan test	–	103.5446	93.0502
Number of instruments	–	14	14

Notes: One-step GMM results are shown. Values before parentheses are coefficients, and values in parentheses are standard errors. *, **, and *** mean 1%, 5%, and 10% significance levels, respectively. L. lnGDP means the lagged variable of lnGDP.

In contrast, the squared term of the interaction term (lnMVA^{2}x INF) is strongly negative (–0.0048) while the interaction term (lnMVA x INF) is positive (0.0038), indicating an 'U'-shaped nexus between value-added manufacturing and economic growth under inflationist pressure. That means value-added manufacturing may first increase economic growth, under lower inflation conditions. Then, owing to higher inflation conditions, economic growth may slow down despite the continuation of value-added manufacturing. The inflection point is 0.503. This value is greater than the value of Model 1 and Model 2's findings. As noted in earlier research, this outcome suggests that inflation may be effective in detecting a certain threshold level between economic growth and value-added manufacturing relations (Kremer et al., 2013). Among the control variables, investment (lnINV), exports (lnEXP), and labor force participation (lnLFE) exhibit a positive correlation with economic growth. Population (lnPOP) and life expectancy (lnLFE) are inversely related to economic growth (Haraguchi et al., 2017; Su & Yao, 2017; Kremer et al., 2013; Wan et al., 2022; Abdulrazzaq, 2024).

5.3. Dynamic panel threshold estimation results

The dynamic panel threshold method, developed by Diallo (2020) and based on the theoretical foundations of Kremer et al. (2013), enabling the endogenous estimation of threshold values, has been employed to estimate the impact of value-added manufacturing on economic growth, considering the effect of inflation. According to the dynamic panel post-estimation findings, the internal validity of the model is confirmed, as instrument validity is not rejected by the Sargan test (p = 0.733), and second-order autocorrelation AR (2) is found to be absent (p = 0.450), while first-order autocorrelation AR (1) is detected as expected in first-differenced equations (p = 0.006). When considered together with the strong sup-Wald statistic and the rejection of linearity, these results indicate that a well-identified dynamic panel threshold GMM specification has been achieved, in which issues of endogeneity and unobserved heterogeneity are effectively addressed. As presented in Table 3, the lagged value of economic growth is statistically significant and positive. This finding indicates that increases or decreases in economic growth manifest themselves with a lag effect in subsequent periods.

A threshold inflation level (INF) of 4.4954, with a 95% confidence interval, has been identified. As illustrated in Figure 1, the likelihood ratio statistics exceed the critical threshold value, confirming the statistical significance of the threshold estimation. Below the threshold inflation level, the coefficient value 0.2582, which is significant at the 1% level, indicates a positive relationship between the threshold regime-dependent variable value-added manufacturing (lnMVA) and economic growth (lnGDP). In other words, as value-added manufacturing increases, economic growth also rises. However, above the threshold inflation level, the coefficient –0.2579, which is significant at the 1% level, demonstrates an inverse relationship between value-added manufacturing and economic growth. This finding suggests that despite an increase in value-added manufacturing, economic growth declines when inflation surpasses a certain level. The results document that during the analyzed period for OECD countries, value-added manufacturing enhances economic growth at and below a threshold inflation level of 4.4954, while inflation above this threshold may adversely impact economic growth, even in the presence of increased value-added manufacturing. These findings align with the baseline estimations in Table 2 and previous studies, which report negative and

Table 3. Dynamic panel threshold estimation results (source: edited by the author(s) by using Stata)

Variables	Dependent variable: lnGDP
L. lnGDP	0.1662 (0.0084)*
Regime-dependent regressors: The effect of manufacturing on economic growth under inflation threshold	
lnMVA (*INF* ≤ 4.4954)	0.2582 (0.0066)*
lnMVA (*INF* > 4.4954)	–0.2579 (0.0066)*
Regime-independent regressors: The effect of control variables on economic growth	
lnINV	0.0724 (0.0058)*
lnEXP	0.5736 (0.0083)*
lnPOP	–0.9396 (0.0205)*
lnLFE	–0.0507 (0.0767)*
lnLFP	0.1024 (0.0292)*
Constant	1.8347 (0.1875)*
Threshold regime	4.4954
90% Confidence interval of threshold regime	2.3637–5.0569
Bootstrap p-value for linearity test	0.0000
sup-Wald test coefficient/standard error	23.562/4.7047
Sargan test statistics/p- value	25.0582/0.7328
Arellano-Bond AR (1) p-value	0.0064
Arellano-Bond AR (2) p-value	0.4501
Observations	1351
Number of instruments	14

