NONLINEAR EFFECTS OF INFLATION AND WAGE POLICY ON FIRM SUSTAINABLE GROWTH IN VIETNAM

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ABSTRACT

This study examines the effects of consumer price index (CPI) and regional minimum wage policy on firms' sustainable growth from both economic and social perspectives. Using a balanced panel of 146 agricultural and manufacturing firms in Vietnam over 2011–2022 (1,752 firm-year observations), the analysis employs panel data regression models to estimate both linear and nonlinear effects. The results reveal clear evidence of inverted U-shaped relationships between CPI and the economic aspect of firm sustainable growth, indicating that moderate inflation promotes growth while excessive inflation constrains it. For the social aspect—measured by employees' income growth, minimum wage policy show positive effects within certain thresholds, but the effects weaken beyond those levels. To ensure robustness, the system GMM approach is applied, and the results remain consistent. Overall, the findings provide firm-level evidence on how inflation and wage policies influence sustainable growth and offer implications for balanced policy design in emerging markets.

KEY WORDS

inflation, minimum wage policy, economic aspect of firm sustainable growth, social aspect of firm sustainable growth

JEL CODES

E60, M21, L25

1 INTRODUCTION

In recent decades, the concept of firm sustainable growth has been conceptualized through three pillars: economic, social, and environmental development (Wang et al., 2022). The economic pillar emphasizes efficiency, competitiveness, and profitability; the social pillar highlights employee well-being, fair labor practices; and the environmental pillar focuses on lowering resource and energy intensity, reducing emissions and waste, and meeting

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environmental standards. Yet prior research has mainly concentrated on the economic and environmental dimensions (Baumgartner and Ebner, 2010; Carroll, 2016), with limited attention to how firms strategically align economic and social objectives (Golicic et al., 2020). This study addresses this gap by examining firm sustainable growth through both the economic and social pillars, whereby the economic pillar is measured by a firm's ability to finance growth internally through retained earnings, commonly captured by the sustainable growth rate proposed by Higgins (1977), and the social pillar is measured by improvements in employees' income.

Early academic research has acknowledged that firm sustainable growth is shaped by both internal and external forces. However, the majority of prior studies have concentrated predominantly on internal determinants such as capital structure, dividend policy, profitability, asset efficiency, liquidity, firm size, and firm age (Burger et al., 2017; Canarella and Miller, 2018; Hartono and Utami, 2016; Lim and Rokhim, 2021). In contrast, the influence of external factors, such as inflation measured by the CPI, on firms' economic sustainable growth remains relatively underexplored. Notably, whether such factors support or constrain firm sustainable growth continues to be a subject of debate. Several scholars argue that the effect of these conditions may be positive, negative, or neutral, depending on whether a certain threshold is crossed (Blakley and Sti, 1989; Khan and Senhadji, 2001; Danladi, 2013). This motivates the present study to investigate the nonlinear impacts of inflation on firm sustainable growth and to identify the critical turning points where its effects change direction.

In addition to inflation, minimum wage policy is another external determinant of sustainability. According to the minimum wage theory, when governments set official minimum wage levels, firms are required to raise the pay of low-paid employees, with effects often spreading to groups earning slightly above the minimum. Minimum wage policy, therefore, represents an important external factor shaping employee welfare. Yet empirical evidence remains mixed, suggesting that the impact of wage policy is not linear but depends on the scale of the increase. When increases are moderate, firms often manage the higher labor costs by raising pay for low-paid and near-minimum employees, thereby improving overall income distribution (Autor et al., 2016; Cengiz et al., 2019). However, once the minimum wage is raised beyond a critical threshold, firms respond in less favorable ways: cutting bonuses, allowances, or non-wage benefits (Harasztosi and Lindner, 2019), restructuring internal wage structures, particularly in financially constrained firms (Arabzadeh et al., 2024), or reducing investments in training and welfare programs (Doh et al., 2025). Drawing on these mixed findings, the present study investigates whether a threshold effect of minimum wage policy exists in determining firms' wage growth rate.

Based on the arguments above, this research addresses the gap in understanding the balance between the economic and social dimensions of sustainability by focusing on Vietnam—a rapidly developing economy where firms face increasing pressure to achieve both financial performance and social accountability. The agriculture and manufacturing sectors were selected due to their significant contributions to Vietnam's GDP and employment, as well as their labor-intensive nature, which makes them particularly relevant for examining social sustainability practices. Moreover, given the availability of data in Vietnam, addressing sustainability challenges in these sectors requires a comprehensive approach that accounts for the interconnected dimensions of sustainable growth. This study emphasizes the economic and social aspects, highlighting a component that is often overlooked in sustainability performance measurement frameworks and corporate reporting. Social sustainability, in particular, is a critical area of focus in many ongoing national and international initiatives related to sustainable development and corporate responsibility. By investigating how firms in these key sectors navigate the dual priorities of economic growth and social responsibility, the study contributes to a more nuanced understanding of sustainable growth in the Vietnamese context.

Specifically, this study tests and quantifies the effects of inflation and minimum wage policy on firms' sustainable growth using a panel dataset of 146 firms over 2011–2022 (1,752 firm-year observations). It addresses two main questions: (1) to what extent do inflation and minimum wage policy affect the economic and social dimensions of firm sustainable growth? and (2) do these effects exhibit threshold behavior, indicating a nonlinear inverted U-shaped relationship?

2 LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 The Overview of Sustainable Growth and Measurement

The term sustainable growth is widely used in both academic and business contexts, though its definition varies across studies (Barney et al., 2010). Literature shows uncertainty on whether it is a two, three-dimensional, or synonymous construct. As noted by Callens and Tyteca (1999) and Barney et al. (2010), it is complex and difficult to measure directly, so scholars have developed indirect indicators (Husgafvel et al., 2015). Economic aspects are often measured by financial ratios such as profitability, market share, turnover, and risk; social aspects by employment, salary, training, and health and safety; and environmental aspects by natural resource use, waste, and pollution.

Firm-level sustainability growth provides multidimensional insights that enhance performance management and decision-making, supporting long-term competitive advantage. Sub-indices can combine qualitative and quantitative data, but measurement depends heavily on data availability, which is limited in many developing countries (den Hond et al., 2007). Environmental dimensions are more commonly studied (Montiel and Delgado-Ceballos, 2014). However, little attention has been paid to the social aspect of sustainable growth, as it is difficult to quantify and therefore often overlooked when developing sustainability metrics based on numerical evaluation methods.

