

The Impact of Investment and Labor Force Participation on Poverty in Aceh: The Mediating Role of Per Capita Income

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ABSTRACT

Research Originality: Poverty remains a persistent challenge in Aceh Province despite multiple interventions. This study contributes to the literature by examining both the direct and indirect effects of investment and labor on poverty, as measured by per capita income, using path analysis.

Research Objectives: The study aims to examine the impact of Labor Force Participation Rate (LFPR), Domestic Investment (DI), and Foreign Direct Investment (FDI) on poverty, with per capita income (PCI) as a mediating factor.

Research Methods: Time-series data from 2009 to 2023 were analyzed using path analysis to identify direct and indirect relationships.

Empirical Results: Findings show that per capita income has the most substantial effect in reducing poverty. DI significantly influences poverty, both directly and indirectly, while LFPR and FDI exhibit no significant impact; however, both trends show a negative correlation with poverty.

Implications: Poverty alleviation strategies should prioritize income growth through domestic investment optimization and enhancing workforce quality.

Keywords:

labor force participation; domestic investment; foreign direct investment; per capita income; poverty reduction

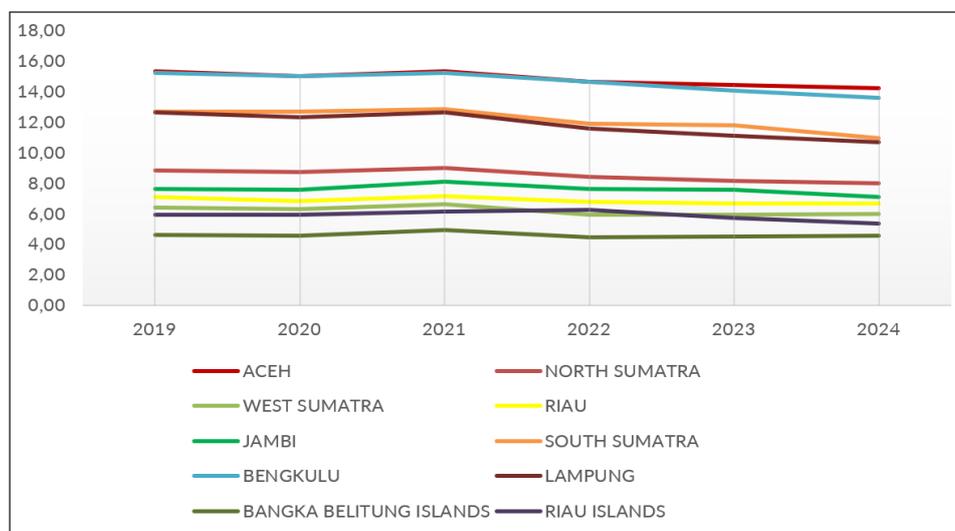
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INTRODUCTION

Poverty remains a persistent development challenge in Indonesia due to its wide-ranging impacts on access to education, health, and employment opportunities. At the aggregate level, poverty reduction has tended to slow down despite sustained economic growth, while income inequality has relatively increased (Purwono et al., 2021; Agussalim et al., 2024; Balasubramanian et al., 2023). This pattern is particularly evident in regions with fragile economic structures and unequal access to basic services, including Aceh, which, despite receiving substantial fiscal transfers, continues to record poverty levels above the national average.

Figure 1. Poverty Rate by Province in Sumatra, 2019–2024



Source: BPS Indonesia, 2025

Based on Figure 1, Aceh ranks as the province with the highest poverty rate in Sumatra, at approximately 14–15%. This figure is significantly higher than that of other provinces such as Bengkulu, Lampung, or South Sumatra, which remain at 12–13 percent, and more than double that of the Bangka Belitung Islands, which is only about 5 percent. This evidence highlights the structural nature of poverty in Aceh, which is more severe than in its neighboring provinces (BPS, 2025). It also suggests that growth-oriented strategies alone are insufficient; instead, a framework is required that explicitly links poverty transmission mechanisms through labor markets, investment flows, and income dynamics.