Notes: One-step GMM results are shown. Values before parentheses are coefficients, and values in parentheses are standard errors. *, **, and *** mean 1%, 5%, and 10% siginificance levels, respectively. "L. lnGDP" refers to the lagged variable of lnGDP.

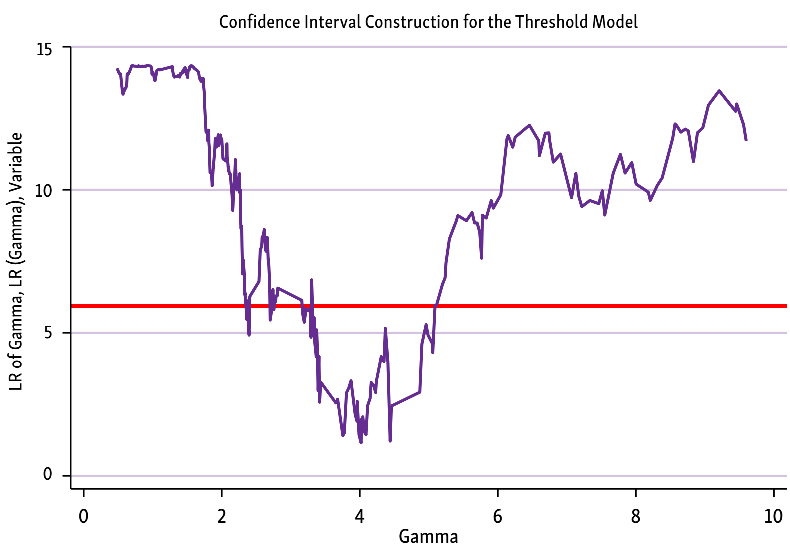

Figure 1. Likelihood ratio statistics graph of confidence interval

positive coefficients of –0.0048 and 0.0038 (Kremer et al., 2013). Among threshold regime-independent variables, investment (lnINV), exports (lnEXP), and labor force participation rate (lnLFP) positively influence economic growth, whereas population (lnPOP) and life expectancy (lnLFE) negatively affect it (Abdulrazzaq, 2024; Haraguchi et al., 2017; Kremer et al., 2013; Su & Yao, 2017; Wan et al., 2022;).

6. Discussion

This study primarily reconfirms the positive nexus between value-added manufacturing and economic growth consistent with prior literature (Abdulrazzaq, 2024; Haraguchi et al., 2017; Karami et al., 2019; Rodrik, 2013; Su & Yao, 2017; Szirmai, 2012; Szirmai & Verspagen, 2015; Timmer et al., 2014; Wan et al., 2022). However, the findings differ significantly from previous studies, contradicting the hypothesis established in this research. First, while previous studies predominantly examined the relationship between the manufacturing sector or service sector or its sub-sectors and economic growth, this study explores the link between value-added manufacturing and growth. Second, the existence of a potential nonlinear relationship between the two variables, driven by inflation, is explored through static and dynamic panel estimation models. It is found that at an inflection point, specifically an inflation rate of 0.503, the effect of value-added manufacturing on economic growth reverses direction. Third, employing the dynamic panel threshold estimation method developed by Diallo (2020), which offers methodological improvements, the study estimates the impact of inflation on the relationship below and above a critical threshold. This method is chosen for its ability to account for a relatively long period marked by dynamic and transitional economic events, its methodological rigor, and the robustness checks of the findings, constituting the study's first contribution. The results confirm the existence of a significant inflation threshold of 4.4954. Below this threshold, value-added manufacturing positively correlates with economic growth, meaning that as value-added manufacturing increases, economic growth also rises. However, above this critical inflation threshold, the relationship becomes negative, indicating that increases in value-added manufacturing are connected with a descent in economic growth when inflation surpasses this level. Thus, this study contributes a second insight to the literature by demonstrating that inflation can influence the relationship between value-added manufacturing and economic growth, with nonlinear dynamic implications. This finding enriches the existing body of research by highlighting the critical role of inflation as a determinant of this relationship.