Based on all the arguments above, and available data in Vietnam, tackling sustainable growth challenges in the process agriculture and manufacturing industry necessitates a holistic approach that considers interconnected dimensions and elements of sustainable growth. Moreover, socially sustainable growth is a key focus area in many ongoing initiatives related to sustainability and responsibility. Hence, our paper concentrates on the economic and social aspects.

2.2 Inflation, Wage Policy and Firm Sustainable Growth

Inflation and Firm Sustainable Growth (Economic Aspect)

While previous literature primarily emphasizes the impact of internal factors, there remain gaps in existing research concerning firm sustainable growth and external factors. In addition to internal factors, an increasing amount of emerging literature highlights the significance of external factors such as the institutional environment and socio-economic aspects. These factors are relevant because the dynamics of a sector, country, city, or region can vary and influence firm growth and performance (Abaidoo and Agyapong, 2023; Anarfi et al., 2016; Fadahunsi, 2012; Gupta et al., 2013; Ramli et al., 2022; Vaz, 2021).

Macroeconomic theory emphasizes that inflation, often captured by CPI, has profound implications for firm performance. Inflation affects profitability through its impact on purchasing power, sales volume, production costs, and borrowing rates, thereby influencing firms' capacity to allocate resources efficiently (Boyd et al., 2001). Egbunike and Okerekeoti (2018) further find that inflation significantly alters firm financial performance, which is central to sustaining growth trajectories. Tarkom and Ujah (2023)

show that macroeconomic indicators, including CPI, indirectly shape firm strategies and operations, with inflation introducing uncertainty that weakens investment decisions. However, existing studies largely employ national-level indicators, overlooking local variations in inflation across provinces or regions (Aginta and Someya, 2022). Moreover, most research focuses on the effects of macroeconomic factors on firm growth or performance, with little attention given to the CPI and firm sustainable growth. This highlights a significant gap in the literature, as understanding the role of CPI is essential for assessing the economic foundations of long-term sustainability (Doane and MacGillivray, 2001).

Minimum Wage Policy and Employee Income (Social Aspect)

The social dimension of sustainable growth emphasizes how firms promote employee welfare, human rights, and fair compensation. Enhancing human capital through retraining, retention, and employee satisfaction has been identified as a central social objective that supports long-term survival and job creation (Maletič et al., 2015). Protecting workers' rights, ensuring fair wages, and providing adequate benefits such as insurance are also increasingly regarded as essential to socially sustainable business practices (Campbell, 2007; Matten and Moon, 2008). Employee satisfaction and income growth are therefore directly linked to firms' social responsibilities, since they reflect both fair treatment of employees and redistribution of economic gains within organizations. Accordingly, this study adopts employee income growth as the primary indicator for measuring the social aspect of sustainable growth.

Beyond internal firm practices, external macroeconomic factors also play a critical role in shaping employee income, with minimum wage policy standing out as a central determinant. Kidanu (2010) and Fatula (2018) emphasize that minimum wage regulation, overall price levels, and GDP composition are strongly associated with employees' earnings. From an institutional perspective, Kaufman (2010) identifies four justifications for minimum wage legislation: establishing a wage floor to correct unequal bargaining power, stabilizing labor markets and employment, fostering long-term efficiency, and addressing externalities and social costs. Building on this, recent studies argue that under certain conditions, minimum wage increases may also promote broader corporate social sustainability (Ni and Kurita, 2020; Zhang et al., 2024).

Evidence from Vietnam provides further support for these findings. ILO (2024) finds that minimum wage hikes significantly raise the earnings of low-wage workers, with estimates suggesting that a 1% increase in the minimum wage results in a 0.83% increase in monthly wages for this group. However, they also note that the positive effect on overall wages has weakened over time, and excessive increases may generate risks for employment and labor market participation. Similarly, Dung (2017) shows that wage increases are transmitted to workers' income in micro, small, and medium enterprises, but the effect is not uniform; while many firms raise wages, smaller enterprises face disproportionate adjustment costs, limiting their ability to fully translate higher statutory wages into increased employee income. By contrast, Nguyen (2025), using a large labor force dataset, finds no significant impact of minimum wage increases on average wages or employment outcomes, though working hours decline slightly. This inconsistency across studies highlights the heterogeneity of minimum wage effects and suggests the possibility of threshold conditions under which the policy's impact on employee income growth changes direction.

Overall, the evidence shows that minimum wage policies play a crucial role in promoting socially sustainable growth through employee income growth. At the same time, results vary across sectors and regions, suggesting the possibility of a threshold effect: changes in minimum wage policy may initially increase the rate of wage growth within firms, but once increases exceed firms' financial capacity, the effect can weaken or even reverse.

Given the preceding discussion, this study aims to investigate how inflation and minimum wage policy influence the sustainable growth of

firms. It integrates and expands upon existing research in the following areas.

First, previous research has given minimal attention to the social aspect of sustainable growth. Scholars have pointed out that measuring the social aspect of sustainable growth is quite complex, as it varies and differs across countries. Therefore, it is difficult to have a measurement that can be universally applied to all countries. To enrich the literature and based on the practical aspects of the Vietnamese market, in addition to the economic aspect of sustainability, this study aims to provide further development of the social aspect of sustainable growth by using the employees' income growth at the firm level. In other words, two combinations of dimensions of sustainable growth have been used in our study, with their various specific aspects that have not been explored in prior research.

Second, the relationship between sustainable growth and firm characteristics is well-understood and aids firms in making long-term strategic decisions. However, the exploration of firm sustainable growth in relation to external factors (inflation and minimum wage policy) is relatively recent, indicating a gap in the current literature. It is also believed that inflation and minimum wage policy impacting firm sustainable growth indeed operate at multiple levels, including both national and provincial levels. These factors' impact varies across different geographical locations (Callens and Tyteca, 1999). Additionally, there is a limited understanding of how firm sustainable growth relates to local environments within a home country's subnational settings. To address this gap and enhance the literature, this study aims to consider inflation and minimum wage policy at the local and national levels, which can usually simultaneously affect firm sustainable growth.