A growing body of research highlights structural barriers that undermine the poverty-reducing impact of growth. High income inequality limits the extent to which output expansion trickles down to lower-income groups (Hornok & Raeskyesa, 2024; Min & Rao, 2023). The dominance of the informal sector leaves many workers in vulnerable employment without social protection (Kataoka, 2019). Interregional disparities in access to basic services—particularly modern energy, health, education, and infrastructure

reinforce vulnerability (Rizal et al., 2024; Saputri et al., 2024). Evidence on energy poverty further suggests that such non-monetary deprivation undermines the productivity and quality of life of poor households (Rizal et al., 2024; Saputri et al., 2024). Meanwhile, demographic changes such as population aging and variations in local institutional capacity add complexity to poverty reduction efforts (Kudrna et al., 2022; Wulandari et al., 2023; Moyer et al., 2022).

From a labor market perspective, the most direct channels to poverty are the Labor Force Participation Rate (LFPR) and the quality of human capital. Increased participation, particularly among women and youth, can improve household welfare; however, the effect largely depends on the quality of the jobs absorbed (Kusumawardhani et al., 2023). Several studies indicate an educational mismatch: regions with a high share of secondary and tertiary graduates often experience educated unemployment, while regions with lower levels of education tend to be absorbed into low-productivity employment (Kataoka, 2019; Gehrke et al., 2025). On the other hand, social policies such as conditional cash transfers have been shown to improve health and education outcomes, including reductions in stunting and greater utilization of health services (Cahyadi et al., 2020; Ferraro & Simorangkir, 2020). Investments in human capital consistently contribute to reducing income inequality (Thye et al., 2022; Omar & Inaba, 2020). At the same time, financial inclusion and internet access have expanded labor force participation; however, without skill upgrading, this shift often leads to informal employment (Ekaputri et al., 2025; Kusumawardhani et al., 2023). Hence, both human capital quality and job quality are prerequisites for a genuinely higher LFPR to reduce poverty.

In terms of Domestic Investment (DI), evidence highlights the significant role of public spending (education, health, and basic infrastructure) and village transfers in reducing poverty and unemployment (Anam et al., 2023; Ernawati et al., 2021). The Village Fund program, for example, has been positively correlated with poverty reduction in many regions, although the magnitude of the effect varies depending on governance and targeting (Anam et al., 2023; Ernawati et al., 2021). However, long-term studies on domestic capital formation indicate efficiency limitations: without improvements in allocation and productivity, increases in DI do not automatically translate into pro-poor growth (Sijabat, 2022). This condition implies that DI must be directed toward high-value-added, labor-intensive sectors and expanded basic services in order for the growth-to-income channel to function optimally for poor households. Additional evidence suggests that government spending on education and health has a significant impact on reducing poverty (Agussalim et al., 2024).

The role of Foreign Direct Investment (FDI) in poverty reduction is conditional. On the one hand, FDI fosters productivity, value-chain integration, and job creation; several cross-country studies find a negative association between FDI and poverty rates (Ahmad et al., 2019; Daud et al., 2025). On the other hand, without sufficient human capital absorption capacity, FDI tends to favor skilled labor, raising wage premiums and sidelining less-skilled workers (Fazaalloh, 2024; Matsuura & Saito, 2023). Indeed,

restrictive FDI policies may increase the number of local firms and jobs, but not necessarily improve welfare if job quality remains low (Gehrke et al., 2025). Moreover, the effect of FDI on DI depends on institutional quality: it can crowd in under good governance or crowd out when institutions are weak (Magbondé et al., 2025; Sattar et al., 2022). Evidence from Indonesia suggests that infrastructure and human capital are key factors in attracting FDI, while the pandemic had only a temporary effect (Budiono & Purba, 2023; Sukhadolets et al., 2021).

Theoretically and empirically, per capita income is a crucial mediating channel through which LFPR, DI, and FDI affect poverty. Growth in average household income reduces poverty, but the size of the effect depends on distribution and inflationary pressures (Agussalim et al., 2024; Balasubramanian et al., 2023). Cross-provincial evidence from Indonesia shows a negative correlation between per capita growth and poverty levels (Purwono et al., 2021). Cross-country findings similarly indicate that the elasticity of poverty to growth is smaller in multidimensional poverty compared to monetary poverty (Balasubramanian et al., 2023; Jiménez, 2024). Positioning per capita income as a mediator, therefore, enables us to capture indirect effects; for instance, FDI/DI and LFPR may not only influence poverty directly but also through income growth.