As empirically established in previous studies, the effect of inflation on economic growth often turns negative once it surpasses a "certain threshold" (Akıncı et al., 2023; Azam & Khan, 2022; Dinh, 2020; Kremer et al., 2013; Seleteng et al., 2013; Vinayagathasan, 2013;). Therefore, for policymakers, achieving a macroeconomic balance that supports economic growth while retaining inflation under control is crucial. In this context, the impact of the control variables, included in the study, on economic growth also holds significant importance. The behavior of other variables in the value-added manufacturing-growth relationship constitutes the final contribution of the analysis. In addition to inflation and growth, variables such as investments, exports, labor force participation, life expectancy, and population are influenced in different ways within the dynamic and fluid structure of the overall macroeconomic equilibrium. Stable prices and a reliable economic environment are widely regarded as fundamental elements for long-term growth. High inflation, by introducing uncertainty about prices, complicates projections of future costs and returns, discourages investments and exports, reduces savings, and raises interest rates. These channels collectively result in negative outcomes for economic growth (Abdulrazzaq, 2024; Karami et al., 2019; Sallam, 2021; Su & Yao, 2017; Szirmai & Verspagen, 2015). High inflation also increases production costs, limiting competitiveness, leading to declines in export revenues, and slowing economic activity (Karami et al., 2019; Wan et al., 2022). Moreover, the adverse effects of high inflation are often more pronounced for low-income groups, as these individuals allocate a significant portion of their income to essential consumption goods. A decline in purchasing power negatively impacts income distribution equity. Rising income inequality undermines economic efficiency and social stability, potentially reducing labor force participation, life expectancy, and population growth, all of which can hinder economic growth (Haraguchi et al., 2017; Karami et al., 2019). Indeed, the Phillips (1958) curve explains the inverse relationship between inflation and unemployment. Inflation levels exceeding a certain threshold can disrupt labor market equilibrium, leading to inefficiencies in manufacturing. Baumol's (1990) cost disease hypothesis further posits that high inflation can lead firms to allocate resources inefficiently. Due to price uncertainty, firms may prioritize short-term investment strategies over long-term objectives, such as R&D activities. This, in turn, restricts the positive impact of value-added manufacturing on economic growth.

7. Conclusions and policy implications

Our paper adds a new aspect to the literature by intersecting two strands of previous research: studies identifying threshold effects in the inflation-growth nexus and studies confirming a positive relationship between value-added manufacturing and economic growth. The study used static and dynamic panel estimations, as well as dynamic panel threshold estimation methods, for 38 OECD member countries over the period 1980–2023, and the findings validate the positive relationship between manufacturing and economic growth, consistent with existing literature. However, the results reveal that inflation serves as a significant threshold within this relationship, indicating that value-added manufacturing impacts economic growth differently below and above this inflation threshold. The analysis findings shed light on policy-managerial recommendations for OECD countries in terms of the value-added manufacturing-growth-inflation trilogy.i) The main implication of this article is that stagnant economies should have an obvious and straightforward industrial policy emphasizing on value-added manufacturing. This is important because value-added manufacturing can generate high multiplier effects and boost economic growth, acting as an "engine of growth" for OECD countries primarily through its forward linkages. The growth-pulling properties of value-added manufacturing are more tied to its share in GDP and the growth of manufacturing, than to its percentage of employment. ii) Despite the diminishing share of manufacturing in GDP, OECD economies must retain value-added manufacturing growth, since it drastically contributes to efficiency, competitiveness, and long-term economic expansion. iii) OECD economies should prioritize reindustrialization strategies, especially during higher inflation periods. The slowdown of growth in industrialized nations following the 2008 financial crisis and COVID-19 has led to proactive government initiatives to revitalize the manufacturing sector. Authorities are urged to construct industrial tactics centered on the expansion of vibrant high-tech businesses within manufacturing. Such an approach not only aims to increase the overall competitiveness of manufacturing but also fosters demand for modern services, indicating a balanced development strategy between manufacturing and non-manufacturing sectors. Reindustrialization strategies may also be essential for both enhancing competitiveness in global markets and preventing procrastination in investment decisions owing to inflationary recession. iv) Value-added manufacturing not only contributes directly to economic growth but also indirectly through the enhancement of capital and labor input growth. This indicates that decision-makers should focus on improving total factor productivity in manufacturing to leverage these indirect benefits.

