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Financial Development and Industrial Sector Growth in West African Monetary Zone (WAMZ): Does Inflation Matter?

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ABSTRACT: This paper investigated the inflation threshold that ensures financial development fosters industrial growth for a panel consisting of five (5) West African Monetary Zone (WAMZ) countries. The study examined the inflation threshold in the finance-industrial growth relationship from 1990 to 2022. Through the Pooled Mean Group (PMG), panel unit root and cointegration, the study established that a nonlinear inflation threshold exists in the relationship. The PMG result indicate evidence of an inflation threshold estimated as 21.7451% and beyond which the benefits of higher industrial growth as the financial system develops and become efficient turns negative. By policy implication, this support the perception that financial development only works in generating higher rate of industrial growth only when inflation does not exceed or is below 21.7451%. Furthermore, the study also find that trade openness and natural resource rents does foster industrial growth, as exchange rate depreciation and population growth are harmful to industrial output expansion. The study recommends the pursuant of price stability at a level below 21.7451% by adopting an inflation targeting framework.

KEYWORDS: Financial Development, Industrial sector growth, Inflation, Threshold

JEL Classification: G_{20}, O_{40}, L_{60}, and E_{31}

I. INTRODUCTION

The common perception in the literature is that broad economic performance can emanate from two sources: using more labour and capital (termed production factors) for the production of more commodities that the economy has potential to, or efficiently combining inputs to produce more goods and services for a certain amount of factor inputs. This is the crux of the neoclassical Solow model proposed by Solow (1959) and Swan (1969) and the underpinning of subsequent modifications or extensions made to it. In most African countries and those in the West African Monetary Zone (WAMZ) to be specific, economic activities are weak. For instance, real growth was estimated at in Ghana between 2000 – 2023. Averagely, the economy of Nigeria grew at a pace of from 2000 – 2023, below what it is able to produce (UNCTAD, 2024).

It is evident that given the momentous output growth in China, Malaysia and the miracle of the Asian Tigers, economic growth is hinged critically on the aggressive pursuit of industrialization and industrial sector growth. Hence, the crucial challenge that confronts policy makers at the central level is framing an industrial strategy and framework that will not only reverse the stalled and weak growth trend but also facilitate sustained industrial sector growth. Some scholars and analysts have argued that the extent that industrial output is expected to grow depends on how developed, efficient and stable the domestic financial sector is. The proponents of this consider financial development a reliable companion of growth and crucial factor in promoting real sector growth (Haibo, Manu & Somuah, 2023; Ehigiamusoe & Lean, 2019; Abeka, Andoh, Gatsi & Kawor, 2021). They argued that a well-sequenced and implemented financial reforms focused on deepening the financial sector, through modernized supervisory and regulatory framework, development of microfinance institutions, restructuring the banking systems, and the incorporation of digital technologies will ensure mineral-rich WAMZ countries escape the resource-trap and pave the way for competitive industrialization. Thus, financial development is important for latecomer industrializers and should circumscribe the national policies of African countries.

A well-functioning and developed financial system transmit to growth through three channels: the household effect, business effect and wealth effects. The household effect channel draws attention to one of the plethora of reasons why a more developed

financial system is crucial in taking activities in the industrial sector to a higher growth echelon. In this channel, financial development ensures financial services are accessible at a reduced cost. It facilitates the procurement of credit by households with less aggressive emphasis on collateral presentation. With access to cheap credit and a structure repayment plan, households are able to purchase durable and non-durable items, which largely influence productivity and consequently cause upward shift in industrial output (Abramova, Artemenko & Krinichansky, 2022). The level of productivity can be amplified through the use of technologies and production process, facilitated through research and development (R & D). Lack of credit and access to it therefore perpetuates low innovation and technological advancement. As the financial sector becomes more developed and efficient, access to credit improves, allowing firms that were previously finance-constrained have access to finance, oiling their R & D activities, thereby increasing the innovative activities of firms and output level. This describes the business effect channel (Abramova, et al., 2022). A further way financial development boost industrial growth through the business channel is facilitating the entrant of new firms and regulating their exist. Smaller and new firms face financing constraints compared to large ones. Financial system development expands access to finance, favouring small and new firms, thus spurring firm entry (Kumarasamy & Singh, 2018). The gradual entrant of new firms provides the benefits of competitive climate and pressure and do more goods to technological and innovation diffusion, as they introduce new manufacturing technology or products (Krinichansky & Sergi, 2019; Abramova, et al., 2022). The wealth effect illustrates the implication of financial development on real wealth. An advanced and better functioning financial system through risk diversification changes the structure of financial assets as it lowers the costs to investors of holding diversified equity portfolio. Additionally, the increased pace of output growth as the economy attains higher financial development increases asset price, raising households' wealth stock as market valuation of assets rises. This raises households' income and consumption spending, further fueling industrial sector growth (Sing, 2022).

The notion that having an advance and functioning financial system have spurring effect on industrial output have drawn attention from decision makers and the academia. The theoretical stance on this is plagued with conflicting predictions. Essentially, the demand-led finance hypothesis alludes that financial development comes after economic growth as financial development is a lag response to higher economic activities. In contrast, the thrust of the supply-leading phenomenon is that financial development facilitates economic growth through mobilizing and pooling savings, producing information about investment projects and allocating capital to the high yielding investment(s) and easing exchange of goods and services (Aluko, Adeyeye & Oladele, 2019; Sulemanna & Dramani, 2022; Yinusa, Akinlo & Adejumo, 2022; Bekele & Dogu, 2020; Olaniyi, 2022; Ibrahim & Alagidede, 2018).

Some empirical studies support financial development being positively linked with economic growth (see Abbas, Afshan & Mustifa, 2022; Puatwoe & Piabuo, 2017; Fakudze, Tsegaye & Sibanda, 2022; Ekanayake & Thaver, 2021; Le Roux, Mutonhori, Nyamutowa & Abel, 2019; Ehigiamusoe & Lean, 2019), while studies of those of (Manu, Xuezhou, Paintsil, Gyedu & Ntarmah, 2020; Moyo & Le Roux, 2021; Yinusa, Akinlo & Adejumo, 2022; An, Zou & Kargbo, 2021; Bara, Mugano & Le Roux, 2016; Nguyen, Le, Ho, Nguyen & Vo, 2022; Ahmed, Kousar, Pervaiz & Shabbir, 2022) alluded to financial development generating negative growth outcome. Despite this, attaining higher financial development has been proffered as anecdote to inducing industrial sector performance.