Third, international scholars have indicated that the impact of factors on sustainable development depends on specific circumstances, which can have either negative or positive effects. This implies that the relationship between variables is not always linear. For example, Higgins (1981) suggests that, in certain situations, the real sustainable growth rate may inversely vary with inflation. This has led us to propose that the relationship between inflation, minimum wage policy, and firm sustainable growth might depend on a specific threshold. Currently, there is little empirical evidence of a curvilinear relationship between inflation, minimum wage policy, and firm sustainable growth. Therefore, this study examines the effect of CPI and regional minimum wage policy on sustainable growth using both linear and nonlinear regression to explore this relationship in greater detail.

Overall, based on the above discussions, we propose the following hypothesis:

H_1: *There is a relationship between CPI and firm sustainable growth (economic aspect).*

H_2: *There is an existence of threshold effects in the relationship between CPI and firm sustainable growth (economic aspect).*

H_3: *There is a relationship between CPI, regional minimum wage policy and firm sustainable growth (social aspect).*

H_4: *There is the existence of threshold effects in the relationship between regional minimum wage policy and firm sustainable growth (social aspect).*

3 METHODOLOGY AND DATA

3.1 Sample Selection

This study analyzes data from listed firms of agriculture and manufacturing industries on both the HoChiMinh Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX) between 2011 and 2022. This study focuses on agricultural and manufacturing firms, which represent two key sectors in Vietnam. These industries contribute substantially to GDP and employment and are highly labor-intensive, making them suitable for examining the social dimension of sustainable growth (Gray and Jones, 2022). In addition, they are among the sec-

tors most directly affected by macroeconomic policies such as inflation and regional minimum wage regulations, since labor and input costs account for a large share of their expenses. They also play a crucial role in Vietnam's global value chains, particularly in exports of agricultural products and manufactured goods, which underscores the practical relevance of studying their sustainable growth. Furthermore, data availability for these industries is relatively reliable compared to other sectors, allowing for consistent empirical analysis. The final sample consists of 146 firms in 12 years with 1752 observations.

Data related to internal factors (firm characteristics) and firm sustainable growth were manually collected from financial statements and annual reports available on the HOSE and HNX websites, along with data from the FIINGROUP Vietnam source. Data on external factors, including the CPI and regional minimum wage policy, were sourced from the annual Provincial Competitiveness Index report and the Vietnam Statistical Yearbook published by the General Statistics Office.

3.2 Research Models

3.2.1 Variables and Theoretical Justification

The theoretical foundations underlying the main variables—CPI and minimum wage policy—have been discussed in the literature review, drawing on the macroeconomic theory, the institutional perspective, and minimum wage theory. Accordingly, this section focuses on the theoretical justification and measurement of the control variables included in the model. These control variables are incorporated to account for firm-specific characteristics that may influence sustainable growth, ensuring that the estimated effects of the main variables are more robust and reliable.

Firm characteristics are important determinants of sustainable growth, and several theoretical foundations have been employed by scholars to explain this relationship. The Resource-Based View highlights firm age, size, liquidity, cash flow, and profitability as key resources for long-term competitiveness (Barney, 1991; Vaz, 2021). The Pecking Order Theory shows that leverage and liquidity influence financing choices, with stronger internal cash flows reducing reliance on debt (Ibrahimov et al., 2025; Ramli et al., 2022). The Slack Resources Theory suggests that profitability provides discretionary resources for sustainable strategies, consistent with evidence linking profitability and sustainability outcomes (Ibrahimov et al., 2025; Waddock and Graves, 1997). Empirical research further confirms that these firm-level factors significantly affect differences in sustainable growth across firms and contexts (Abaidoo and Agyapong, 2023; Fadahunsi, 2012). In line with these theories and previous studies, firm characteristics are included in our analysis as control variables, as specified in Model 1 and Model 2.

Since sustainable growth indicators are derived from audited financial statements, audit quality plays a crucial role in their reliability. Agency theory (Jensen and Meckling, 1976) views auditing as a monitoring tool that reduces information asymmetry and constrains opportunism, while signaling theory suggests that engaging high-quality auditors, such as Big4, sends a credible signal of transparency and accountability. Together, these perspectives imply that audit quality enhances the credibility of financial information and signals a firm's commitment to ESG compliance and sustainable growth.

According to social embeddedness theory (Granovetter, 1985), firms' economic behavior is shaped by the social context and community norms in which they are embedded. Hence, when local average income levels are high, societal and employee expectations for wages are also elevated, pushing firms to adjust compensation policies to attract and retain talent (Jardim et al., 2024). Conversely, in regions with lower income levels, social pressure and labor market competition are weaker, allowing firms to offer lower wages. This perspective suggests that local average income can influence firm-level wage growth and thereby affect the social dimension of sustainable growth.

3.2.2 Measure of Firm Sustainable Growth

Economic Aspects

We follow the convention in the sustainable growth rate model developed by Higgins (1977), Wang et al. (2023) to define sustainable growth of firms using their own funds without external financing, as follows:

$$\mathrm{ESGR}_{i,t} = \frac{p_{i,t}(1-d_{i,t})(1+L_{i,t})}{t_{i,t} - p_{i,t}(1-d_{i,t})(1+L_{i,t})},$$

where:

- $\mathrm{ESGR}_{i,t}$ is economic of sustainable growth rate of firm i in year t;
- $P_{i,t}$ is profit margin of firm i in year t;
- $d_{i,t}$ are dividends divided by profits of firm i in year t (dividend payout ratio);
- $L_{i,t}$ is debt to equity ratio of firm i in year t;
- $T_{i,t}$ is measured by total assets to sales of firm i in year t.

Social Aspects

In Vietnam, listed firms must publish annual reports that include a Social-Governance section covering labor policies such as wages, bonuses, insurance, and training. Since social insurance contributions are standardized and based on wages, the wage system serves as the most reliable quantitative indicator of employee benefits. A sustainable company must ensure good employee policies and retention; therefore, following Maletič et al. (2015) and data availability, this study uses the firm's annual salary growth rate to measure social sustainable growth (SSGR), consistent with DeLuca and Van Zandweghe (2023) and Kelle (2016), as follows:

$$\mathrm{SSGR}_{i,t} = \frac{\mathrm{ASF}_{i,t} - \mathrm{ASF}_{i,t-1}}{\mathrm{ASF}_{i,t-1}} \cdot 100,$$

where $\mathrm{ASF}_{i,t}$ is average salary of firm.