These results highlight inflation's pivotal role in modulating manufacturing's economic impact, offering fresh insights into their interconnected dynamics. Stagnant economies must adopt clear industrial policies prioritizing value-added manufacturing, which generates high multiplier effects and acts as an engine of growth through forward linkages with other sectors. Its growth-pulling properties are tied more to its GDP share than employment, emphasizing the need to sustain manufacturing's contribution to efficiency and competitiveness. For advanced OECD economies (e.g., the United States, Germany, and Japan), with established manufacturing bases, the focus should be on high-value-added sectors like high-tech and green manufacturing, using R&D incentives and public-private partnerships to enhance total factor productivity while keeping inflation low through proactive monetary policies. Emerging OECD economies (e.g., Mexico, Türkiye, and Chile), often reliant on labor-intensive manufacturing, should pursue structural reforms to shift toward higher-value-added production, supported by human capital investments and stringent inflation control measures to stay below the threshold, alongside export-oriented strategies to counter premature deindustrialization. All OECD economies should prioritize reindustrialization, especially during high-inflation periods post-2008 and post-COVID-19, by expanding high-tech manufacturing to foster competitiveness and demand for modern services and mitigating investment delays due to inflationary recessions. Value-added manufacturing also contributes indirectly to growth by improving capital and labor inputs, urging policymakers to boost total factor productivity through education and technological upgrades. The aggregated value-added manufacturing variable may obscure sub-sectoral technological differences that influence growth under inflation thresholds, suggesting future research to disaggregate these sectors.

As with any study, this analysis has certain limitations and aspects that could pave the way for future research. First, the value-added manufacturing variable used in the analysis is an aggregated representation encompassing multiple sub-manufacturing sectors. Technological differences across these sub-sectors could significantly influence their capacity to generate value-added manufacturing. Investigating how these variations affect economic growth, particularly under the influence of inflation thresholds and critical levels, would extend the scope of this study and provide valuable insights. Second, OECD countries are not homogeneous, as they exhibit varying levels of economic trajectories and technological capabilities.

Consequently, future research focusing on developed and developing economies separately could yield heterogeneous and robust findings. Lastly, due to the long period covered in this study (44 years), data for some countries are unavailable. To address this, the dynamic panel threshold estimation method, which offers methodological superiority, is employed. Conducting analyses for different periods using evolving econometric techniques could further expand the contribution of this research to the field.

Author contributions

EEA conceived the study and were responsible for the design and development of the data analysis. EEA were responsible for data collection and analysis. EEA and LSE were responsible for data interpretation. LSE and EEA wrote the first draft of the article.

Disclosure statement

We are hereby confirming that there is no conflict of interest in this research.

References

Abdulrazzaq, Y. M. (2024). The effect of manufacturing value added on economic development: Empirical evidence. *Migration Letters*, *21*(3), 1045–1053.

Acemoglu, D., & Robinson, J. (2013). *Why nations fail*: *The origins of power prosperity and poverty*. Profile Books. https://doi.org/10.1111/dpr.12048

Akıncı, M., Yüce Akıncı, G., & Yılmaz, Ö. (2023). Is ınflation a trigger of growth or a harbinger of economic slowness? A dynamic threshold model analysis on 26 sub-regions of Turkey. *Fiscaoeconomia*, *7*, 671–707. https://doi.org/10.25295/fsecon.1351453

