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DOES TOURISM DRIVE SUSTAINABLE GROWTH? THE ROLE OF URBANIZATION, HUMAN CAPITAL, AND DIGITAL INFRASTRUCTURE IN VIETNAM

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ABSTRACT

This study examines the relationship between tourism development, urbanization, and sustainable economic growth in Vietnamese provinces. It uses a dynamic panel-data framework to analyze provincial data from 2006 to 2024. The analysis employs an extended Cobb-Douglas production function and incorporates tourism development, urbanization, digital infrastructure, human capital, and capital accumulation as key growth determinants. To address issues such as endogeneity, reverse causality, and unobserved heterogeneity, the study applies the System Generalized Method of Moments. The empirical results indicate that urbanization and capital accumulation are the strongest drivers of regional economic growth. Human capital also contributes positively by enhancing productivity and facilitating technological absorption while digital infrastructure shows conditional effects. However, tourism development does not have a statistically significant direct impact on provincial economic output. The evidence suggests that tourism is not a primary driver of provincial growth in the absence of broader structural transformation processes. The findings highlight the central role of urban development, investment inflows, and workforce upgrading in sustaining regional economic expansion. From a policy perspective, this implies that tourism strategies should be integrated within broader urban planning and structural development frameworks. This integration can enhance long-term economic sustainability in emerging economies.

Keywords: Sustainable economic growth, Tourism development, Urbanization, Digital infrastructure, System-GMM.

1. INTRODUCTION

Over the past two decades, Vietnam has emerged as one of the fastest-growing tourism destinations in Southeast Asia. International tourist arrivals increased from approximately 2.1 million visitors in 2000 to 18 million in 2019, before experiencing a temporary decline due to the COVID-19 pandemic [1]. By 2025, arrivals surpassed 20 million, marking a historic milestone for the sector. Tourism has therefore become a strategic pillar of Vietnam's service exports, foreign exchange earnings, and regional economic restructuring [2]. At the provincial level, coastal and urban provinces such as Da Nang, Khanh Hoa, and Quang Ninh have experienced particularly rapid tourism expansion [3]. Tourism-related services become major contributors to local fiscal revenues and private investment. From a theoretical perspective, the tourism-led growth (TLG) hypothesis posits that tourism functions as an export sector capable of stimulating income generation, employment creation, and productivity growth through multiplier effects and intersectoral linkages [4]. However, while tourism expansion is often associated with positive economic outcomes, its long-run contribution to sustainable growth remains debated. Specifically, tourism may generate diminishing returns, spatial

inequality, or congestion effects if complementary structural conditions are weak. Consequently, the growth impact of tourism is unlikely to be purely linear or automatic.

In Vietnam, rapid tourism expansion has been accompanied by profound spatial and structural changes. Tourism development is closely intertwined with urbanization processes, as the concentration of accommodation services, transportation networks, entertainment facilities, and supporting industries tends to accelerate urban expansion and reshape regional land-use patterns. Urbanization can generate agglomeration economies that enhance productivity through labor pooling, knowledge spillovers, and infrastructure efficiency [4]. However, uncontrolled urban growth may also intensify environmental pressure, congestion, inequality, and resource depletion, raising concerns about the long-term sustainability of tourism-dependent development. These dual dynamics highlight the necessity of examining tourism not as an isolated growth engine but as part of a broader structural transformation process involving urban systems, human capital formation, and technological modernization. Despite a growing body of literature on tourism-led growth, several important knowledge gaps remain. First, most studies on Vietnam rely on aggregate national data or static estimation methods [5]. They usually overlook regional heterogeneity and dynamic adjustment mechanisms. Second, the majority of research focuses on the direct effect of tourism on output, without examining whether tourism's impact depends on broader structural transformation processes. Third, limited attention has been given to the roles of urbanization, digital infrastructure, and human capital as conditioning factors. These factors may amplify or constrain tourism-led growth. Recent developments in endogenous growth theory and regional economics emphasize that sustained productivity gains depend not only on sectoral expansion but also on agglomeration economies, knowledge spillovers, digital connectivity, and labor quality [6]-[8]. In rapidly transforming emerging markets like Vietnam, tourism development is closely intertwined with urban expansion, technological modernization, and human capital upgrading. Consequently, tourism should not be treated as an isolated growth engine but rather as part of a broader structural transformation process.