The post-pandemic era ushered in record-high inflationary environment. In Nigeria, prices rose from pre-pandemic level of 11.98% in December 2019 to 34.19% in June 2024 (NBS, 2024). For Ghana, headline inflation soared from 7.9% in the pre-pandemic period of December 2019 to 54.1% in December 2022, rescinding to 22.8% in June 2024 (Ghana Statistical Service, 2024). Inflation, like poor institutions (see Chen, Hongo, Ssali, Nyaranga & Nderitu, 2020; Bandura & Dzingirai, 2019; Aluko & Ibrahim, 2020; Olaniyi & Oladeji, 2021; Mbuyi & Mulumba, 2022; Asante, Takyi & Mensah, 2023; Fengju & Wubishet, 2024) and low human capital (see Yusheng, Bawuah, Nkwantabisa, Atuahene & Djan, 2021; Sarwar, Khan, Sarwar & Khan, 2020; Ibrahim, 2018; Abubakar, Kassim & Yusoff, 2015; Hakeem, 2010; Mahmood & Alkahtani, 2018) adversely affect the ability of financial development to upscale industrial output growth. These previous contributions are indicative of presence of certain conduit to financial developing spurring industrial output growth, as they either dampen or magnify the growth-spurring effect of financial development. Stimulated by this, this study opts to determine whether the extent to which financial development help industrial sector growth depends on lower inflation level. The argument of this study is that, achieving higher industrial growth through a sound and well-functioning financial system would require a less inflationary environment. High inflation level causes the real rates of return on savings to fall, increasing the incentive to borrow, and reducing the incentive of financial institutions to lend. Furthermore, high inflation reduces the real value of banks' deposits and monetary reserves, causing a decline in financial depth (Batayneh, Al Salamat & Momani, 2021). Long run investment and entrepreneurship may be hindered as the design and commitment to contracts by corporations and individuals becomes difficult due to indeterminate prices and costs. Also, a high-inflationary environment jeopardises the function of financial institutions to effectively and efficiently allocate credits as investors become reluctant in entering contracts (Kagochi, 2019; Bandura, 2022). As noted by Bandura (2022), high inflation would produce uncertainties as costs and profits become difficult to predict, causing financial institutions to be more vigilant and risk averse, thus

reducing the enthusiasm to provide long-term finance for investments that speed up industrial growth. Where financing is made, these uncertainties and risks are priced into interest rates and other service costs, further constraining households and businesses from taking out loans for consumption and R & D activities (Batayneh, et al., 2021; Bandura, 2020).

In continuation to this, subsequent part of this thesis follows this organization. We discussed the theoretical and empirical issues between finance, inflation, and growth in Section 2. Section 3 discusses methodological and estimation method. Section 4 presents the estimated results and we conclude in Section 5.

II. LITERATURE REVIEW

Theoretical Framework

There have been multiplicities of theoretical arguments on how financial development relates with economic growth. Pioneering works of Bagehot (1873), Schumpeter (1912), Keynes (1930), and Mckinnon (1973) emphasized financial development as strong pillar for speeding economic growth. The consensus of these scholars is that a well-developed financial system provides impetus for economic growth. As noted by Shahbaz, Afza & Shabbir (2023), this motivating growth effect of financial development begins with saving and savings is a prelude that sets entrepreneurial ideas and investment projects into motion. Developed financial system mobilize and pool savings from economic agents with surplus of capital or idle capital, pool and hedge risks, facilitate exchange of commodities, grant access to financial institution and services, screen and monitor projects, and allocate capital or saved resources to investments with higher yield and efficient users (Khan, Sarwar & Khen 2020; Kassie, 2021; Cheng, Chien & Lee, 2021; Fowowe, 2011). Through these functions, a well performing financial system becomes a strategic engine through which economic growth can be achieved. By mobilizing and increasing savings, financial development increases available resources for investment. It promotes innovation and specialization by reducing transaction cost. Theoretically, financial development can catalyse growth through the trio channels of household, business and wealth effects. The household effect channel emphasized that, financial development grants households easy and cheap access to credit to purchase consumables/non-durable and consumer durable goods, namely, refrigerators, automobiles, home appliances, furniture and fixtures, food, clothing, footwear, beer, among others, which build up aggregate demand and drive-up productivity (Abramova, Artemenko & Krinichansky, 2022; Fields, 2002). In the business effect context, financial development can make firms have better access to financial resources to fund research and development, which could enhance output level aided by the use of efficient and higher-output yielding technologies. Moreso, by facilitating firms' access to cheap capital to acquire more inputs and plants, financial development can foster business expansion (Abramova, et al.., 2022; Clarke, 2002). Financial development catalytic role in the growth process through the business channel may stem from its risk diversification function, critical for wealth creation. An increase in wealth may spur economic growth through increased consumption spending (Alp & Seven, 2019). These arguments constitute the supply-leading hypothesis, which convincingly argues that, a well-functioning financial system exert leading role in enhancing economic growth (Olaniyi, 2020; Aluko, et al., 2019). There is equally the demand-following hypothesis whose proponents assert that, a well-functioning, efficient and effective financial sector is not a prelude that facilitate economic performance, but rather follows economic growth mainly attributed to sustained need for financial products and services (Bekele & Degu, 2020; Bara, et al., 2016).

Empirical Literature

In recent times, the role of financial development (FD) in the economic and real sector growth process has attracted considerable interest from scholars. For example, Abbas, et al., (2022) studied whether financial development (FD) speed up economic activities. Their research was for a sample of 26 lower-middle; 44 middle-income; and 18 upper-middle-income countries and the link was investigated from 1995 – 2018. In addition, they seek the influence of FD on income inequality, proxy with Gini coefficient. Through the pooled mean group (PMG), they find FD to cause upward shift in economic output across all groups, with the marginal effect higher in the upper-middle income economies. Regarding income inequality, they established that the financial system in the lower-middle and upper-middle income economies needs to developed to a certain level for income to begin to converge. Ellahi, Kiani, Awais, Affandi, Saghir & Qaim (2021) claim using the generalized method of moments (GMM) estimator that economic growth, legal origin, more open economy, and strong institutions foster a developed financial system for a panel comprising seven SAARC countries from 1995 to 2018. As noted by them, an environment of high inflation undermines financial development. Puatwoe & Piabuo (2017) addressed whether financial development is capable of accelerating economic activities in Cameroon, doing so with data from 1980 – 2014 and the autoregressive distributed lag (ARDL) estimator. They found considerable evidence consistent with the finance-led hypothesis, as increased financial resources to private individuals ramp up real economic output. Also, deposit and money supply were identified as vital factors that catalyse growth. Fakudze, et al., (2022) through the ARDL estimator show that financial system development boosts economic activities and output in Eswatini,