Angadi, V. B. (1998). Price stability, bop equilibrium and economic growth. *Economic and Political Weekly*, *33*(39), 2521–2524.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, *58*(2), 277–297. https://doi.org/10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), 29–51. https://doi.org/10.1016/0304-4076(94)01642-D

Aydin, C., Essen, Ö., & Bayrak, M. (2016). Inflation and economic growth: A dynamic panel threshold analysis for Turkish republics in transition process. *Procedia – Social and Behavioral Sciences*, *229*, 196–205. https://doi.org/10.1016/j.sbspro.2016.07.129

Azam, M., & Khan, S. (2022). Threshold effects in the relationship between inflation and economic growth: Further empirical evidence from the developed and developing world. *International Journal of Finance and Economics*, *27*(4), 4224–4243. https://doi.org/10.1002/ijfe.2368

Baumol, W. J. (1990). Entrepreneurship: Productive, unproductive and destructive. *Journal of Political Economy*, *98*(5), 3–22. https://doi.org/10.1086/261712

Caner, M., & Hansen, B. E. (2004). Instrumental variable estimation of a threshold model. *Econometric Theory*, *20*(5), 813–843. https://doi.org/10.1017/S0266466604205011

Dholakia, R. H. (2020). A theory of growth and threshold inflation with estimates. *Journal of Quantitative Economics*, *18*, 471–493. https://doi.org/10.1007/s40953-020-00215-x

Diallo, I. A. (2020). *XTENDOTHRESDPD*: *Stata module to estimate a dynamic panel data threshold effects model with endogenous regressors*. [Computer Software]. Boston College Department of Economics.

Dinh, D. (2020). Optimal inflation threshold and economic growth: Ordinal regression model analysis. *Journal of Asian Finance*, *Economics and Business*, *7*(5), 91–102. https://doi.org/10.13106/jafeb.2020.vol7.no5.091

Felipe, J., Mehta, A., & Rhee, C. (2014). *Manufacturing matters… but it's the jobs that count* (Asian Development Bank Economics Working Paper Series No. 420). Asian Development Bank.

Hahn, F. H. (1989). Kaldor on growth. *Cambridge Journal of Economics*, *13*(1), 47–57. https://doi.org/10.1093/oxfordjournals.cje.a035090

Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing and inference. *Journal of Econometrics*, *93*(2), 345–368. https://doi.org/10.1016/S0304-4076(99)00025-1

Hansen, B. E. (2000). Sample splitting and threshold estimation. *Econometrica*, *68*(3), 575–603. https://doi.org/10.1111/1468-0262.00124

Haraguchi, N., Cheng, C. F. C., & Smeets, S. (2017). The importance of manufacturing in economic development: Has this changed? *World Development*, *93*, 293–315. https://doi.org/10.1016/j.worlddev.2016.12.013

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, *115*(1), 53–74. https://doi.org/10.1016/S0304-4076(03)00092-7

Kaldor, N. (1968). Productivity and growth in the manufacturing industry: A reply. *Economica*, *35*(140), 385–391. https://doi.org/10.2307/2552347

Karami, M., Elahinia, N., & Karami, S. (2019). The effect of manufacturing value added on economic growth: Empirical evidence from Europe. *Journal of Business Economics and Finance*, *8*(2), 133–146. http://doi.org/10.17261/Pressacademia.2019.1044

Kónya, I. (2018). *Economic growth in small open economies*: *Lessons from the Visegárd countries*. Palgrave. https://doi.org/10.1007/978-3-319-69317-0.

Kremer, S., Bick, A., & Nautz, D. (2013). Inflation and growth: New evidence from a dynamic panel threshold analysis. *Empirical Economics*, *44*, 861–878. https://doi.org/10.1007/s00181-012-0553-9

Krugman, P. (1991). Increasing returns and economic geography. *Journal of Political Economy*, *99*(3), 483–499. https://doi.org/10.1086/261763

Kuznets, S. (1955). Economic growth and income inequality. *American Economic Review*, *45*(1), 1–28.