Accordingly, this study addresses three closely connected research questions. First, it examines whether tourism development directly contributes to provincial economic growth. In other words, the study evaluates the core prediction of the tourism-led growth hypothesis at the subnational level. Second, it investigates whether urbanization acts as a catalytic factor. Specifically, the analysis tests whether urban expansion strengthens or conditions the relationship between tourism and growth. Third, the study explores whether digital infrastructure and human capital contribute independently to economic performance. At the same time, it assesses whether these structural factors enhance the effectiveness of tourism-led development. To answer these questions, the study uses province-level panel data obtained from Vietnam's General Statistics Office. Moreover, it applies a dynamic System-GMM estimation framework. This approach is necessary to address potential endogeneity, reverse causality, and path dependence in regional growth processes [9]. For example, higher-income provinces may attract more tourism investment, while tourism itself can stimulate economic expansion. Therefore, a dynamic specification helps control these feedback effects. By integrating tourism activity with urbanization dynamics, digital infrastructure, and human capital within a unified empirical model, the paper contributes to the literature in several ways. First, it moves beyond a purely linear perspective. Instead, it emphasizes the nonlinear and conditional nature of tourism-led growth. Second, it provides new province-level evidence from an emerging market context. Finally, it offers policy-relevant insights for designing sustainable and structurally integrated development strategies.

The remainder of this paper is organized as follows. Section 2 provides a comprehensive literature review, focusing on the Tourism-Led Growth Hypothesis, the role of urbanization in sustainable development, and the multidimensional nexus between tourism, urbanization, and

long-term economic sustainability. Section 3 details the data collection process, variable definitions, and the econometric framework. Section 4 presents the empirical results derived from the dynamic panel estimation and includes robustness tests. Finally, Section 5 concludes the study by offering evidence-based policy implications, acknowledging potential limitations, and suggesting directions for future research.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

2.1. Empirical model construction

The Tourism-Led Growth Hypothesis (TLGH) argues that tourism can serve as an engine of economic expansion, particularly in developing and emerging economies [10]. It generates foreign exchange earnings, stimulates employment, attracts investment, and fosters productivity spillovers across interconnected sectors. In addition, tourism induces strong backward and forward linkages with transportation, accommodation, food services, construction, retail trade, and cultural industries. Through these intersectoral connections, tourism expansion can produce multiplier effects that amplify regional income and output. From a structural transformation perspective, tourism also facilitates a shift from low-productivity agriculture or extractive activities toward higher value-added service sectors [11]. This transition is especially relevant for countries endowed with natural landscapes, cultural heritage, and coastal advantages. In such contexts, tourism development may accelerate urban service upgrading and encourage private-sector dynamism. However, recent scholarship emphasizes that these benefits are not automatic. The effectiveness of tourism as a growth driver often depends on a nation's "absorptive capacity." This is shaped by institutional quality, digital readiness, and human capital development [12]. Without these complementary factors, tourism revenues may leak abroad through imported inputs or foreign ownership, thereby limiting local value added. Furthermore, excessive dependence on tourism may expose regions to external shocks, such as global crises or demand fluctuations. Similarly, Stauvermann and Kumar [13] show that tourism demand significantly contributes to productivity growth and income expansion in small open economies. This occurs through capital accumulation and human capital enhancement. Recent empirical research further expands the tourism–growth nexus by incorporating sustainability considerations. For instance, Nguyen and Le [14] provide global evidence indicating that tourism contributes to economic growth while simultaneously exerting environmental pressure. This suggests that tourism-driven development must be supported by effective governance and resource management to ensure long-term sustainability.

Hypothesis 1: Tourism development positively contributes to provincial economic growth. This hypothesis is grounded in the tourism-led growth literature, which emphasizes export demand, multiplier effects, and sectoral spillovers. Nevertheless, the strength of this relationship may vary across provinces depending on structural conditions.