reaffirming the finance-led argument. From 1996 to 2018 which they covered, the granger results categorically revealed that financial development response to economic growth, as evident that contradicts the ARDL result the causal pathway is one-way, from economic growth to financial development. The evidence from Manu, Xuezhou, Paintsil, Gyedu & Ntarmah's (2020) study of 33 Africa countries (split into subgroups of 10 Western Africa, 4 Southern Africa, 4 Northern Africa, 5 Central Africa and 10 Eastern Africa countries); from 1980 to 2017 suggests financial development is not good for growth in Central, West, and Southern African countries, as total output in these countries decreases with financial development. Growth as suggested by the causality results is predicted by trade and foreign direct investment. Ekanayake & Thaver (2021) using panel fully modified least square (FMOLS) and least square (PLS) methods to analyse panel dataset of 138 developing countries from 1980 – 2018 stressed the power of a developed financial institution speeding up economic activities. This result was also replicated across the six (6) subgroups of East Asia and the Pacific, sub-Saharan Africa (SSA), Europe and Central Asia, Middle East and North Africa, Latin America and Caribbean. Ibrahim (2018) applied the system GMM estimator to data of 29 SSA countries, resolving that from 1980 – 2014, FD, and human capital stimulated the economies of the SSA countries. Their empirical results clearly emphasized that the growth-inducing effect of FD is greater in environmental of high human capital accumulation or highly educated individuals. Haibo, Manu & Somuah (2023) study in 34 African countries conducted from 1980 – 2017 with the combined estimators of panel quantile regression and GMM style panel vector autoregressive (PVAR) show that FD ramp up productivity to a certain point, after which it obstructs output growth, revealing that excess finance impedes the pace at which output grows. Moreso, estimation result show government spending is good for growth, while FDI stifle real income. Moyo & Le Roux (2021) results obtained from estimating annualized data of 11 SADC (Southern African Development Community) collected from 1990 to 2015 and using the PMG method suggests that an enhanced and efficient financial system, government spending and trade are anti-growth as they stifle output expansion in the group of SADC countries. Furthermore, they alluded that stimulating growth will require upscaling investment and propping up the value of the local currency. Exploring the finance-growth nexus, Le Roux, et al., (2019) relied on data of 12 SADC countries spanning 1990 – 2014. The fixed effect results show financial development catalyse economic progress and output growth. Additionally, greater economy openness potentially ramped up productive activities as opposed to high inflation levels which hampered growth in the regional countries. Ehigiamusoe & Lean (2019) from investigation of 16 West African (WA) countries concluded that a more developed financial system increases the speed of output growth, but the marginal effect varies with the degree of volatility of the WA currency. Instructively, the mean group (MG) and PMG results suggested that higher exchange rate and volatility weakens the potency of finance in upscaling output growth in WA countries from 1980 – 2014. Ehigiamusoe & Lean (2018) while addressing the finance-growth connection in 16 West African countries for the duration of 1980 – 2014, contribute that finance is good for output growth, showing evidence of a well-developed financial system boosting real output growth in 10 out of the 16 countries studied off the random effect, mean group and PMG estimators. In a departure, the nonlinearity in how FD relates with economic growth was the subject of Yinusa, et al., (2022) research. Applying the system GMM estimator to a panel of 38 SSA countries studied from 1986 to 2015, they show that FD insignificant undermine growth. The GMM results provided evidence that growth in the real sector of agriculture, industrial and service sectors enhance the growth effect of FD. Bist (2018) who considered a sample of 16 low-income show through the FMOLS method that from 1995 to 2014, financial development produce positive growth outcome as output significantly expands on the back of the financial system becoming more developed. Chebab, Mazlan, Ngah & Chin (2020) PMG, MG and dynamic fixed effect results alluded to the FD and economic relationship being non-monotonic, as FD stimulates output growth and beyond a certain threshold, it tends to produce negative growth outcome for sample of 11 MENA (Middle East and North Africa) countries. Aluko, et al., (2020) relied on the Dumitrescu and Hurlin (DH) causality tests applied to data which spanned 1990 – 2015 to state that the economy and real sector of the 33 SSA countries can perform better through a developed financial system and vice versa, duly expressing bidirectional causal link in the finance-growth connection. Muhoza (2019) considered a panel sample of five (5) EAC (East African Countries) for the duration of 1985 – 2017 and showed that higher credit to the private sector leads to higher income per individual. Also, the panel dynamic OLS and FMOLS results highlights that financial intermediation is not the single growth-enhancing factor, reeling out FDI, capital and trade as growth catalysts. Abeka, Andoh, Gatsi & Kawor (2021) while assessing whether telecommunication development augment growth in 44 SSA through FD concluded through the system GMM estimator that countries with developed financial system will experience upward shift in output level and the positive effect of FD are higher in countries with developed telecommunication infrastructures. Chen, et al., (2020)'s nonlinear ARDL results did show that having a financial system that is well-developed catalyses output growth in the short and long-period growth is impeded when financial institutions are shallow and underdeveloped for Kenya from 1972 – 2017. Bandura & Dzingirai (2019) in an empirical assessment of the augmenting role institutions has in the FD-growth connection claim from the system GMM result that FD continually increase the growth pace of output provided credit allocated to the private does not exceed the range of 33 – 37%, noting that decline in output sets in when