Synthesizing these findings, a notable research gap exists in the scarcity of integrated studies that simultaneously assess LFPR, DI, and FDI, along with the mediating role of per capita income, within a regional context such as Aceh. Many studies have focused on single dimensions (e.g., Village Fund, energy, gender, or FDI) or examined Indonesia in aggregate (Ekaputri et al., 2025; Rammohan & Tohari, 2023; Rizal et al., 2024). However, for effective policymaking, decision-makers require a causal understanding: which factors have direct effects on poverty, and which operate through income. Recent literature further emphasizes the importance of making both FDI and DI more pro-poor by strengthening linkages with local sectors and enhancing human capital quality (Džogan et al., 2025; Yuldashev et al., 2023). Building on this gap, the present study employs path analysis to examine the direct and indirect effects of LFPR, DI, and FDI on poverty, with per capita income as the mediating variable. This approach is particularly relevant as it distinguishes between direct channels and income-mediated channels, aligns with empirical evidence that growth and investment operate differently across channels and income groups, and provides a stronger foundation for policy recommendations. Specifically, these include strengthening the quality and orientation of DI (education, health, basic infrastructure, and labor-intensive sectors), channeling FDI into sectors with strong domestic linkages while upgrading workforce skills, and expanding quality labor force participation (especially women and youth) so that the benefits of growth are more evenly distributed (Chizema, 2025; Fazaalloh, 2024; Xiao & Qamruzzaman, 2022).

METHODS

This study was conducted in Aceh Province, which is known as one of the regions with relatively high poverty levels in Indonesia (see Figure 2). The data employed are secondary time-series data covering the period from 2009 to 2024. The choice of this period aims to provide an up-to-date empirical picture of the relationship between labor force participation, investment, per capita income, and poverty in Aceh. Data sources are drawn from the official publications of Statistics Indonesia (BPS) and the Aceh Provincial Office of BPS. To strengthen the research context, we present a map of Indonesia that depicts the distribution of poverty rates across provinces, based on BPS data. Each province is shaded according to its poverty category: <5%, 5–10%, 10–15%, 15–20%, and >20%. Aceh is highlighted with a bold red outline, emphasizing its position as one of the provinces with the highest poverty levels in Sumatra.

Figure 2. Poverty Rate by Province in Indonesia - Aceh Highlighted



Source: author's calculation

The dependent variable is poverty, which is proxied by the percentage of the population living in poverty relative to the total population, as measured by the BPS. This indicator is consistent with previous studies by (Jiménez, 2024; Purwono et al., 2021; Shukla, 2023). The first independent variable is the Labor Force Participation Rate (LFPR), defined as the percentage of the working-age population who are employed or seeking employment, in line with Akhtar et al. (2020), Kataoka (2019), and Kis-Katos & Sparrow (2015). The second independent variable is Domestic Investment (DI), referring to realized domestic capital investment as reported by BPS, following a study by Degrit Nst & Sari (2024), Magbondé et al. (2025), and Wiganepdo & Sugiyanto (2022). The third independent variable is Foreign Direct Investment (FDI), measured from realized direct foreign investment according to BPS, as highlighted in Daud et al. (2025), Emako et al. (2023), and Matsuura & Saito (2023). In addition, this study incorporates Per Capita Income (PCI) as a mediating variable, measured using Gross Regional Domestic Product (GRDP) per capita. This variable reflects the average economic capacity of the population and has been applied in prior studies such as Jiménez (2024), Nizar et

al. (2023), and Shukla (2023). To stabilize variance, approximate normal distribution, and facilitate elasticity interpretation, PCI, DI, and FDI were transformed into natural logarithms (ln) prior to analysis.

Moreover, the selection of these variables is theoretically and empirically justified. Poverty is widely recognized as a multidimensional issue; however, its monetary measurement, as indicated by the proportion of poor households, remains the most widely used and comparable indicator across regions. LFPR is included to capture the role of labor supply and human resource utilization in poverty dynamics. At the same time, DI and FDI are used to represent domestic and external capital accumulation that can drive economic growth. PCI, meanwhile, serves not only as a mediating factor but also as a crucial outcome variable that reflects improvements in living standards. By incorporating these variables together in a path analysis framework, this study aims to provide a more comprehensive picture of both the direct and indirect channels through which labor, investment, and income interact to influence poverty reduction. The definitions, measurements, data sources, and references for each variable are summarized in Table 1.