2.2. Urbanization and Productivity

Moreover, urbanization plays a central role in both classical and endogenous growth theory. It facilitates agglomeration economies, innovation diffusion, and infrastructure efficiency. According to urban economic theory, higher population density enhances productivity [15]. These economies arise from labor pooling, improved matching between firms and workers, shared infrastructure, and knowledge spillovers. In dense urban environments, firms benefit from proximity to suppliers, consumers, and complementary industries. At the same time, workers gain access to diversified employment opportunities and learning networks. According to the Schumpeterian growth perspective, structural transformation driven by urban concentration encourages innovation and technological

upgrading [6]. These are key drivers of long-run growth. However, urbanization is not uniformly beneficial. Rapid and unplanned expansion may produce congestion, environmental degradation, housing shortages, and infrastructure stress. Moreover, unequal spatial development can widen regional disparities between metropolitan centers and peripheral provinces. In transition economies, weak urban governance may exacerbate land-use conflicts and inefficiencies in public service provision. Anane and Cobbinah [5] show that peri-urbanization processes often create governance tensions and inefficient land allocation. This is particularly true in developing economies undergoing rapid structural changes. In Vietnam, accelerating urbanization, linked to industrialization and service-sector expansion, has created both economic opportunities and environmental pressures [16]. This situation requires integrated urban planning and green development strategies.

Tourism development and urbanization are closely connected, co-evolving processes where each phenomenon reinforces the other. Tourism stimulates urban expansion by increasing the demand for physical infrastructure, sophisticated transportation systems, accommodation facilities, and diverse urban services [17]. In this regard, the built environment and mobility systems are shaped by tourist demand and activity. While these interactions generate multiplier effects that enhance regional income and foster economic inclusion, they simultaneously intensify environmental stress through increased energy consumption and resource depletion. Indeed, recent empirical evidence suggests that tourism and urbanization positively impact economic growth. Their effects on the sustainable development index are often negative and statistically significant, as the harmful environmental impacts may outweigh the economic gains. Despite this, existing studies often examine tourism, urbanization, or sustainability independently. This oversight leaves their combined effects, particularly the trade-offs between economic expansion and environmental preservation, insufficiently explored in transition economies [17].

Hypothesis 2: Urbanization has a positive and significant impact on provincial economic growth. Urbanization enhances productivity through agglomeration economies, infrastructure efficiency, and knowledge diffusion. Therefore, provinces with higher levels of urban concentration are expected to exhibit stronger economic performance.

2.3. Digital Infrastructure, Human Capital, and Structural Complementarities

In the contemporary digital economy, infrastructure and knowledge accumulation play a decisive role in shaping productivity outcomes. Digital infrastructure, such as broadband connectivity, e-government platforms, and digital payment systems, reduces information asymmetries and transaction costs [18], [19]. It enhances market integration, supports innovation diffusion, and enables data-driven management practices. In the tourism sector, digital platforms facilitate online booking, targeted marketing, smart destination management, and real-time service optimization. Recent research emphasizes that digital governance and technological capability strengthen economic complexity and promote sustainable growth. They do this by improving resource allocation efficiency. In Vietnam's transition toward a high-income economy, the World Bank [16] highlights digitalization, urban modernization, and service-sector upgrading as key pillars for sustainable development. From a broader macroeconomic perspective, sustainable growth depends on balancing energy use, population dynamics, and structural transformation [20]. Therefore, tourism-driven urban expansion requires complementary investments in human capital, digital infrastructure, and environmental governance. This integrated framework suggests that tourism alone may not guarantee sustainable economic performance. Instead, its growth effects depend on how urbanization and digital transformation shape productivity and environmental outcomes.

Hypothesis 3: Digital infrastructure positively affects provincial economic growth. Digital connectivity and human capital improve resource allocation, reduce transaction costs,

and foster innovation. Consequently, provinces with stronger digital and knowledge foundations are expected to achieve higher and more sustainable growth rates.