3.2.3 Measure of Consumer Price Index, Regional Minimum Wage Policy

Consumer Price Index

In Vietnam, the calculation of the Consumer Price Index (CPI) involves the General Statistics Office (GSO) selecting a range of commonly consumed goods and services, collectively known as a "basket." This basket, representing typical consumption patterns, is used to collect monthly price data. The GSO assigns specific weights to these items to compute the CPI at provincial, regional, and national levels. The annual CPI growth data at the provincial level, provided by the GSO, have been utilized in our study.

Regional Minimum Wage Policy

The regional minimum wage policy in Vietnam is a government-mandated regulation that sets the minimum wage levels that employers must pay their employees, depending on the geographic region where the employees work. These regions are classified into four categories, often referred to as Region 1, Region 2, Region 3, and Region 4, based on the cost of living, economic development, and industrial concentration. The wage levels are determined annually by the government, based on recommendations from the National Wage Council, which considers factors like inflation, economic growth, and the living standards of workers.

This study uses the regional minimum wage growth rate as a measure. It is calculated as

$$\frac{\mathrm{RMW}_c - \mathrm{RMW}_p}{\mathrm{RMW}_p},$$

where RMW_c is regional minimum wage in the current period and RMW_p is regional minimum wage in the previous period.

3.2.4 Research Models

Based on the theoretical framework and prior studies, this study proposes a model examining the effects of local CPI and minimum wage policy on firms' sustainable growth. Following Higgins (1981)'s argument, we propose that a potential non-linear relationship between CPI

Tab. 1: Variable definition

Variable	Measurement
$\text{ESGR}_{i,t}$	The sustainable growth rate of in i in year t (economic aspect)
$\text{SSGR}_{i,t}$	The sustainable growth rate of in i in year t (social aspect) − annual salary growth rate of firm i in year t
$\text{Age}_{i,t}$	Logarithm of age of firm i in year t
$\text{AE}_{i,t}$	Asset efficiency of firm i in year t, measured by sales/total assets
$\text{CFO}_{i,t}$	Cash flow of firm i in year t
$\text{Firmsize}_{i,t}$	Logarithm of total assets of firm i in year t
$\text{Liq}_{i,t}$	The value of current assets of firm i divided by current liabilities in year t
$\text{Lev}_{i,t}$	Total liabilities to total assets of firm i in year t
$\text{ROA}_{i,t}$	Return on total assets of firm i in year t
$\text{GRLabour}_{i,t}$	Growth rate of number labour of firm i in year t
$\text{dumESGR}_{i,t}$	Dummy variable, equals 1 if firm sustainable growth (economics aspect) in year t is positive, and zero otherwise
$\text{Big4}_{i,t}$	A proxy for audit quality, equals one if the firm's auditor is one of the Big4 in year t, and zero otherwise
$\text{CPI}_{i,t}$	Consumer Price Index growth by province for firm i in year t
$\text{CPI}^2_{i,t}$	Squared term of CPI by province for firm i in year t
$\text{Regimini}_{i,t}$	Regional minimum wage growth rate for the region of firm i in year t
$\text{Regimini}^2_{i,t}$	Squared term of regional minimum wage of firm i in year t
$\text{Localincome}_{i,t}$	Local average income by province in which firm located (thousand VND)

and sustainable growth may exist; the impact—whether positive or negative—depends on certain thresholds. Therefore, Model 1 includes CPI^2 to capture this non-linearity.

Model 1

$$\begin{aligned}\text{ESGR}_{i,t} = {} & \alpha_0 + \alpha_1\,\text{Age}_{i,t} + \\ & + \alpha_2\,\text{AE}_{i,t} + \alpha_3\,\text{CFO}_{i,t} + \\ & + \alpha_4\,\text{Firmsize}_{i,t} + \alpha_5\,\text{Liq}_{i,t} + \\ & + \alpha_6\,\text{Lev}_{i,t} + \alpha_7\,\text{ROA}_{i,t} + \\ & + \alpha_8\,\text{GRLabour}_{i,t} + \\ & + \alpha_9\,\text{Big4}_{i,t} + \\ & + \alpha_{10}\,\text{CPI}_{i,t} + \alpha_{11}\,\text{CPI}^2_{i,t} + \\ & + \alpha_{12}\,\text{Localincome}_{i,t} + \epsilon_{i,t}\end{aligned} \tag{1}$$

According to Callens and Tyteca (1999), the measurement perspectives of sustainable growth are not independent but are related to each other. For example, the employment rate might be reduced from a business standpoint—due to cost-saving measures—but it should be maximized from a social perspective. Hence, the dummy variable related to the economic aspects of sustainable growth was added to Model 2 to control for the relationship between these two aspects. Moreover, based on the argument in the previous section, minimum wage policy is one of the macroeconomic policies that might impact the social aspect of firm sustainable growth (Zhang et al., 2024; Ni and Kurita, 2020). Therefore, in addition to the variables in Model 1, the variable for regional minimum wage policy has been included in Model 2 with both linear and quadratic terms.

Model 2

$$\begin{aligned}\text{SSGR}_{i,t} = {} & \alpha_0 + \alpha_1\,\text{Age}_{i,t} + \\ & + \alpha_2\,\text{AE}_{i,t} + \alpha_3\,\text{CFO}_{i,t} + \\ & + \alpha_4\,\text{Firmsize}_{i,t} + \alpha_5\,\text{Liq}_{i,t} + \\ & + \alpha_6\,\text{Lev}_{i,t} + \alpha_7\,\text{ROA}_{i,t} + \\ & + \alpha_8\,\text{GRLabour}_{i,t} + \\ & + \alpha_9\,\text{Big4}_{i,t} + \\ & + \alpha_{10}\,\text{dumESGR}_{i,t} + \\ & + \alpha_{11}\,\text{CPI}_{i,t} + \\ & + \alpha_{12}\,\text{Regimini}_{i,t} + \\ & + \alpha_{13}\,\text{Regimini}^2_{i,t} + \\ & + \alpha_{14}\,\text{Localincome}_{i,t} + \epsilon_{i,t}\end{aligned} \tag{2}$$

4 RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Tab. 2 describes descriptive statistics of variables in the two models. The average expected rate of economic sustainable growth is approximately 0.1156. There is considerable variability in ESGR, as indicated by the standard deviation of 0.2227, with ESGR values ranging from a minimum of −2.7041 to a maximum of 3.4654, showing that some firms experience significant declines or growth. Moreover, the average sustainable growth rate (annual salary growth rate) is approximately 8.51%, and SSGR values range from −0.55 to 1.89, suggesting that while some firms are experiencing negative annual salary growth, others are growing at a rate of up to 189%. By comparison, the average regional minimum growth wage rate is about 14.25% and ranges from 0 to 68.67%, showing a wide range of minimum wage levels across different regions. The average CPI is 4.7% which has a standard deviation of 4.3%, indicating low variability in CPI across the sample.