Lucas, R. E. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3–42. https://doi.org/10.1016/0304-3932(88)90168-7

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, *107*(2), 407–437. https://doi.org/10.2307/2118477

Nar, M. (2025). The effects of financial pressure policies on economic growth: The case of OECD countries. *Technological and Economic Development of Economy*, *31*(1), 149–168. https://doi.org/10.3846/tede.2024.22082

Naudé, W., & Szirmai, A. (2012). *The importance of manufacturing in economic development*: *Past*, *present and future perspectives* (UNU-MERIT Working Paper No. 2012-041). United Natons Maastricht Economic and social Research institute on Innovation and Technology.

Organisation for Economic Co-operation and Development (n.d.). *OECD data-explorer* [Database]. https://data-explorer.oecd.org/

Pesaran, M. H. (2007). A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Econometrics*, *22*(2), 265–312. https://doi.org/10.1002/jae.951

Pesaran, M. H. (2015). Testing weak cross-sectional dependence in large panels. *Econometric Reviews*, *34*(6–10), 1089–1117. https://doi.org/10.1080/07474938.2014.956623

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957. *Economica*, *25*(100), 283–299. https://doi.org/10.1111/j.1468-0335.1958.tb00003.x

Porter, M. E., & Van Der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, *9*(4), 97–118. https://doi.org/10.1257/jep.9.4.97

Rebelo, S. T. (1991). Long-run policy analysis and long-run growth. *Journal of Political Economy*, *99*(3), 500–521. https://doi.org/10.1086/261764

Rodrik, D. (2013). Unconditional convergence in manufacturing. *The Quarterly Journal of Economics*, *128*(1), 165–204. https://doi.org/10.1093/qje/qjs047

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5), 71–102. https://doi.org/10.1086/261725

Romer, P. M. (1994). The origins of endogenous growth. *Journal of Economic Perspectives*, *8*(1), 3–22. https://doi.org/10.1257/jep.8.1.3

Rostow, W. W. (1959). The stages of economic growth. *The Economic History Review*, *12*(1), 1–16. https://doi.org/10.2307/2591077

Sallam, M. A. (2021). The role of the manufacturing sector in promoting economic growth in the Saudi economy: a cointegration and VECM approach. *Journal of Asian Finance*, *Economics and Business*, *8*(7), 21–30. https://doi.org/10.13106/jafeb.2021.vol8.no7.0021

Seleteng, M., Bittencourt, M., & Van Eyden, R. (2013). Non-linearities in inflation-growth nexus in the SADC region: A panel smooth transition regression approach. *Economic Modelling*, *30*, 149–156. https://doi.org/10.1016/j.econmod.2012.09.028

Smith, A. (1776). *An inquiry into the nature and causes of the wealth of nations*. W. Strahan and T. Cadell Publishing.

Solow, R. M. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics*, *70*(1), 65–94. https://doi.org/10.2307/1884513

Solow, R. M. (1994). Perspectives on growth theory. *Journal of Economic Perspectives*, *8*(1), 45–54. https://doi.org/10.1257/jep.8.1.45

Su, D., & Yao, Y. (2017). Manufacturing as the key engine of economic growth for middle-income economies. *Journal of the Asia Pacific Economy*, *22*(1), 47–70. https://doi.org/10.1080/13547860.2016.1261481

Szirmai, A. (2012). Industrialization as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, *23*(4), 406–420. https://doi.org/10.1016/j.strueco.2011.01.005

Szirmai, A. (2013). Manufacturing and economic development. In A. Szirmai, W. Naudé, & L. Alcorta (Eds.), *Pathways to industrialization in the twenty-first century*: *New challenges and emerging paradigms* (pp. 53–75). Oxford Academic. https://doi.org/10.1093/acprof:oso/9780199667857.003.0002

Szirmai, A., & Verspagen, B. (2015). Manufacturing and economic growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, *34*, 46–59. https://doi.org/10.1016/j.strueco.2015.06.002

Șerban, A. C., Pelinescu, E., & Dospinescu, A. S. (2022). Beta convergence analysis of gross value added in the high-technology manufacturing industries. *Technological and Economic Development of Economy*, *28*(2), 290–312. https://doi.org/10.3846/tede.2021.15918

Thanh, S. D. (2015). Threshold effects of inflation on growth in the ASEAN-5 countries: A panel smooth transition regression approach. *Journal of Economics*, *Finance and Administrative Science*, *20*(38), 41–48. https://doi.org/10.1016/j.jefas.2015.01.003

Timmer, M. P., De Vries, G. J., & De Vries, K. (2014). *Patterns of structural change in developing countries*. (Groningen Growth and Development Centre Research Momerandum No. 149).