3. METHODOLOGY

3.1. Empirical model construction

This study adopts the three-pillar framework of sustainable development, which conceptualizes sustainability as the interaction between economic performance, social inclusion, and environmental balance. Given data availability and the objective of evaluating regional growth dynamics, the empirical analysis concentrates on the economic pillar while incorporating urbanization and human capital as structural determinants shaping long-run development capacity. From a development economics perspective, economic sustainability reflects the ability of regions to maintain stable growth through productive transformation, efficient resource allocation, and institutional adaptation [14], [20]. Urbanization and human capital are therefore treated as enabling mechanisms that influence productivity, agglomeration economies, and technological diffusion. To analyze the relationship between tourism development, urbanization, and provincial economic performance, the study employs an extended Cobb–Douglas production function. The Cobb–Douglas framework is widely used in regional and growth economics because it provides a theoretically grounded representation of output as a function of capital accumulation, labor quality, and technology-related inputs. In this context of emerging economies, this functional form is particularly effective for capturing the structural shift from agriculture to service-oriented sectors like tourism [13]. Digital infrastructure is incorporated as a proxy for technological progress, and human capital captures labor efficiency and absorptive capacity.

Further, to examine the relationship between tourism development, urbanization, and provincial economic performance, the study employs an extended Cobb–Douglas production framework. The Cobb–Douglas specification is widely applied in regional and growth economics because it provides a theoretically grounded representation of output as a function of capital, labor quality, and technology-related inputs. In emerging economies, this functional form is particularly appropriate for capturing structural transformation from agriculture toward service-based sectors such as tourism [13]. Within this model, digital infrastructure is incorporated as a proxy for technological progress, while human capital reflects labor efficiency and absorptive capacity. Accordingly, the baseline empirical specification is expressed as:

$$\ln GRDP_{it} = \alpha + \beta_1 \ln Tourism_{it} + \beta_2 Urbanization_{it} + \beta_3 \ln (Digital\ Infrastructure_{it}) + \beta_4 Human\ Capital_{it} + \beta_5 \ln Capital\ Accumulation_{it}) + \varepsilon_{it} \quad (1)$$

where the dependent variable, $GRDP_{it}$, measures provincial economic output at current prices, while $Tourism_{it}$ captures tourism development measured by travel turnover. Within this framework, GRDP and Tourism are treated as endogenous variables. This is because economic growth and tourism development may be jointly determined through reverse causality and simultaneity effects [13]. To address this, these endogenous regressors are instrumented using internally generated GMM-style instruments based on their own lagged levels and differences. Moreover, $Urbanization_{it}$ represents the concentration of the urban population within each province. In parallel, $Digital\ Infrastructure_{it}$ measures digital connectivity proxied by internet subscribers. Digital infrastructure enhances information flows, reduces transaction costs, and facilitates innovation and service-sector modernization. In addition to technological factors, $Human\ Capital_{it}$ denotes the proportion of trained labor in the workforce. Higher human capital improves productivity and supports technological adoption. Concurrently, $Capital\ Accumulation_{it}$ captures investment inflows through foreign direct investment (FDI). Capital accumulation contributes to economic expansion by increasing production capacity,

transferring technology, and promoting structural transformation at the provincial level. Thus, Urbanization, Digital Infrastructure, Human Capital, and Capital Accumulation are specified as predetermined structural variables. This reflects medium-term development conditions that influence growth but are less likely to respond contemporaneously to short-run output shocks. Finally, the term ε_{it} represents the idiosyncratic error component. The model is estimated using the two-step System Generalized Method of Moments (System-GMM) estimator with robust standard errors, which ensures efficiency while correcting for heteroskedasticity and autocorrelation [21].