these thresholds are surpassed. The result also alluded to growth-spurring effect of FD being strengthened by strong domestic institutions in the 27 SSA countries. Aluko & Ibrahim (2020) through the panel threshold regression (PTR) model found that a sound and strong institutions is prerequisite for FD to facilitate growth in 28 SSA countries. They found that an institutional strength above 22.069 is required for FD to stimulate output growth during the period from 1996 through 2015. As suggested, below the institutional quality threshold of 22.09, FD fail to propel economic expansion. An, et al., (2021) examine 30 SSA countries for the timeframe of 1985 – 2015 and show that FD has output expanding effects. However, the fixed effect subgroup results reveal that FD had squeeze effect on output level of low- and middle-income countries and only boost economic activities in upper-income economies. Ibrahim & Alagidede (2020) observes that real output in Ghana responds asymmetrically to changes in FD. As keenly noticed from 1980 through 2016, positive and negative FD shocks dampened real output level over the long period, with the deceleration in output level resulting from a slump in FD observed to be significant. Taiwo's (2021) PTR results shows that for FD to improve economic performance of 38 SSA countries a certain level of real sector development is necessary. Within the period 1986 – 2015, a minimum sector performance of 31.1860% for industry, 33.8982% for agriculture and 1.2241% for total factor productivity was considered mandatory. Olaniyi & Oladeji (2022) system GMM results from a study of 13 West African countries suggest that the economies of the countries in the sub-region can grow faster when their financial system is well-developed. The GMM result countered the notion that pace of real output growth due to a developed financial system is larger with strong institutions. Camara & Diallo (2020) quantile regression results suggest that better functioning financing system enhances real output growth for a sample of 13 ECOWAS for the timeframe of 1991 to 2017. Yusheng, et al., (2021), in an analysis of 32 SSA countries covering 1990 – 2016 used the fixed effect and difference GMM estimators to message that a well-developed financial system facilitates real output expansion when there is a high accumulation of human capital. Bara, et al., (2016) fixed effect and system GMM results were dovish on the role of FD, as they showed that the economies of the 15 SADC countries declined as development in the financial system intensified. However, it was reported that the causal pathway between FD and real output growth from 1985 to 2014 was bidirectional, though the demand-following causation held greater sway. Nguyen, et al., (2022) collected panel country-level data of 22 emerging economies over the timeframe of 1980 – 2020 and also confirmed using the dynamic common correlated estimator (DCCE) that financial progress drives real income growth. Ahmed, et al., (2022) using the FMOLS and DOLS methods reached the same conclusion for a sampled five (5) South Asian economies. Ibrahim & Alagidede (2018) system GMM results showed that too much credit is unhealthy for growth in the 29 SSA countries sampled, revealing that boosting real output growth requires moderate financial system development; estimating a domestic credit threshold consistent with economic performance as being below or not exceed 29% of GDP.

III. METHODOLOGY

This section is the third part of the study and relates to issues on data and sources, and lays the approach to modelling the finance-industrial growth relationship studied, among others.

Data

The data for this study extends from 1990 to 2022, translating to 33 years. The annualized panel dataset was for 5 WAMZ countries, which are Gambia, Ghana, Guinea, Nigeria and Sierra Leone. Predating the 1990s, it was observed that reforms targeted at fostering financial progress in most SSA economies were less prominent, and this influenced the choice to start the investigation from 1990. The Svirydzenka's (2016) composite financial development index (FIN) was used as index of financial development. The newly developed index trumps the single indicator measures as it reflects the extents the financial markets and institutions of the sample countries are developed in terms of access, depth, and efficiency. The index takes values from zero to unity, with higher values indicating higher financial progress or development. The industrial sector was concentrated on as most countries in SSA thrive to be industrialized and the sector is perceived to a prime candidate and viable sector for banking lending as it is often shielded from the inherent problems that beleaguers the agriculture sector. Activities in the industrial sector was measured with value additions of the sector expressed against GDP in percentage terms. Trade openness (which defines the autarky level of the economy and measured with the sum of exports and imports as % of GDP), natural resource rents, foreign direct investments (net inflows expressed against GDP in percentage), exchange rate (official value of local currency in terms of US dollar), inflation (the rate CPI changes) and population growth (measuring market size) were used as controlled variables. The data for these variables were collected from the United Nations Conference on Trade and Development (UNCTAD) [the source for FDI, POP, and INF], the World Development Indicators (WDI) [the data for IND, NRE, EXR and TON were taken from this] and the International Monetary Fund (IMF) database [the source for FIN data].

Model Specification

In the modelling of the finance-growth relationship, we draw on the claims of the supply-leading hypothesis that a well-functioning financial system has the wherewithal and capabilities of spurring economic expansion. In addition, the study was guided by the claims that inflation can repress financial intermediation as it erodes the usefulness of financial assets, raises uncertainty about prices, interest rates, and exchange rate, increases the cost of hedging financial risks, disincentivize savings, shrink earnings of firms, and lowers real rates of returns on a broad of class assets (Farahani, Ghabel & Mohammadpour, 2021; Hadian & Izadi, 2014; Rosseau & Yilmazkuday, 2009).

This study followed previous contributions by those of Yusheng, et al., (2021), Olaniyi & Oladeji (2022), Taiwo (2021), and Ibrahim & Alagidede (2018), inter alia.

The study begins with a baseline specification in Eqn. (1):

$$ino_{it} = \gamma_0 + \vartheta_1 ino_{i,t-1} + \vartheta_2 fin_{it} + \vartheta_3 ton_{it} + \vartheta_4 nre_{it} + \vartheta_5 fdi_{it} + \vartheta_6 lnexr_{it} + \vartheta_7 pop_{it} + \delta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Here, ino_{it} is industrial value added as % of GDP; fin_{it} denote the composite financial development index; ton_{it} is trade openness; nre_{it} is natural resource rents; fdi_{it} is foreign direct investment; $lnexr_{it}$ is natural logarithmic transformation of exchange rate; pop_{it} represent population growth; δ_i is unobserved country-specific effect; λ_t is time effects; ε_{it} is the error term; the subscript t denotes time in years; subscript i indicates cross-section, and $\vartheta_1 - \vartheta_7$ are elasticities.

In line with the hypothesis of whether the industrial growth effect of financial development is moderated by inflation, the study extended Eqn. (1) with the interaction term of FIN and INF. Eqn. (1) becomes:

$$ino_{it} = \gamma_0 + \vartheta_1 ino_{i,t-1} + \vartheta_2 fin_{it} + \vartheta_3 inf_{it} + \vartheta_4 (fin_{it} * inf_{it}) + \vartheta_5 ton_{it} + \vartheta_6 nre_{it} + \vartheta_7 fdi_{it} + \vartheta_8 lnexr_{it} + \vartheta_9 pop_{it} + \delta_i + \lambda_t + \varepsilon_{it} \quad (2)$$

From Eqn. (2), the study followed prior studies such as those by Olaniyi (2022), Abeka, Andoh, Gatsi & Kawor (2021), Bandura & Dzingirai (2019), Olaniyi & Oladeji (2022) and Ehigiamusoe, Lean & Smyth (2020) to obtain the marginal effect of FD on industrial growth in the presence of higher or lower inflation.