Table 1. Operational Variables

Variables	Definitions	Measurements	Sources	References
Poverty	Percentage of the poor population relative to the total population	Poverty rate (%)	(BPS, 2024b)	(Jiménez, 2024; Purwono et al., 2021; Shukla, 2023)
Labor Force Participation Rate (LFPR)	Percentage of the labor force relative to the working-age population	LFPR (%)	(BPS, 2024e)	(Akhtar et al., 2020; Kataoka, 2019; Kis-Katos & Sparrow, 2015)
Domestic Investment (DI)	Realized domestic capital investment	Billion Rupiah (Rp)	(BPS, 2024c)	(Degrit Nst & Sari, 2024; Magbondé et al., 2025; Wiganepdo & Sugiyanto, 2022)
Foreign Direct Investment (FDI)	Realized foreign direct investment	Billion Rupiah (Rp)	(BPS, 2024d)/ (BI, 2025)	(Daud et al., 2025; Emako et al., 2023; Matsuura & Saito, 2023)
Per Capita Income (PCI)	Gross Regional Domestic Product per capita	Million Rupiah (Rp)	(BPS, 2024a)	(Jiménez, 2024; Nizar et al., 2023; Shukla, 2023)

The analytical method employed in this study is path analysis. This technique was first introduced by Wright (1934) as an extension of linear regression to explain causal relationships among variables. According to Streiner (2005), path analysis is appropriate when the study involves variables that can be directly observed and aims to decompose effects into direct, indirect, and total components. In this study, all variables analyzed—labor force participation, domestic investment, foreign direct investment, per capita income, and poverty—are directly measurable using BPS data. Path analysis is therefore

considered the most suitable method, as it can explain both the magnitude of effects and the mechanisms through which variables exert their influence, aligning with the research objectives. The path model structure consists of two sub-structures with model equations written as follows:

$$Z = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon_1 \quad (1)$$

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 Z + \varepsilon_2 \quad (2)$$

Description, Y = Poverty; α = Constant; $\beta_{1,2,3}$ = Regression Coefficient; X_1 = Labor Force Participation Rate (LFPR); X_2 = Domestic Investment (DI); X_3 = Foreign Direct Investment (FDI); Z = Per Capita Income (PCI).

The analytical procedure began with the collection of secondary data from BPS Indonesia and BPS Aceh. This was followed by diagnostic testing of basic assumptions, including normality, multicollinearity, autocorrelation, and linearity. The next step involved estimating sub-structure I and sub-structure II. Based on the estimation results, direct, indirect, and total effects were computed using path coefficients.

RESULT AND DISCUSSION

The path analysis conducted in this study generated several key findings. First, in Sub-structure I, it was found that Labor Force Participation Rate (LFPR), Domestic Investment (DI), and Foreign Direct Investment (FDI) were positively associated with Per Capita Income (PCI). However, none of these relationships was statistically significant. This result suggests that while these variables have the potential to increase income, their effects remain limited in the context of Aceh. Second, in Sub-structure II, PCI, DI, and FDI were found to significantly reduce poverty, whereas LFPR also exhibited a negative but statistically insignificant effect. Thus, PCI emerges as the primary channel for poverty reduction, while DI and FDI reinforce its role both directly and indirectly.

Table 2. Estimation Results of Sub-structure I

Variable Relationship	Coefficient	Significance
Constant	-2.796458	
LFPR → Per Capita Income	0.088566	0.0525
DI → Per Capita Income	0.030639	0.2755
FDI → Per Capita Income	0.048289	0.0806
R ²	0.721107	
Adj R ²	0.651384	
F-Statistic	10.34242	
Prob(F-Statistic)	0.001204	

Source: data processing results using Eviews, 2025

The estimation results of Sub-structure I show that the coefficients of LFPR, DI, and FDI on PCI are 0.088566, 0.030639, and 0.048289, respectively. All three coefficients are positive but statistically insignificant. Statistical significance was determined by comparing the p-values against a 5% significance level ($\alpha = 0.05$). Since all p-values exceeded 0.05, despite the positive signs, the effects are not statistically significant. This result indicates that although increases in LFPR, DI, and FDI tend to contribute to per capita income growth, the impacts are not strong enough to be empirically validated (Table 2).