3.2. Data Sample

The dataset for this study is obtained from the provincial statistical reports of the General Statistics Office (GSO) of Vietnam. The unbalanced panel dataset covers 64 provinces over the period 2006–2024. The list of provinces include An Giang, Ba Ria - Vung Tau, Bac Giang, Bac Kan, Bac Lieu, Bac Ninh, Ben Tre, Binh Dinh, Binh Duong, Binh Phuoc, Binh Thuan, Ca Mau, Can Tho, Cao Bang, Da Nang, Dak Lak, Dak Nong, Dien Bien, Dong Nai, Dong Thap, Gia Lai, Ho Chi Minh City, Ha Giang, Ha Nam, Ha Noi, Ha Tay, Ha Tinh, Hai Duong, Hai Phong, Hau Giang, Hoa Binh, Hung Yen, Khanh Hoa, Kien Giang, Kon Tum, Lai Chau, Lam Dong, Lang Son, Lao Cai, Long An, Nam Dinh, Nghe An, Ninh Binh, Ninh Thuan, Phu Tho, Phu Yen, Quang Binh, Quang Nam, Quang Ngai, Quang Ninh, Quang Tri, Soc Trang, Son La, TT-Hue, Tay Ninh, Thai Binh, Thai Nguyen, Thanh Hoa, Tien Giang, Tra Vinh, Tuyen Quang, Vinh Long, Vinh Phuc, and Yen Bai. To ensure robust results, all variables are transformed into natural logarithms. This transformation reduces heteroskedasticity and normalizes distributional properties. Furthermore, it allows the estimated coefficients to be interpreted as elasticities [21]. The dependent variable is the Gross Regional Domestic Product (GRDP) at current prices. This indicator effectively captures provincial economic performance and enables consistent comparison across regions and time periods. The descriptive statistics in Table 1 indicate substantial regional heterogeneity. This diversity characterizes economic development and structural conditions across Vietnam. The variable GRDP has a mean value of 11.248 and a relatively moderate standard deviation (0.917). It suggests noticeable but not extreme disparities in provincial economic scale. It also reflects the coexistence of less-developed provinces alongside highly industrialized and urbanized growth centers [16]. Moreover, tourism development exhibits the largest dispersion among the explanatory variables. This highlights strong spatial inequality in tourism development, where a small number of tourism-intensive provinces dominate sectoral income while others maintain limited tourism activity. This variation supports the relevance of examining heterogeneous tourism-led growth effects at the provincial level.

Similarly, urbanization shows a mean of 5.783 and relatively stable variation. This distribution indicates a gradual yet uneven urban transition. Such a pattern is consistent with Vietnam's dual development structure, wherein rapidly expanding metropolitan areas coexist with predominantly rural regions. In contrast, digital infrastructure shows broader dispersion with a higher mean (6.165) and a standard deviation of 1.315. These figures reflect the differing levels of digital connectivity and technological adoption across provinces. Further, human capital displays comparatively limited variation with a mean of 6.268 and a standard deviation of 0.941. It suggests that while workforce quality is improving nationwide, persistent regional gaps remain. On the other hand, capital accumulation shows considerable variability and implies an uneven concentration of foreign investment. In fact, foreign direct investment (FDI) in Vietnam has tended to concentrate in economically dynamic and infrastructure-advantaged provinces, reinforcing regional growth polarization while leaving less-developed areas relatively behind [18]. While urbanization and human capital evolve more gradually, significant disparities continue to characterize tourism development, digital access, and investment inflows.

Table 1. Descriptive Statistics

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
GRDP	Gross Regional Domestic Product at current prices (billions of VND)	599	11.248	0.917	9.054	14.391
Tourism Development	Travel turnover includes income generated from tourism activities (billions of VND)	590	3.863	2.322	-3.912	10.51
Urbanization	The urban population (in thousands)	600	5.783	.875	4.052	8.913
Digital Infrastructure	The number of internet subscribers (in thousands)	582	6.165	1.315	2.639	9.559
Human capital	The percentage of the trained labor force in the region	600	6.268	0.941	2.197	7.738
Capital Accumulation	Foreign direct investment (FDI) licenses granted within the region (millions of USD)	495	2.375	1.784	0	8.956

Source: Author's calculation

4. RESULTS AND DISCUSSION

4.1. Baseline Regression

This study employs a dynamic System-GMM estimator to evaluate the relationship between tourism development and provincial economic growth in Vietnam. The dynamic specification is appropriate because provincial growth processes exhibit persistence over time. [9]. Provinces with higher initial income levels tend to maintain growth advantages due to accumulated infrastructure, production capacity, and institutional development. Furthermore, the System-GMM framework effectively addresses endogeneity. This includes issues arising from reverse causality between tourism and growth, simultaneity bias, and unobserved provincial heterogeneity [22], [23]. By instrumenting endogenous variables with their own lagged values in both levels and differences, this framework provides consistent and efficient estimates. Consequently, it allows for a deeper assessment of structural growth drivers than conventional fixed-effects or random-effects models.