The marginal effect is obtained by differentiating Eqn. (2) partially with respect to FD to give:

$$\frac{\partial ino_{it}}{\partial fin_{it}} = \vartheta_2 + \vartheta_4 inf_{it} \quad (3)$$

Eqn. (3) explains the role of inflation in influencing or repressing how financial development impact on industrial output.

Next, the study turn attention to computing the net effects (NE) of the modulating variable of inflation. The study does so by following Wirajing, Nchofoung & Etape (2023), using equation (4):

$$NE = \vartheta_2 + (\theta \times \vartheta_4) \quad (4)$$

Here, θ is the average of inflation.

To retrieve the threshold for inflation, the net effect was decomposed following prior works of Wirajing, et al., (2023), Olaniyi (2022) and Olaniyi & Adedokun (2022). The threshold is given by Eqn. (5):

$$\pi_{inf} = \frac{\vartheta_2}{\vartheta_4} \quad (5)$$

Cross-sectional dependence (CSD)

Currently, we operate within a globalized landscape where activities or events in one country extends beyond its physical border and thus, issues relating to financial development and economic growth are not exclusively felt within a country, but often affect neighbouring countries and depending on the degree of integration, can extend to countries miles away. With the interdependence of economies, the consideration of this possibility when analysing economic relations is vital to obtaining robust outcomes, necessary for good inference.

Generally, the expectation is that the observations of N sections that constitute a panel are independently drawn, ensuring independence of the errors of the cross-sections. Where this is violated and the errors or observation disturb the outcomes of each other, then the problem of cross-sectional dependence arises. In situation where this prevails, shock in one country spills to or transfer to another understudy unit through the vehicle of international trade and financial and/or economic regional integration. There has been emphasis to check for existence of CSD (Baltagi & Pesaran, 2007). It has been shown that when CSD exists and is ignored during estimation, the estimator often become biased and inconsistent (Ahmed, et al., 2022). Therefore, the existence of CSD was checked using CSD test developed by Pesaran (2004).

Slope Homogeneity (SH)

Another important issue within panel analysis that requires address relates to slope homogeneity. It is possible that the effect of FD on industrial performance may not be the same for the understudy countries, as the policies implemented by decisions makers of the countries studied to achieve financial progress, increase financial access, depth and efficiency could be dissimilar. Other sources of slope homogeneity include culture, market size, fluidity of the financial system, growth policies and framework, *inter alia*. If there is heterogeneity across understudy economies, then pooling observations of the units will create certain problems, as pooled estimators may produce biased estimates when the slope coefficients are truly heterogenous (Herzer & Donaubauer, 2017). Also, neglecting SH between understudy economies can yield erroneous extrapolations and outcomes. Hence, the method proposed by Levene (1960) and Brown & Forsythe (1974) were used to conduct homogeneity test.

Panel Unit Root

Following confirmation of the existence of CSD and SH, the study analyse the integration process of the series through unit root testing. On panel unit root tests, the literature distinguishes between two types of tests, namely, the first- and second-generation tests. The first generation operate on the assumption of no CSD (see Levin, Lin & Chu, 2002; Im, Pesaran & Shin, 2003), and the second generation allows dependence within the panels (see Pesaran, 2004; Choi, 2006). The sample data cover from 1990 to 2022 and with each year having unique disturbances, the value distribution of the variables over this long period often times experience random drift. In specific term, may be nonstationary. The following are demerits of series having unit root. First, the t-statistics are not approximate to normal distribution, making hypothesis test inefficient. Second, existence of unit root causes spurious regression, as regression relationship become unreliable (Baltagi, 2006; Asterious & Hall, 2016). Thus, the study implemented panel unit root analysis upon INO, FIN, INF, POP, NRE, FDI, TON and logarithm of EXR using Levin, et al., (LLC) (2002) and Im, et al., (IPS) (2003) methods.

Levin, et al., (2002) test statistics are estimated by Eq. (6)

$$\Delta Y_{it} = \theta_i + \delta Y_{i,t-1} + \sum_{n=1}^{r} \delta_{in} \Delta Y_{i,t-n} + \varepsilon_{it} \qquad (6)$$

Where Y_{it} represent variable ino_{it}, fin_{it}, pop_{it}, nre_{it}, fdi_{it}, ton_{it}, inf_{it}, and $lnexr_{it}$, Δ depicts first difference. The LLC (2002) hypothesis test is H_0: $\delta = 0$ for unit root contained in the series against H_1: $\delta < 0$ for absence of unit root.

The Im, et al., (2003) method combines information from both units and time dimensions, ensuring little time observations are used in the estimation of the test statistics. The test which has superior power relative to the LLC (2002) test is employed to validate the outcome of the LLC test. The merit of the IPS approach is that it allows heterogeneity of the coefficient of $Y_{i,t-1}$ (Asterious & Hall, 2016).

The test statistics for the IPS (2003) test is obtained from estimating Eq. (7)

$$\Delta Y_{it} = \theta_i + \delta_i Y_{i,t-1} + \sum_{n=1}^{r} \delta_{in} \Delta Y_{i,t-n} + \vartheta_i t + \varepsilon_{it} \qquad (7)$$

The hypothesis test is H_0: $\delta_i = 0$ for all i against H_1: $\delta_i < 0$ for atleast one i.

Panel Cointegration

The study explored whether the variables of the model have long-run relationship after their first differentials through cointegration test. It has been suggested that the long-period effect of shocks on variables with unit root inherently do not revert over time to steady-state position, making relationship produced from such combine variables to appear false (Baltagi, 2006; Gujaratti & Porter, 2020). However, if there is evidence that cointegration exists, then the regression estimates will be meaningful and no longer spurious (Kennedy, 2008). In addition to the Kao (1999) test, the study also employed the Westerlund (2007) test of cointegration to validate the Kao result. The Westerlund test unlike the residual-based Kao test allows the autoregressive parameter to vary across the 5 WAMZ countries.