Vinayagathasan, T. (2013). Inflation and economic growth: A dynamic panel threshold analysis for Asian economies. *Journal of Asian Economics*, *26*, 31–41, https://doi.org/10.1016/j.asieco.2013.04.001

Wan, X., Kazmi, S. A. A., & Wong, C. Y. (2022). Manufacturing, exports, and sustainable growth: Evidence from developing countries. *Sustainability*, *14*(3), Article 1646. https://doi.org/10.3390/su14031646

Westerlund, J. (2007). Testing for error correction in panel data. *Oxford Bulletin of Economics and Statistics*, *69*(6), 709–748. https://doi.org/10.1111/j.1468-0084.2007.00477.x

World Bank. (n.d.). *World Bank open data* [Database]. https://data.worldbank.org

Yilmazkuday, H. (2012). Inflation thresholds and growth. *International Economic Journal*, *27*(1), 1–10. https://doi.org/10.1080/10168737.2012.658831

APPENDIX

Table A1. Descriptive statistics (source: edited by the author(s) by using Stata)

Variables	Observation	Mean	Sta. Dev.	Minimum	Maximum	Coe. Var.	Skewness
lnMVA	1662	10.4407	0.9185	6.0223	12.3974	8.7973	0.1521
lnGDP	1588	4.2472	0.4267	3.0094	5.1261	10.0466	–0.1207
INF	1610	11.5061	55.8352	–4.4475	1281.4435	485.2660	2.4537
lnEXP	1570	10.6091	0.7550	8.5790	12.5526	7.1165	0.0803
lnPOP	1672	7.0766	0.6551	5.3581	8.5185	9.2572	–0.0593
lnINV	1559	4.8230	0.6985	2.9256	6.7187	14.4826	0.2274
lnLFP	1422	1.7870	0.0467	1.5807	1.9158	2.6133	–0.1857
lnLFE	1634	1.8847	0.0232	1.7959	1.9271	1.2309	0.1094

Table A2. Estimation results of panel unit root and cross-section dependence tests (source: edited by the author(s) by using Stata)

	Variables	CSD	CIPS	CADF
Level	lnGDP	128.481*	–1.483*	–1.395*
	lnINV	27.042*	–2.582	–2.438
	lnEXP	38.384*	–2.381**	–2.840*
	lnPOP	102.730*	–2.492*	–2.592*
	lnLFE	56.827*	–2.803**	–3.047*
	lnLFP	135.395*	–2.284*	–2.471*
	INF	72.047*	–2.356*	–2.044*
	lnMVA	48.293*	–2.704	–1.989*
First difference	lnGDP	–	–3.951*	–3.456*
	lnINV	–	–3.603*	–4.044*
	lnEXP	–	–3.739*	–4.173*
	lnPOP	–	–3.484*	–3.841*
	lnLFE	–	–3.505*	–3.477*
	lnLFP	–	–3.199*	–3.773*
	INF	–	–3.039*	–3.388*
	lnMVA	–	–3.633*	–4.352*

Notes: Determinants of all results are constant and trending. *, **, and *** mean 1%, 5%, and 10% significance levels, respectively. According to Pesaran (2007), –2.49, –2.54, and –2.71 are critical values at 1%, 5%, and 10% levels, respectively.

Table A3. Findings of panel cointegration test (source: edited by the author(s) by using Stata)

Statistics	Value	Z-value	Bootstrap p-value
G_t	–3.562	–2.261	0.000*
G_a	–3.847	1.405	0.000*
P_t	–5.708	–1.233	0.011**
P_a	–4.053	–0.054	0.000*

Notes: Deterministics of all results are constant and trend. *, **, and *** mean 1%, 5%, and 10% significance levels, respectively. The bootstrap values represent the probabilities obtained through 400 replications.