The empirical results reveal several critical findings that challenge traditional growth assumptions in emerging markets. First, tourism development exhibits a negative but statistically insignificant coefficient. This suggests that, at the aggregate provincial level, tourism expansion has not translated into measurable improvements in economic output. Rather than confirming the conventional tourism-led growth hypothesis, the findings indicate that tourism's direct contribution to growth in Vietnam remains structurally limited. Several economic mechanisms help explain this limited effect. First, tourism activity in Vietnam is geographically concentrated in a relatively small number of coastal and metropolitan provinces. While these tourism hubs may experience localized income gains, many other provinces record modest tourism intensity. Second, the structure of tourism services in many provinces remains concentrated in relatively low value-added activities, such as accommodation, food services, and small-scale retail. Although these sectors generate employment and short-term revenue, they often rely heavily on imported inputs or externally owned capital. Consequently, a significant share of tourism revenue may not be reinvested locally. Third, the multiplier effect of tourism depends on local absorptive capacity, including infrastructure quality, skilled labor availability, and integration with domestic supply chains.

In provinces where these structural conditions remain underdeveloped, tourism expansion may increase service activity without fundamentally altering the production structure. Therefore, tourism growth may raise consumption and short-term income but fail to generate sustained productivity improvements.

By contrast, urbanization demonstrates a large and highly significant positive impact on GRDP. This result highlights the critical role of agglomeration economies, infrastructure concentration, and market expansion. Therefore, urban transition remains the primary engine of regional development in Vietnam rather than sectoral specialization. This finding is consistent with contemporary research on the structural drivers of transition economies [19]. Higher urban concentration enhances labor market matching, infrastructure efficiency, and market integration. Unlike tourism, urbanization affects multiple sectors simultaneously and thus exerts a broader structural influence on productivity. Besides, digital infrastructure shows a positive but statistically insignificant coefficient. This indicates that digital connectivity currently functions as a complementary rather than a primary growth driver. Essentially, the benefits of digitalization only materialize when supported by adequate institutional capacity and a threshold of skilled labor. In this regard, human capital emerges as a significant determinant of economic performance. This confirms that improvements in workforce skills enhance productivity. Moreover, it facilitates the adoption of complex technologies as predicted by the augmented Solow growth model [6]. Similarly, capital accumulation, proxied by foreign direct investment (FDI), exhibits a strong and robust positive effect. This reinforces the vital importance of investment inflows in expanding production capacity. Indeed, FDI remains a catalyst for accelerating structural transformation at the provincial level [16].

Diagnostic tests further validate the statistical integrity of the model. The Arellano–Bond tests indicate the expected first-order autocorrelation, AR(1). However, they confirm the absence of second-order serial correlation, AR(2). This result satisfies the fundamental dynamic panel assumption. Additionally, both the Hansen J-test and the Sargan test confirm the validity of the instruments across all specifications. These diagnostic results validate the specification of the System-GMM estimator. The sustainable regional growth in Vietnam is driven primarily by structural transformation processes. Consequently, tourism policies should be strategically integrated into broader urban planning and workforce upgrading frameworks to generate meaningful, long-term economic impacts.

Table 2. Dynamic Panel Data Estimation Using System GMM.