The equation for the Westerlund (2007) test is:

$$\Delta y_{it} = \theta_i' d_t + \vartheta_i \left(y_{i,t-1} - \delta_i' x_{i,t-1} \right) + \sum_{m=1}^{r} \lambda_{im} \Delta y_{i,t-m} + \sum_{m=1}^{r} \varphi_{im} \Delta x_{i,t-m} + \varepsilon_{it} \qquad (8)$$

Where ϑ_i represent the error correction estimates, Δ is first difference, y_{it} is the outcome variable and x_{it} is k dimensional regressors.

Estimation Method

The study focuses to capture whether inflation affects industrial growth for a sample of five (5) WAMZ countries through financial development. This is captured using Eqn. (2) and the primary interest variables are FIN and INF. The framework used in estimating Eqn. (2) is the pooled mean group (PMG) proposed by Pesaran, Shin & Smith (1999). There are several reasons this estimation approach was chosen. First, the estimator mitigates the shortfalls of the first-difference and system GMM estimators in the estimation of dynamic heterogeneous panel. The two GMM estimators purges any possible long-run link among interest variables. Second, the PMG estimator allows homogeneous long-run slope coefficients, but assumes heterogenous dynamic parameters. Third, under the condition of parameter homogeneity, the long-run estimators provided by this approach are consistent and efficient. Lastly, the estimates produced through the PMG approach exhibit less sensitivity to outlier estimates (Zahonogo, 2016; Asterious & Hall, 2016).

IV. RESULTS AND DISCUSSIONS

Table 1: Variables Descriptive Analysis

	INO	FIN	INF	TON	NRE	FDI	EXR	POP
Mean	22.9689	0.1104	15.2029	57.9497	11.3194	3.1554	929.7771	2.5415
Median	25.2099	0.0945	11.04	53.2779	11.6171	1.98	21.8844	2.54
Max.	38.8073	0.2727	110.9	131.4854	34.2695	32.3	9840.598	5.79
Min.	4.4287	0.0319	-0.92	16.3521	2.0013	-1.89	0.0326	-1.77
S. Dev.	8.9199	0.0527	15.8038	21.375	5.8698	4.0444	2294.706	0.7736
Skewness	-0.3576	0.9285	3.3116	0.8204	0.4383	3.3608	2.7252	-0.8062
Kurtosis	2.0352	3.0125	17.0157	3.5881	3.4293	20.4379	9.2167	12.4893
J.B.	9.9157	22.9932	1652.124	20.8885	6.3529	2401.192	469.9409	636.9517
Prob.	0.0070	0.0000	0.0000	0.0000	0.0417	0.0000	0.0000	0.0000
Obs.	165	160	165	165	160	165	165	165

Source: Researchers' compilation (2024)

Table 1 gives details on the characteristics of the study variables. Table 1 shows that unbalanced panels was utilized in the assessment of whether financial development piques industrial growth in the understudy WAMZ countries. Industrial sector's output is estimated to average 22.9689% of GDP within the range of 4.4287 and 38.8073% of GDP. This indicates that productivity level in the industrial sector of the understudy countries is relatively low. The mean of the financial development index for the sample economies stands at 0.1104 with range from 0.0319 to 0.2727. According to the descriptive analysis, the mean of FIN for the sample countries is higher than its median value of 0.0945, reiterating the evidence that the financial system of most of the understudy countries are less-developed. Reasons for this is that the financial structure in these countries are not oriented towards market-based systems, there is preference for purchasing government securities against credit distribution to private enterprises, shallow financial depth, strong legal institution is lacking, and underdeveloped stock market forged by poor financial infrastructure, weak regulation, limited companies listing which has narrowed the option of investable companies, and slow clearance procedures. Inflation level is estimated at 15.2029% and is larger than the median value of 11.04%, pointing to most of the countries having lower inflation level as prices deflated to -0.92%. The standard deviation value of 15.8038% for INF which is higher than the mean supports this, and evidence that fewer countries have unstable macroeconomic landscape as there has been episodes of hyperinflation with prices peaking at 110.9%. The mean value of trade openness is 57.9497% of GDP and the understudy sample recorded the worst trade levels of 16.3521% of GDP and the highest trade contribution of 131.4854% of GDP. As shown in Table 1, TON mean value is higher than the median value of 53.2779% of GDP evidencing that majority of the understudy countries have underperformed in terms of trade and are not well integrated to global trade. Natural resource earnings is estimated at 11.3194% of GDP within the range of 2.0013 and 34.2695% of GDP. Comparison of the median and mean values evidence that most of the countries earn higher than the average natural resource receipts. FDI is averaged at 3.1554% of GDP among cross-sections, connoting that the economies of the WAMZ countries are less attractive to foreign investors. FDI standard deviation value is higher than the mean, showcasing variation in FDI inflows as few countries receive FDI that exceed the average level. Table 1 shows that the currency of the understudy countries has depreciated significantly and has experienced the

highest fluctuation among considered series. Population growth is estimated at 2.5415% for the economies sampled with range of -1.77% to 5.79%. Further analysis of the data shows the variables do not follow a normal distribution pattern.

Table 2: Correlation Result

	INO	FIN	INF	TON	NRE	FDI	EXR	POP
INO	1.0000							
FIN	0.2779*	1.0000						
INF	0.2955*	-0.0694	1.0000					
TON	0.0659	-0.2678*	0.0246	1.0000				
NRE	0.5684*	0.2261*	0.4229*	-0.0150	1.0000			
FDI	-0.2536*	-0.1533*	-0.1069	0.2271*	-0.0178	1.0000		
EXR	0.3334*	-0.1836*	-0.0662	0.4550*	0.1107	0.0876	1.0000	
POP	-0.4372*	0.1115	-0.2920*	-0.0045	-0.2107*	0.0585	-0.0544	1.0000

Note: * shows significance at 5%

Source: Researchers' computations (2024)

Generally, the correlation matrix is used to detect threat of collinear regressors or multicollinearity among modeled variables. We presented the outcome of this analysis in Table 2. The coefficients as seen in Table 2 testify to multicollinearity absent among considered variables. We only observed high coefficient in the pair of TON and EXR (0.4550 was estimated) and that of INF and NRE which produced a coefficient of 0.4229. The coefficients portrayed in Table 2 depicts low and/or moderate percentages, posing no danger to the relationship estimated.