Correlation Matrix for the Variables

Overall, ESGR, SSGR are positively correlated with variables CPI, Regimini. Moreover, ESGR and SSGR exhibit positive correlations with firm characteristics such as ROA, GRLabour, and asset efficiency. As anticipated by our theoretical framework, firms with strong performance tend to show a higher potential for sustainable growth. All correlation coefficients are less than 0.8 or greater than −0.8, indicating that multicollinearity is not a concern in the research models.

Variance Inflation Factors (VIF)

It is believed that the model includes both linear terms and the quadratic regression, which exacerbate higher VIF values. Hence, in order to reduce VIF, we use centering the squared terms of CPI and Regimini to mitigate multicollinearity and enhance the stability and reliability of the regression coefficients. In line with the approaches of Kyriazos and Poga (2023) and Iacobucci et al. (2016), we applied this technique to center CPI (becoming C.CPI and C.CPI^2) and Regimini (becoming C.Regimini and C.Regimini^2). Consequently, the VIF values are below 10 (Hair et al., 2009). Thus, our model is not affected by multicollinearity issues and yields the same results.

Tab. 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ESGR	1,752	0.11560	0.22270	−2.7041	3.4654
SSGR	1,752	0.08500	0.15320	−0.5500	1.8900
Age	1,752	1.36540	0.22330	0.6021	1.8325
AE	1,752	1.31210	0.89110	0.0004	8.7488
CFO	1,752	9.02500e+07	3.81000e+08	−2.9200e+09	5.1800e+09
Firmsize	1,752	8.83350	0.62067	7.2652	10.7240
Liq	1,752	2.36350	3.23290	0.1500	52.2600
Lev	1,752	130.90100	365.14430	0.2700	14,025.8000
ROA	1,752	0.07000	0.07960	−0.3642	0.7219
GRLabour	1,752	0.00340	0.20030	−0.8200	2.2000
Big4	1,752	0.25390	0.43540	0.0000	1.0000
CPI	1,752	0.04700	0.04300	0.0051	0.1863
Regimini	1,752	0.14255	0.13989	0.0000	0.6867
Localincome	1,752	5,023.93000	1,905.52500	1,114.0000	10,401.0000

Tab. 3: Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) ESGR	1													
(2) SSGR	0.101***	1												
(3) Age	−0.009	−0.025	1											
(4) AE	0.196***	0.065***	0.024	1										
(5) CFO	0.102***	−0.079***	0.031	−0.005	1									
(6) Firmsize	0.009	−0.009	0.110***	−0.308***	0.272***	1								
(7) Liq	−0.016	−0.033	−0.052**	−0.136***	−0.014	−0.196***	1							
(8) Lev	−0.153***	0.022	0.070***	−0.027	−0.029	0.099***	−0.115***	1						
(9) ROA	0.591***	0.059**	0.045*	0.205***	0.164***	−0.033	0.128***	−0.218***	1					
(10) GRLabour	0.067***	0.198***	−0.012	0.017	−0.023	0.126***	−0.069***	0.046*	0.057**	1				
(11) Big4	0.031	−0.002	0.011	−0.123***	0.249***	0.460***	−0.068***	0.028	0.103***	0.037	1			
(12) C.CPI	0.144***	0.165***	−0.234***	0.056**	−0.039*	−0.127***	−0.047**	0.002	0.057**	0.072***	−0.104***	1		
(13) C.Regimini	0.134***	0.157***	−0.277***	0.074***	−0.022	−0.156***	−0.075***	0.004	0.039*	0.081***	−0.107***	0.711***	1	
(14) Localincome	−0.048**	−0.048**	0.147***	−0.047**	0.049**	0.061**	0.095***	−0.010	0.030	−0.070***	0.074***	−0.361***	−0.464***	1

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

All values of the collinearity Diagnostics, as shown in Tab. 4, have VIF less than 10, the conclusion is that multicollinearity is not a significant concern in the research models.

Tab. 4: Collinearity Diagnostics (Mean VIF = 2.56)

Variable	VIF	SQRT VIF	Tolerance
Age	1.14	1.07	0.8764
AE	1.24	1.11	0.8096
CFO	1.15	1.07	0.8720
Firmsize	1.62	1.27	0.6162
Liq	1.16	1.08	0.8632
Lev	1.08	1.04	0.9280
ROA	1.20	1.09	0.8358
GRLabour	1.04	1.02	0.9578
Big4	1.32	1.15	0.7549
C.CPI	8.82	2.97	0.1133
C.CPI^2	5.90	2.43	0.1694
C.Regimini	5.52	2.35	0.1810
C.Regimini^2	3.27	1.81	0.3059
Localincome	1.40	1.18	0.7146

Regression Results

This section will interpret the analysis of the selected model following the application of the Hausman test and the Breusch-Pagan Lagrangian test. Our study presents the chosen model after conducting all necessary tests. Furthermore, outliers present significant methodological challenges in empirical research, as even a few can distort research findings (Cousineau and Chartier, 2010). To address the outliers problem, we employed deletion as a handling technique. We recalculated the results for all models after excluding outliers using DFFITS, a metric that identifies prediction outliers in regression analysis.

For robustness checks, we conducted additional analyses using alternative regression methods. First, the sample was divided into two industry groups: agriculture and manufacturing. Second, to test for differences between firms with positive and negative sustainable growth, the sample was further split accordingly.