From a theoretical standpoint, these results can be explained within the framework of endogenous growth theory, which emphasizes that capital accumulation and labor participation are essential but require complementary factors, such as technological progress and efficiency gains, to produce significant long-term effects (Aghion & Howitt, 2009). In line with labor market theory, higher labor force participation is expected to expand productive capacity and output (Borjas, 2023). Likewise, investment theory suggests that both domestic and foreign investment should enhance aggregate demand and capital stock, thereby increasing income. However, the statistical insignificance observed here implies that the theoretical expectations are not fully reflected in the estimated coefficients, highlighting that the contributions of LFPR, DI, and FDI to PCI are present in direction but insufficient in magnitude to reach conventional thresholds of significance. These findings are consistent with the notion that theoretical models often capture idealized mechanisms, whereas empirical outcomes may reveal weaker relationships when tested within specific contexts.

Table 3. Estimation Results of Sub-structure II

Variable Relationship	Coefficient	Significance
Constant	53.74037	
LFPR → Poverty	-0.297820	0.1795
DI → Poverty	-0.437937	0.0040
FDI → Poverty	-0.316370	0.0268
PCI → Poverty	-3.763530	0.0112
R ²	0.953912	
Adj R ²	0.937153	
F-Statistic	56.91843	
Prob(F-Statistic)	0.000000	

Source: data processing results using Eviews, 2025

The estimation results of Sub-structure II indicate that the independent variables tend to affect poverty, though their significance levels vary negatively. LFPR has a direct coefficient of -0.297820, indicating that higher labor force participation may reduce

poverty; however, the effect is not statistically significant, as its p-value exceeds 0.05. Conversely, DI exerts a significant impact, with a direct coefficient of -0.437937, demonstrating that higher domestic investment meaningfully reduces poverty. FDI also has a significant coefficient of -0.316370, showing that foreign investment contributes to poverty reduction. Meanwhile, PCI recorded a coefficient of -3.763530, which is both significant and substantially larger than the other variables (see Table 3).

Table 4. Direct, Indirect, and Total Effects of Variables

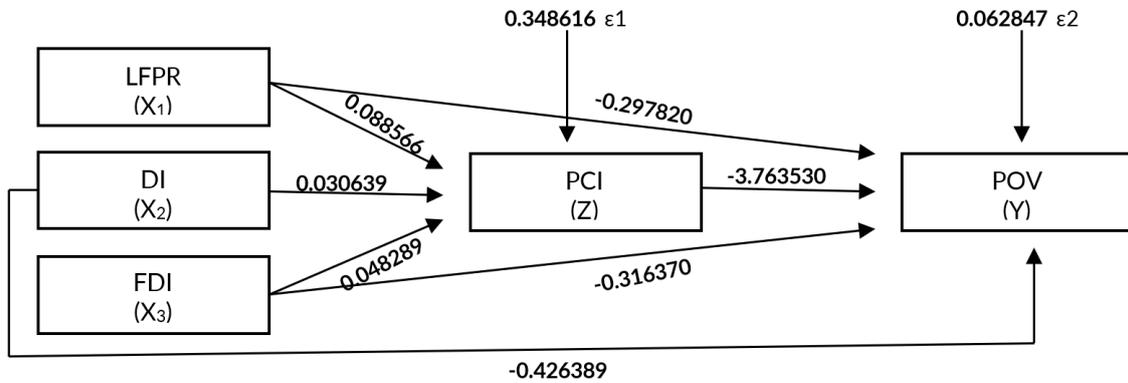
Variable Relationship	Direct	Indirect	Total
LFPR → PCI	0.088566	-	0.088566
DI → PCI	0.030639	-	0.030639
FDI → PCI	0.048289	-	0.048289
LFPR → Poverty	-0.297820	-0.333321	-0.631141
DI → Poverty	-0.437937	-0.115311	-0.553248
FDI → Poverty	-0.316370	-0.181737	-0.498107
PCI → Poverty	-3.763530	-	-3.763530