Table 3: Slope Heterogeneity Result

Code	Mean	St. Dev.	Freq.	Test Statistics
101	-0.5388	3.3821	33	**W0** = 13.8271 $df(4, 160)$ Pr > F = 0.0000
102	2.6285	4.3320	33	
103	1.2663	2.6609	33	**W50** = 11.0574 df (4, 160) Pr > F = 0.0000
104	0.2451	5.2141	33	
105	-3.6012	7.7578	33	**W10** = 12.9844 df (4, 160) Pr > F = 0.0000
Total	-5.824e-15	5.3587	165	

Source: Researchers' computations (2024)

The Levene (1960) and Brown & Forsythe (1974) homogeneity tests results are set out in Table 3. The null hypothesis of both tests suggests equality of variance across the panels, against the alternative of the cross-section slope coefficients being different (H_A: $\sigma_1^2 \neq \sigma_2^2 \ldots \neq \sigma_n^2$). The Levene (1960) W_0 statistics and the W_{10} and W_{50} statistics developed by Brown & Forsythe (1974) are evidenced to be significant, at 5%. Therefore, the null hypothesis of identical individual slope coefficients is rejected. This implies existence of heterogeneity within the understudy countries.

Table 4: CSD Results

Test	Statistics	Prob.	Decision
Pesaran (2004)	-1.017	0.3094	Independence

The results from the Pesaran's (2004) test indicates that the test statistics of -1.017 is not significant and the null hypothesis depicting cross-sectional independence is not rejected. This implies that, there is no spillover effects within the panel.

Table 5: Result of Panel Unit Root Test

Panel Unit Root Test					
Panel I: LLC			Panel II: IPS		
Variables	Levels	1st Diff.	Levels	1st Diff.	Remark
$ino_{i,t}$	-1.1974	-8.4977***	-1.4790*	-8.8170***	I(1)
$fin_{i,t}$	-1.4145*	-8.1711***	-1.1381	-9.4498***	I(1)
$inf_{i,t}$	-4.6671***	-	-4.8159***	-	I(0)
$ton_{i,t}$	0.4636	-6.3515***	-1.0985	-8.7882***	I(1)
$fdi_{i,t}$	-0.4595	-4.7605***	-0.7982	-7.0877***	I(1)
$nre_{i,t}$	-2.0814**	-	-2.3548***	-	I(0)
$lexr_{i,t}$	-2.1925**	-	0.3512	-6.4583***	I(U)
$pop_{i,t}$	-2.7278***	-	-2.8325***	-	I(0)

Note: *, ** & *** shows 10, 5 & 1% significance

Source: Researchers' computations (2024)

The synopsis of the panel unit root tests based on the specification proposed by LLC and IPS are set out in Table 5. The statistics for INF, NRE and POP level series are significant, indicating that the variance of the variables (INF, NRE and POP) does not shift overtime. The IPS supports the level values of INF, NRE and POP being stationary. Evidence from the LLC and IPS tests reveals that the hypothesis of no unit root function in INO, FIN, TON, and FDI cannot be dismissed at their level values, but is dismissed at their first differences. The LLC reveals that the level values of $lnexr$ lacks unit root. As shown in Table 5, the IPS show that the mean variance of the level values of $lnexr$ has time-dependent properties, but unit root is ruled out in its first difference. Consequently, the study assert that the variables used are I(0) and I(1) and are combined in such forms.

Table 6 gives the Kao and Westerlund cointegration results. For the hypothesis of no cointegration, the five Kao t-statistics are significant following testing at 5% level. According to the Kao test statistics, evidence of co-movement amid the variables is found. This means variable values of INO, FIN, FDI, NRE, POP, INF, and EXR do not drift too far apart in the long period for the cross-sections. This is supported by the Westerlund test, as evidence of cointegration is found for the sample of the understudy economies.

Table 6: Kao and Westerlund cointegration results

Test	**Statistics**	**Prob.**
Kao		
Modified DF	-1.9214**	0.0273
DF	-1.8546**	0.0318
ADF	-2.0446**	0.0204
Unadjusted modified DF	-3.8187***	0.0001
Unadjusted DF	-2.5728***	0.0050
Westerlund		
Variance ratio	1.7720**	0.0392

Note: *, ** & *** shows 10, 5 & 1% significance

Source: Researchers' computations (2024)

Table 7: PMG elasticities results

Variable	**Coefficient**	**Std. Error**	**t-statistics**	**Prob.**
Long Run				
$fin_{i,t}$	242.2887***	63.9793	3.7869	0.0003
$fin_{i,t} * inf_{i,t}$	-11.1422***	4.4983	-2.4769	0.0149
$inf_{i,t}$	0.8416**	0.3825	2.2002	0.0300
$ton_{i,t}$	0.1427***	0.0465	3.0665	0.0028

$nre_{i,t}$	0.8530***	0.2415	3.5316	0.0006
$fdi_{i,t}$	-0.0586	0.1647	-0.3558	0.7227
$lnexr_{i,t}$	-2.8181***	0.9122	-3.0892	0.0026
$pop_{i,t}$	-7.3313***	1.4869	-4.9303	0.0000
Short Run				
ECM_{t-1}	-0.2614***	0.0876	-2.9837	0.0036
$d(fin_{i,t})$	-80.6357***	29.6406	-2.7204	0.0077
$d(fin_{i,t} * inf_{i,t})$	6.3428***	2.3357	2.7154	0.0078
$d(inf_{i,t})$	-0.5170**	0.2098	-2.4637	0.0154
$d(ton_{i,t})$	0.0708	0.0788	0.8983	0.3711
$d(nre_{i,t})$	-0.0385	0.0864	-0.4463	0.6563
$d(fdi_{i,t})$	-0.3026**	0.1407	-2.1505	0.0339
$d(lnexr_{i,t})$	-1.1273	2.826	-0.3989	0.6908
$d(pop_{i,t})$	-4.2854	3.2061	-1.3366	0.1843
c	3.6948	2.5895	1.4268	0.1567
Threshold Value		21.7451		
Net Effect		72.949		
Group		5		
Obs.		165		

Note: *, ** & *** shows 10, 5 & 1% significance

Source: Researchers' computations (2024)

Table 7 gives the PMG results of Eqn. (2) which checks how the level of inflation influence financial development impact on industrial growth. The PMG results offer evidence backing the argument that financial development takes prelude in the industrial growth process, emphasized by the supply-leading hypothesis. Financial development produced a positive industrial growth outcome, as the positive slope coefficient of FIN that is significant indicates that a well-functioning financial system provides impetus for growth for the understudy economies. The finding shows that a sound and better functioning financial system is important for industrial performance in the understudy countries as it reduces the financing constraints facing households and firms, allowing households and businesses access to relatively cheap credit, aiding purchase of household items and for business expansion; channeling mobilized savings to entrepreneurial activities and investments that produce high returns and for firms to increase input level (labour and capital) to optimize output and for business expansion. This result support prior researches including those by Abbas, et al., (2022), Fakudze, et al., (2022), Ekanayake & Thaver (2021), and Haibo, et al., (2023). The study observed a reverse situation in the short run as financial development impede real industrial output growth. The study argues that the inability of the understudy economies to benefit from financial development in the short term can be explained in part by several factors. First, the financial system in the WAMZ countries is relatively underdeveloped and may be below the threshold necessary to facilitate industrial output expansion. Second, financial institutions prefer purchasing government issued less-risky securities relative to allocating credit to the private sector. Third, the positive industrial growth effect of FIN could be contingent on domestic factors such as structural characteristics and institutional environment.