Tab. 5 illustrates the results of a regression analysis. We consistently observe that C.CPI positively influences firm sustainable growth

Tab. 5: Regression results of Model 1

Variable	ESGR Fixed-effects (within) regression: robust standard errors	Positive ESGR Fixed-effects (within) regression: robust standard errors	Negative ESGR POLS: robust standard errors
Age	−0.0165 (0.0439)	−0.0156 (0.0473)	0.0189 (0.0212)
AE	0.0140** (0.0066)	0.0162** (0.0068)	−0.0223*** (0.0079)
CFO	−0.0000 (0.0000)	−0.0000 (0.0000)	−0.0000 (0.0000)
Firmsize	0.0043 (0.0167)	−0.0006 (0.0152)	0.0220** (0.0090)
Liq	−0.0022 (0.0014)	−0.0015 (0.0011)	−0.0002 (0.0010)
Lev	0.0000 (0.0000)	0.0002*** (0.0000)	−0.0002*** (0.0000)
ROA	1.9654*** (0.0717)	1.8878*** (0.0813)	0.8459*** (0.1141)
GRLabour	−0.0145 (0.0103)	−0.0166* (0.0092)	−0.0554 (0.0344)
Big4	0.0020 (0.0129)	−0.0060 (0.0112)	−0.0067 (0.0128)
C.CPI	0.6804*** (0.1565)	0.6953*** (0.1607)	0.6510** (0.2628)
C.CPI^2	−3.6649*** (1.1432)	−4.2552*** (1.1423)	−3.6115* (2.1015)
Localincome	−0.0000 (0.0000)	−0.0000 (0.0000)	0.0000** (0.0000)
_cons	−0.0408 (0.1451)	−0.0056 (0.1235)	−0.2280*** (0.0874)
N	1684	1452	240
adj. R^2	0.6000	0.5600	0.6330
P	0.0000	0.0000	0.0000
Breusch and Pagan Lagrangian test	0.0000	0.0000	0.1592
Hausman (Prob)	0.0000	0.0000	
Test for heteroskedasticity	0.0000	0.0000	0.0000

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; C.CPI = value of centered CPI; C.CPI^2 = value of centered CPI^2.

at the 1% significance level across all models. This implies that higher CPI levels significantly boost firm economic sustainable growth in all cases. Firm growth is reliant on the cost of external financing, which is affected by the economic effectiveness. Interestingly, the coefficient for C.CPI^2 is significantly negative in all models, indicating a significant nonlinear (inverse U-shaped) relationship. Hence, H_1 is supported.

The inverse U-shaped approach is employed to assess the nonlinear relationship between CPI and ESGR, focusing on the turning point and boundary slopes within the observed range (Tab. 6 and Fig. 1).

Tab. 6 and Fig. 1 (Model 1) reveal a statistically significant reversed U-shaped relationship between CPI and ESGR. The estimated turning point occurs at CPI = 0.1398 (90% Fieller CI: 0.1216–0.1818), with the overall test confirming

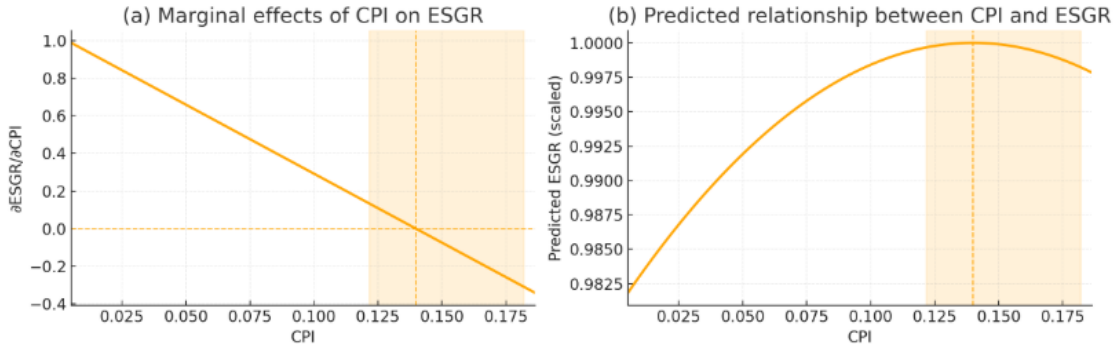

Fig. 1: Marginal and predicted effects of CPI on ESGR (Model 1)

nonlinearity at the 5% significance level. ESGR initially increases with CPI, reaches a peak around the turning point, and subsequently declines, supporting the presence of an inverse U-shaped association, providing support for H_2.

Tab. 6: Nonlinear reversed U shapes for Model 1: CPI

Statistic	**Value**
Slope at lower bound	0.6428***
Slope at upper bound	−0.6851*
Test	**Value**
Overall test of reversed U-shape (P-value)	0.0418
Turning point (CPI*)	0.1398
90% Fieller interval for turning point	[0.1216, 0.1818]

Notes: To ensure clarity and consistency in economic interpretation, all reported values are transformed from the centered CPI (C.CPI) to the original CPI scale; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In the full model, the coefficient of CPI is 0.2737, statistically significant at the 0.1% level. This indicates a strong positive relationship between CPI and SSGR. Similarly, C.Regimini exhibits a significant positive relationship with a coefficient of 0.2311. Moreover, C.Regimini^2 displays a significant negative quadratic effect, suggesting an inverse U-shaped relationship for Regimini. Consistent with the full model, the model for firms with positive growth has the same results, both CPI and Regimini having stronger positive relationships, and the quadratic term of Regimini showing a negative effect. In contrast, in the model of negative growth, the coefficient of these variables is not statistically significant, suggesting that the relationships between these variables and the dependent variable are weak or negligible for negative values.

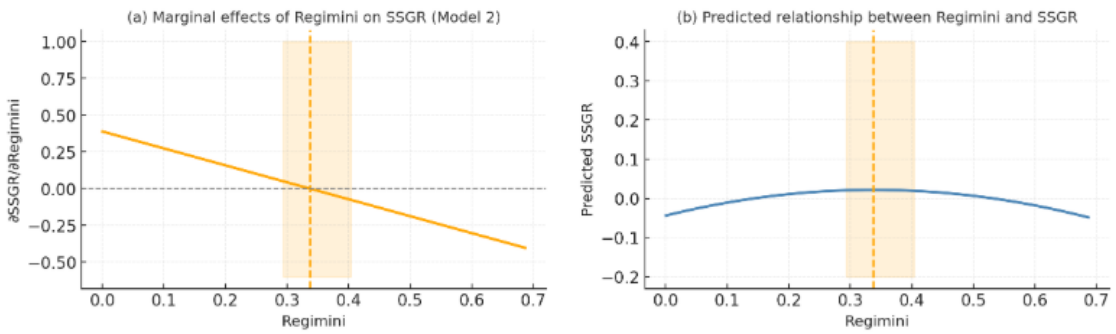

Fig. 2: Marginal and predicted effects of Regimini on SSGR (Model 2)