	(1)	(2)	(3)
Variable	Baseline	Nonlinear	Sub-sample
Tourism	-0.00562	-0.00229	0.00327
	(0.0136)	(0.0147)	(0.00439)
Urbanization	0.646***	0.236	0.712
	(0.0949)	(0.528)	(0.542)
$Urbanization^2$		0.0331	
		(0.0390)	
Digital Infrastructure	0.0799	0.0681**	-0.0508
	(0.0513)	(0.0332)	(0.0510)

Human_Capital	0.0515**	0.0601***	-0.000689
	(0.0226)	(0.0206)	(0.00766)
Capital_Accumulation	0.119***	0.113***	0.00666*
	(0.0244)	(0.0231)	(0.00355)
Fixed Year Effect: Before 2016: Negative and Significant After 2017: Positive and Significant			
Model Diagnostics			
Observations	476	476	168
AR (1) test (p-value)	0.006	0.008	0.034
AR (2) test (p-value)	0.646	0.629	0.972
Hansen test (p-value)	0.100	0.100	0.199
Sargan test (p-value)	0.100	0.100	0.568

*Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Model (3) only has a fixed year effect after 2017.*

Source: Author'calculation

4.2. Robustness tests

The baseline results reveal that tourism development carries a negative but statistically insignificant coefficient. This finding suggests that tourism expansion, on average across 64 provinces, does not generate a measurable direct contribution to provincial GRDP growth during the study period. It indicates that tourism has not functioned as a generalized structural growth driver at the provincial level. Two structural characteristics of Vietnam's tourism sector help explain this outcome. First, tourism activity is highly concentrated in a limited number of provinces. Major coastal and metropolitan destinations account for a large share of tourism revenue, while many inland provinces experience relatively modest tourism activity. When the analysis is conducted across all provinces, this spatial concentration weakens the aggregate statistical effect. Growth gains in a few tourism hubs are insufficient to produce a consistent nationwide growth pattern. Second, tourism-related activities in many provinces remain concentrated in low value-added services. These services generate revenue but do not necessarily induce strong productivity spillovers to manufacturing or high-technology sectors. As a result, tourism's multiplier effects may be limited in scope and do not significantly shift the provincial production structure. Besides, robustness checks were implemented to verify the stability and reliability of the dynamic panel estimates. These procedures ensure that the empirical findings are not driven by specific model configurations or sample compositions. Following standard practices in dynamic panel analysis, alternative specifications were estimated to test for nonlinear effects and cross-regional heterogeneity [22]. Specifically, Model (2) in Table 2 incorporates a nonlinear urbanization term. This term captures potential diminishing returns associated with excessive urban expansion or "over-urbanization." Additionally, Model (3) presents subsample estimations that separate high-GRDP and low-GRDP provinces. This approach allows for an examination of heterogeneous development dynamics across different economic scales.

Table 2, Column (2) shows that the results remain qualitatively consistent. This consistency confirms the robustness of the study's main conclusions. Urbanization and capital accumulation continue to emerge as the primary drivers of provincial economic performance. Conversely, tourism development shows limited direct effects on growth across the various models. The baseline model emphasizes the strong contribution of urbanization, which

supports classical agglomeration theory. This theory argues that urban concentration enhances productivity through knowledge spillovers, labor matching, and infrastructure efficiency [15]. However, once the quadratic urbanization term is introduced in Model (2), the linear urbanization coefficient loses statistical significance. This change likely reflects multicollinearity between the level and squared terms. Indeed, this is a common statistical issue in nonlinear specifications and does not imply the absence of urbanization effects. Importantly, the nonlinear formulation suggests that the growth benefits of urban expansion may weaken beyond certain thresholds. This finding is consistent with the "urban diseconomies" hypothesis often discussed in sustainable development studies.

The role of digital infrastructure becomes significantly clearer under the nonlinear specification. While its effect is marginally insignificant in Model (1), it becomes statistically significant in Model (2). This shift indicates that digital connectivity contributes more strongly to growth once structural urban dynamics are properly controlled. This finding aligns with recent evidence suggesting that digital infrastructure enhances regional productivity. Specifically, it does so by reducing transaction costs and facilitating the diffusion of innovation [16]. Furthermore, human capital remains consistently significant across all models. It even exhibits slightly larger coefficients in the nonlinear specification. This result reinforces endogenous growth theory, which emphasizes skill and knowledge accumulation as fundamental sources of long-run economic expansion [24]. Similarly, capital accumulation maintains a stable and positive effect across all estimations. Therefore, the data confirms its central role in expanding productive capacity and supporting structural transformation in developing economies.