As shown in Table 4, PCI has the most significant total effect, at -3.763530, followed by DI and FDI, while LFPR has a negative but statistically insignificant effect. These results highlight that per capita income functions as the primary pathway through which changes in LFPR, DI, and FDI are transmitted into poverty reduction. In practical terms, it is not merely the existence of investment or workforce expansion that matters, but how effectively these factors translate into higher household incomes. The strong and significant role of PCI underscores the importance of inclusive growth: without ensuring that income gains reach poor households, the potential of LFPR, DI, and FDI to alleviate poverty will remain limited. Although DI and FDI display smaller coefficients than PCI, both variables show consistent and significant effects in reducing poverty, both directly and indirectly. This indicates that investment, whether domestic or foreign, contributes not only through job creation and capital formation but also by supporting income growth that amplifies its impact on welfare. Conversely, the weak role of LFPR reflects structural labor market issues in Aceh, such as skill mismatches and limited access to decent work. These findings reinforce theoretical expectations that income serves as a central mediator in the growth–poverty nexus, while also providing empirical evidence that targeted investment and productivity-oriented labor policies are crucial to achieving sustainable poverty reduction.

Figure 3 also displays the error terms (ϵ) for the dependent variables: ϵ_1 for PCI and ϵ_2 for poverty. These values represent the proportion of variation unexplained by the model, calculated as 1 minus the R-squared value. Accordingly, $\epsilon_1 = 0.348616$ indicates that approximately 34.86% of the variation in PCI is unexplained by LFPR, DI, and

FDI, while $\epsilon_2 = 0.062847$ suggests that factors outside the model influence 6.28% of the variation in poverty.

Figure 3. Path Analysis Result Diagram



Overall, this study demonstrates that PCI is the primary channel for poverty reduction. Increases in PCI significantly reduce poverty, reinforcing the notion that economic growth is a critical driver of welfare improvement. However, in the context of Aceh, average income growth has not been fully inclusive, as reflected in poverty rates that remain higher than the national average. This highlights the need for growth policies in regions with relatively high inequality to ensure a more equitable distribution of benefits. (Agussalim et al., 2024; Jiménez, 2024; Purwono et al., 2021).

Additionally, investment plays a crucial role in alleviating poverty. DI contributes by creating jobs and providing basic infrastructure that supports the productivity of the poor, consistent with findings on the effectiveness of pro-poor public spending (Anam et al., 2023; Ernawati et al., 2021). Similarly, FDI significantly reduces poverty, aligning with empirical evidence from other developing countries (Chizema, 2025; Daud et al., 2025). Nevertheless, the direction of FDI matters: foreign investment concentrated in capital-intensive sectors may exacerbate inequality, whereas investment directed toward labor-intensive sectors is more effective in alleviating poverty (Handayani et al., 2022; Matsuura & Saito, 2023).

Unlike other variables, LFPR shows a negative but relatively weak relationship with poverty. This suggests that increasing labor force participation alone is insufficient without improvements in workforce quality and the availability of decent employment opportunities. The phenomena of skills mismatch and low female participation in Aceh further reinforce the argument that labor force participation will only have a substantial impact if accompanied by productivity improvements and expanded access to formal employment (Kataoka, 2019; Kusumawardhani et al., 2023; Rammohan & Tohari, 2023).

CONCLUSION

This study demonstrates that PCI serves as the primary pathway for poverty reduction in Aceh Province. Increases in PCI significantly reduce poverty, reinforcing the role of inclusive economic growth in improving household welfare. DI exerts both direct and indirect significant effects on poverty reduction through income growth. Meanwhile, LFPR and FDI both show negative but statistically insignificant impacts, indicating that labor force expansion and foreign capital inflows alone are insufficient without improvements in workforce quality, domestic linkages, and access to decent employment.

From a policy perspective, the findings highlight the importance of channeling DI into education, health, basic infrastructure, and halal tourism as a labor-intensive sector with strong local linkages. In addition, enhancing workforce skills—particularly among women and young people—is crucial to maximizing the poverty-reducing potential of growth and investment. These measures will help ensure that economic progress translates into more equitable and sustainable poverty alleviation in Aceh.

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