Tab. 7: Regression results of Model 2

Variable	SSGR Random-effects GLS regression: robust standard errors	Positive SSGR Random-effects GLS regression: robust standard errors	Negative SSGR POLS: robust standard errors
Age	0.0111 (0.0170)	0.0030 (0.0133)	0.0176 (0.0219)
AE	0.0050* (0.0030)	0.0031 (0.0029)	0.0043 (0.0057)
CFO	−0.0000*** (0.0000)	−0.0000*** (0.0000)	0.0000 (0.0000)
Firmsize	−0.0003 (0.0056)	−0.0033 (0.0060)	−0.0165* (0.0094)
Liq	−0.0008 (0.0008)	−0.0009 (0.0007)	0.0027 (0.0023)
Lev	0.0000*** (0.0000)	0.0000 (0.0000)	0.0000 (0.0001)
ROA	0.0711** (0.0353)	−0.0119 (0.0364)	−0.0222 (0.0731)
GRLabour	0.0946*** (0.0240)	0.0600*** (0.0192)	0.1310*** (0.0264)
Big4	0.0140** (0.0064)	0.0006 (0.0067)	0.0300** (0.0124)
dumESGR	0.0277*** (0.0080)	0.0257*** (0.0073)	0.0135 (0.0125)
CPI	0.2737*** (0.0893)	0.2666*** (0.0862)	−0.1074 (0.2185)
C.Regimini	0.2311*** (0.0424)	0.1396*** (0.0390)	−0.1178 (0.0731)
C.Regimini^2	−0.5375*** (0.1149)	−0.2168** (0.1094)	0.2625 (0.2577)
Localincome	0.0000 (0.0000)	0.0000 (0.0000)	0.0000* (0.0000)
_cons	0.0149 (0.0514)	0.1052* (0.0551)	−0.0313 (0.0945)
N	1653	1229	246
adj. R^2	0.1549	0.1047	0.2088
P	0.0000	0.0000	0.0000
Breusch and Pagan Lagrangian (Prob)	0.0030	0.0535	0.4238
Hausman (Prob)	0.1238	0.1788	
Test for heteroskedasticity	0.0000	0.0000	0.0128

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$; C.Regimini = value of centered Regimini; C.Regimini^2 = value of centered Regimini^2.

Overall, the results indicate significant linear and quadratic relationships for the full model and for only positive social sustainable growth values. Therefore, H_3 is supported only for firms with positive sustainable growth.

Similarly, the nonlinear reversed U-shaped association between Regimini and SSGR is reported in Tab. 8 and illustrated in Fig. 2 (Model 2). The estimated turning point is 0.3374, with the 90% Fieller confidence interval ranging from 0.2934 to 0.4035. The overall

test for the presence of a reversed U-shape is statistically significant at the 1% level, confirming a nonlinear pattern. This result indicates that as the regional minimum wage growth rate (Regimini) increases, SSGR initially rises, reaches its maximum at the turning point, and subsequently declines. These findings provide strong evidence supporting H_4.

Tab. 8: Nonlinear reversed U shapes for Model 2: Regimini

Statistic	**Value**
Slope at lower bound	0.2246***
Slope at upper bound	−0.5668***
Test	**Value**
Overall test of reversed U-shape (P-value)	0.0002
Turning point (Regimini*)	0.3374
90% Fieller interval for turning point	[0.2934, 0.4035]

Notes: To ensure consistency with the interpretation in the main text, all reported values are transformed from the centered Regimini (C.Regimini) to the original Regimini scale; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness Check for Each Industry

In this section, we further perform additional robustness assessments by dividing the sample for each industry. Tab. 9 presents results for two models examining the impact of CPI/Regimini on firm sustainable growth, and the estimation results remain quantitatively the same. Consistent with the above findings, a nonlinear, reversed U-shaped curve is identified between CPI and ESGR, Regimini and ESGR.

Robustness Check for Endogeneity

The study further tests the robustness of the results using the system GMM approach to address endogeneity. This dynamic panel method incorporates lagged dependent variables as regressors and instruments to control for endogeneity.

Findings from GMM (as shown in Tab. 10) are similar to the results above, indicating the existence of a nonlinear inverted U-shaped relationship between CPI and the economic aspect of firm sustainable growth, and between regional minimum wage growth rate and the social aspect of firm sustainable growth.

5 CONCLUSIONS

5.1 Discussion of Findings

This study investigates the effects of local CPI and minimum wage policy on firms' sustainable growth in both economic and social aspects, using a sample of 146 agricultural and manufacturing firms with 1,752 observations from 2011–2022. The economic aspect examines linear and nonlinear relationships between local CPI and ESGR, while the social aspect includes the squared term of the regional minimum wage policy to capture potential non-linear effects.

First, while most studies focus on the linear impact of inflation on firm growth or performance, our research contributes to the literature by exploring the nonlinear relationship between the CPI measured at the local level, a key inflation indicator, and the economic sustainable growth of firms. Our findings align with the concept of threshold effects noted in the studies by Blakley and Sti (1989), Khan and Senhadji (2001), Danladi (2013), demonstrating a nonlinear, inverted U-shaped relationship between CPI and firm sustainable growth. The empirical results indicate that CPI can positively influence firm growth up to a certain threshold, beyond which higher inflation tends to exert negative effects. This nonlinear pattern may also help explain why previous studies have not reached consensus on the inflation–growth relationship.

Second, in this study, we define the social aspect of sustainable growth as the extent to which a firm promotes and improves the quality of employees' income growth. Consistent with Kaufman (2010), Zhang et al. (2024), Ni and Kurita (2020), Fatula (2018), our study provides evidence to show the positive impact of CPI and Minimum Wage Policy on the social aspect of firm sustainable growth.