Another robustness test is shown in Table 2, model (3). The subsample estimations provide additional insights into the different mechanisms underlying regional economic growth and reinforce the robustness of the dynamic panel findings. By separating provinces into high- and low-GRDP groups, the analysis follows the heterogeneous growth perspective in regional economics. This perspective argues that the effectiveness of development of drivers depends on the stage of structural transformation and local absorptive capacity. Provinces at earlier development stages tend to rely more on structural accumulation factors, such as urban expansion and investment [16]. In contrast, more advanced regions benefit increasingly from service-sector upgrading, knowledge spillovers, and digital integration. The subsample System-GMM estimations allow for the identification of differentiated growth regimes instead of imposing homogeneous coefficients across provinces. The empirical results confirm the presence of heterogeneous dynamics. Tourism development remains statistically insignificant in both subsamples. However, urbanization becomes statistically insignificant. This implies that part of urbanization's contribution operates indirectly through accumulated development dynamics rather than through contemporaneous expansion. The role of digital infrastructure varies across specifications as well. Finally, capital accumulation remains one of the most stable determinants across models. It reaffirms investment as a fundamental engine of regional expansion and structural transformation. Therefore, the subsample analysis demonstrates that growth drivers operate differently across development stages. Low-GRDP provinces appear more dependent on structural transformation through urbanization and capital accumulation. On the other hand, higher-income regions show stronger path dependence and reduced responsiveness to short-run policy variables. These robustness checks strengthen the external validity of the results.

5. CONCLUSION

This study investigates the relationship between tourism development, urbanization, and sustainable economic growth across Vietnamese provinces using a dynamic panel econometric framework. The System-GMM technique accounts for endogeneity, regional heterogeneity,

and dynamic adjustment processes in provincial growth. The empirical findings provide several important insights. First, the results consistently show that urbanization is the strongest and most robust driver of provincial economic growth. The positive and significant coefficients across models support agglomeration theory. This theory suggests that urban expansion enhances productivity through concentration of infrastructure, labor mobility, and knowledge spillovers. Second, tourism development does not exhibit a statistically significant direct impact on GRDP growth. This finding suggests that tourism alone may not lead to broad-based economic expansion. Instead, the benefits of tourism appear to depend on complementary structural conditions. These conditions include urban infrastructure quality, investment capacity, and human capital development. In other words, tourism acts more as a supporting sector rather than an independent engine of growth. Third, digital infrastructure shows a positive but context-dependent contribution. This implies that digitalization enhances economic performance primarily when integrated with urban and institutional development. Meanwhile, human capital and capital accumulation consistently emerge as significant growth determinants. This reinforces endogenous growth theory and highlights the importance of skilled labor and investment inflows in sustaining long-term development.

The findings suggest several policy directions. Policymakers should prioritize balanced and sustainable urban planning. This ensures that urban expansion is accompanied by efficient public services, environmental management, and infrastructure investment. Rather than relying solely on tourism promotion, provincial strategies should integrate tourism with urban development, digital transformation, and workforce upgrading. Additionally, investment policies should focus on improving human capital quality and attracting productive capital inflows. This is especially important in lagging provinces to reduce regional disparities. Furthermore, expanding digital infrastructure can enhance productivity and support service-sector modernization when aligned with broader development planning.

Despite its contributions, the study has certain limitations. The analysis mainly focuses on the economic aspect of sustainability due to data constraints. Environmental and social dimensions are not explicitly modeled. Additionally, provincial aggregate data may mask intra-regional disparities and sectoral differences in tourism impacts. The relatively large number of instruments in the System-GMM estimation may weaken diagnostic power, although robustness checks were conducted to address this concern. Future studies should expand the framework by incorporating environmental indicators, such as carbon emissions or resource efficiency, to fully capture sustainable development outcomes. Micro-level or city-level datasets could help identify localized tourism spillovers and effects of urban governance. Moreover, future research may explore spatial econometric approaches to examine interprovincial spillover effects. It should also look into threshold or interaction models linking tourism with institutional quality and digital transformation. Such extensions would provide a more comprehensive understanding of how tourism-driven development contributes to sustainable growth in emerging economies.

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