Table 7 shows the parameter estimate of the interactive term $(fin * \inf)$ is significant, yielding negative impact on industrial value added. Meanwhile, the unconditional FIN coefficient is significant and induces real growth in the industrial sector of the WAMZ countries. The negative coefficient of the interactive term indicates that inflation and financial development do not complement each other, but rather are substitutes in achieving industrial expansion of the WAMZ economies. The result alludes to inflation not complementing the function of a sound and well-developed financial system in allocating mobilize savings to ramp up productivity in the industrial sector, suggesting that high inflation constitute a drag to dampen the potency of a well-functioning financial system in fostering industrial expansion. This finding portends that financial development and high inflation are not meant to coexist and pursued simultaneously as high inflationary environment will constrict the efficient allocation of resources, dampen the magnitude of savings, reduce productivity as real return on investment is lowered, impede the hiring process and prevent business expansion. The policy prescription to ensuring the economies of the understudy countries benefits from a well-functioning financial system is stabilizing prices by bringing inflation back down to a level that can guarantee industrial growth.

This level of inflation was obtained through threshold analysis. This study following prior studies (Olaniyi, 2020; Olaniyi & Oladeji, 2020) ascertained the ultimate level of inflation rate that causes the industrial growth-inducing effect of financial development to disappear.

The inflation threshold was computed by partially differentiating Eqn. 2 with respect to financial development (FIN) and the result equated to zero. Following Kumar & Stauvermann (2016) and Olaniyi & Adedokun (2022), the estimation of the inflation threshold was done using the long run elasticities. The outcome ($\frac{\partial ino}{\partial fin}$ = 242.2887 – 11.1422INF) yielded an inflation threshold of 21.7451%.

The inflation threshold of 21.7451% obtained from Eqn. 5 (242.2887/11.14221) establishes the inflation level that crowd-out the spurring effect of financial development on industrial growth. The inflation threshold of 21.7451% has policy relevance, as the threshold is within the range of -0.92% to 110.9% provided in Table 1. The notion of an inflation threshold agrees with prior contributions (see Bandura, 2020; Ehigiamusoe, et al., 2019; Huang, Lin, Kim & Yeh, 2010; Yilmazkuday, 2013). The result establish that a low-inflation environment allows the economies of the WAMZ countries to benefit from the industrial productivity spurring gains of financial development. High inflation, by reducing real return on assets, banks' deposits, increasing dissaving, and making the prediction of costs and profits difficult, distorts the assessment of projects, tampering with firms' valuation, reducing profitability, distort the ability of financial development to efficiently allocate capital, thus offsetting the positive gains of financial development on industrial performance.

The study estimated a positive net effect of financial development on industrial performance, taking into consideration the effect of inflation, 72.949 = [(-11.1422 × 15.2029 + (242.2887)]. At the inflation threshold of 21.7451%, the net effect is zero [(-11.1422 × 21.7451 + (242.2887) = 0]. Further price variability above the threshold of 21.7451% yields negative net effect, portending that inflation below 21.7451% ensures financial development continually produces positive industrial growth outcomes.

Table 7 shows that natural resource rents and trade openness does foster growth of the industrial sector of the WAMZ countries over the long period. The finding on natural resource rents which is significantly argues against the resource curse hypothesis and can be attributable to the provision of certain overhead capitals that drives industrial activities which are financed by government earnings from mineral exploration and other royalties. The result on trade openness shows clearly the gains in terms of higher industrial productivity from an economic environment that allows for free trade, increased trade integration, and drag down on restrictive trade policies. A contrary and surprising result is that exchange rate appreciation has positive long-run industrial effect, with industrial growth growing at an average of 2.8181%. The stronger industrial growth generated by currency appreciation may be attributed in part to lower input costs reaped by local importing firms through a stronger currency. This is likely to ramp up productivity as the cost of imported technology and intermediate goods falls, translating into reduced product prices and stronger demand. The negative coefficient of POP evidence the output dampening effect of excessive population growth. This result is testament to the inability of the WAMZ nations to harness the capacity and strength its youthful population to attain higher industrial growth level. This negative contribution can be attributed to the high dependency ratio that characterize the understudy economies, reducing savings and ability of financial development to mobilize and allocate savings. Table 7 shows that inflation yields positive contribution to industrial growth. This result is indicative that higher price variability is not repugnant and distortionary to industrial activities in the regional countries.

V. CONCLUSION AND RECOMMENDATIONS

Inflation is considered one of the factors that can weaken or diminishes the potency of financial development (FD) to promote higher in the industrial sector of the WAMZ nations. Apart from reducing the real returns on interest, inflation pressure makes the prediction of costs and profits difficult and the uncertainties of this is priced into interest rate, constricting financial institutions to efficient allocate capital to firms for R & D activities and finance expansion. In lieu of this, this study examined whether inflation plays a role, either as a modulator or an impairer on how FD impact on industrial growth in 5 WAMZ countries. The conclusion inferred from the analysed data suggested that FD cataylse industrial activities and output, but FD begins to faulter in driving industrial growth when there is rising price pressures above 21.7451%. Important policy insights are derivable from these findings. Policy makers in the WAMZ countries should be aware that the progressive industrial growth effect of FD fizzles out if price pressures soar above 21.7451% and as such should address inflation and bring prices down below 21.7451%, preferably adopting an inflation targeting method. It is important that policymakers implement policies that can develop the financial system and improve industrial performance. This can be increasing bank credits to the industrial sector at lower interest rate or the government acting as warrantor.

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