Tab. 9: Regression results of Model 1 and Model 2 for each industry

	Model 1: ESGR		Model 2: SSGR	
Variable	**Agriculture**	**Manufacturing**	**Agriculture**	**Manufacturing**
Age	0.0064	−0.0076	0.0303	0.0149
	(0.1416)	(0.0485)	(0.0304)	(0.0203)
AE	−0.0194	0.0199***	−0.0014	0.0056
	(0.0162)	(0.0074)	(0.0063)	(0.0035)
CFO	0.0000	−0.0000	−0.0000	−0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Firmsize	0.0308	−0.0123	−0.0009	0.0051
	(0.0415)	(0.0178)	(0.0117)	(0.0067)
Liq	−0.0022	−0.0008	−0.0032	−0.0000
	(0.0028)	(0.0010)	(0.0030)	(0.0010)
Lev	−0.0000	0.0001**	0.0000*	0.0000
	(0.0001)	(0.0000)	(0.0000)	(0.0000)
ROA	1.9249***	1.9740***	0.0996	0.0800*
	(0.1429)	(0.0765)	(0.0628)	(0.0475)
GRLabour	−0.0406*	−0.0161	0.1172***	0.0814***
	(0.0204)	(0.0131)	(0.0332)	(0.0278)
Big4	0.0091	0.0030	0.0326***	0.0085
	(0.0323)	(0.0127)	(0.0120)	(0.0073)
C.CPI	1.1378***	0.5962***		
	(0.3238)	(0.1729)		
C.CPI^2	−6.6039***	−2.9120**		
	(1.8106)	(1.3053)		
dumESGR			0.0118	0.0314***
			(0.0147)	(0.0082)
CPI			0.8403***	0.1676*
			(0.1719)	(0.0970)
C.Regimini			0.1512*	0.2691***
			(0.0774)	(0.0450)
C.Regimini^2			−0.4732**	−0.6265***
			(0.2230)	(0.1228)
Localincome	−0.0000	−0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
_cons	−0.2849	0.0799	−0.0270	−0.0295
	(0.3072)	(0.1513)	(0.1278)	(0.0576)
N	401	1285	389	1337
adj. R^2	0.6830	0.5790	0.2060	0.1201
P	0.0000	0.0000	0.0000	0.0000
Breusch and Pagan Lagrangian test (Prob)	0.0003	0.0000	1.0000	0.0000
Hausman (Prob)	0.0000	0.0000		0.5613
Test for heteroskedasticity (Prob)	0.0000	0.0000	0.6302	0.0000

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Tab. 10: Dynamic Panel System GMM for Model 1 and Model 2

Variables	Model 1 (ESGR)	Variables	Model 2 (SSGR)
L.ESGR	0.1879***	L.SSGR	−0.0736**
	(0.0085)		(0.0356)
Age	0.0346	Age	0.0322
	(0.0359)		(0.0257)
AE	−0.0029	AE	0.0061
	(0.0106)		(0.0085)
CFO	0.0000	CFO	−0.0000*
	(0.0000)		(0.0000)
Firmsize	−0.0440**	Firmsize	−0.0030
	(0.0176)		(0.0173)
Liq	−0.0020	Liq	−0.0016
	(0.0017)		(0.0016)
Lev	0.0001***	Lev	−0.0000*
	(0.0000)		(0.0000)
ROA	1.9905***	ROA	−0.1632
	(0.1078)		(0.2458)
GRLabour	0.0296	GRLabour	0.1043*
	(0.0375)		(0.0737)
Big4	0.0042	Big4	0.0256*
	(0.0207)		(0.0288)
		dumESGR	0.0126*
			(0.0336)
		CPI	0.4776
			(0.7945)
C.CPI	1.2699***	C.Regimini	0.3680**
	(0.2660)		(0.1628)
$C.CPI^2$	−12.7542**	$C.Regimini^2$	−0.9037***
	(6.2411)		(0.2697)
Localincome	0.0000***	Localincome	0.0000*
	(0.0000)		(0.0000)
N	1460	*N*	1606
Arellano-Bond Test		Arellano-Bond Test	
Order 1 *p*-value	0.0000	Order 1 *p*-value	0.0000
Order 2 *p*-value	0.1670	Order 2 *p*-value	0.1090
Hansen Chi-Square	0.2930	Hansen Chi-Square	0.7360

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Specifically, for the minimum wage policy, this positive effect is only observed within a certain threshold. Beyond this threshold, the impact reverses. However, this effect is only applicable to firms with positive growth, as these policies do not impact firms with negative growth.

5.2 Limitations and Further Research

While our research has provided several valuable insights, it also has certain limitations. Firstly, this study relies on the Higgins (1977) models to represent sustainable growth from a financial perspective and an annual salary growth rate to represent for social aspect. It does not address other dimensions, such as quality and social factors considerations. Measurement approaches related to labor training, community engagement, or social responsibility programs have not been studied due to limitations in data availability from corporate disclosures. Secondly, although our analysis identifies nonlinear relationships and threshold effects

for macroeconomic factors such as inflation and minimum wage policy, these thresholds are estimated from sample-specific data. They may not be stable across time, sectors, or broader datasets. Therefore, interpreting them as indicative rather than prescriptive is important. Future research could adopt a more comprehensive framework with richer indicators of firm sustainable growth and explicitly test the temporal stability and policy relevance of threshold estimates.

5.3 Practical Implications

The findings reveal nonlinear inverted U-shaped relationships between CPI and the economic aspect of firm sustainable growth, and between minimum wage policy and the social aspect. These results offer several implications for firms and policymakers in emerging markets:

First, CPI affects firm sustainable growth not only at the national level but also at the provincial level, highlighting the significant role of local governments in shaping the business environment. In countries such as Vietnam, coordination between central and provincial authorities is crucial for maintaining stability and supporting sustainable development.

Second, while moderate inflation may support firm sustainable growth, excessive inflation can undermine performance. This underscores the importance of careful coordination of monetary and fiscal policies, along with timely information sharing across regions, to sustain a stable business environment.

Third, reasonable adjustments in minimum wages can positively affect employee welfare, whereas overly rapid increases may impose burdens on firms. Policymakers may therefore consider gradual adjustments and broader consultation with businesses to balance social protection with economic sustainability.

Finally, for listed firms in emerging economies, inflation volatility remains a major challenge. Rather than exerting uniformly positive or negative effects, inflation influences firms differently at different levels. This highlights the need for firms to strengthen resilience through adaptive strategies, such as flexible pricing, efficient resource allocation, and scenario planning, particularly in environments where institutional capacity to stabilize inflation is limited.

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