



INTERNATIONAL TOURISM AND ECONOMIC GROWTH IN VIETNAM: A WAVELET COHERENCE ANALYSIS

Turismo internacional e crescimento econômico no Vietnã: uma análise de coerência wavelet

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ABSTRACT

Tourism is increasingly recognized as a key economic driver in Vietnam, fostering growth and international integration. Based on the Tourism-Led Growth hypothesis, this study uses wavelet analysis (XWT, WTC, PWC) on 1995–2024 data of GDP per capita, international arrivals, and service share to examine their dynamic linkages. Results show that tourism positively relates to GDP but remains unstable, strongest in the medium term (4–6 years). When controlling for services, the linkage weakens, confirming the service sector as the main transmission channel. Tourism can thus drive sustainable growth only when supported by service development, infrastructure, and legal–policy frameworks such as Resolution 08-NQ/TW, Resolution 127/NQ-CP on e-visa expansion, digital transformation, and green tourism.

Keywords: International tourism, Economic growth, Tourism-led growth hypothesis, Wavelet coherence, Tourism law, Entry policies

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TURISMO INTERNACIONAL E CRESCIMENTO ECONÔMICO NO VIETNÃ: UMA ANÁLISE DE COERÊNCIA WAVELET

International tourism and economic growth in Vietnam: a wavelet coherence analysis

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RESUMO

O turismo é cada vez mais reconhecido como um importante motor econômico no Vietnã, fomentando o crescimento e a integração internacional. Com base na hipótese do Crescimento Liderado pelo Turismo, este estudo utiliza a análise wavelet (XWT, WTC, PWC) em dados de 1995-2024 de PIB per capita, chegadas internacionais e participação de serviços para examinar suas ligações dinâmicas. Os resultados mostram que o turismo se relaciona positivamente com o PIB, mas permanece instável, sendo mais forte no médio prazo (4 a 6 anos). Ao controlar os serviços, a ligação enfraquece, confirmando o setor de serviços como o principal canal de transmissão. O turismo pode, portanto, impulsionar o crescimento sustentável apenas quando apoiado pelo desenvolvimento de serviços, infraestrutura e estruturas legais e políticas, como a Resolução 08-NQ/TW e a Resolução 127/NQ-CP sobre expansão do visto eletrônico, transformação digital e turismo verde.

Palavras-chave: Turismo internacional, Crescimento econômico, Hipótese de crescimento liderada pelo turismo, Coerência wavelet, Direito do turismo, Políticas de entrada

INTRODUCTION

Numerous studies have confirmed the growth-driving role of tourism in Vietnam. The Tourism-Led Growth Hypothesis was tested and supported for 1995–2013, showing tourism as a key long-term driver of GDP (Shih W. & Do N., 2016). Extending to 1986–2020 with structural breaks, tourism per worker and capital accumulation remained major growth pillars, alongside urbanization, financial development, and trade openness (Ronald Ravinesh Kumar et al., 2025). At the intersectoral level, tourism is closely linked with trade and transport: exports and income per capita exhibit bidirectional causality with international arrivals—mainly from exports and income toward arrivals (Phan Thanh Hoan et al., 2023), GDP explains variations in trade, arrivals, and transport, while international visitors both stimulate trade and interact with passenger transport (Nguyen Quang Hai, 2025). FDI also correlates positively with tourism in both the short and long run (Hoang Thao Thi Phuong, 2023). These findings reinforce tourism's role as a “growth pole” connected with trade, transport, and investment.

Despite this, key gaps remain. First, while most prior studies analyze separate transmission channels such as arrivals, revenue, exports, or services, recent work by Ronald Ravinesh Kumar et al. (2025) integrates them under a unified dynamic framework with structural breaks. Second, there is limited quantitative evidence on short- and long-term cross-effects between tourism, trade, and services. In macroeconomic terms, exports represent a foreign exchange and aggregate demand channel, where international visitor spending counts as “service exports,” improving the balance of payments and promoting global trade (World Tourism Organization, 2019). Globally, tourism fosters growth, but effects depend on income level and institutional quality (Tang Chor Foon & Tan Eu Chye, 2018). However, most studies still focus on tourism demand or direct effects rather than dynamic interrelations with macro variables such as exports and services (Haiyan Song et al., 2012).

Third, studies on sustainable policy and competitiveness—such as ESG or tourism product development—remain mostly descriptive, lacking quantitative linkage to growth outcomes (Thai Thi Nhung, 2025; Vu T. P. A., 2025). International research stresses that sustainable tourism requires systemic, policy, and mindset changes aligned with sustainability and innovation goals (Stefan Gössling et al., 2012).

This paper thus analyzes the dynamic relationship between economic growth and international tourism in Vietnam, testing the Tourism-Led Growth hypothesis and proposing policy implications to leverage tourism as a strategic, law-based driver of economic development.

1 LITERATURE REVIEW

1.1 Tourism and Economic Growth

Tourism is widely recognized as a key sector with strong potential to drive economic growth by generating foreign exchange, creating employment, attracting infrastructure investment, and stimulating supporting industries such as transport, accommodation, and food services. The “Tourism-Led Growth Hypothesis” (TLGH) posits that tourism development—measured by international arrivals or tourism revenues—can serve as a long-term engine for GDP growth (Brida J. G. & Pulina M., 2010).

One of the earliest formal tests of this hypothesis was by Balaguer Jacint and Cantavella-Jordá Manuel (2002) who confirmed a long-run relationship between international tourism and GDP in Spain (1975–1997) using cointegration and causality tests. Later, Juan Gabriel Brida et al. (2016) reviewed over 100 empirical studies and found broad support for TLGH, especially in emerging economies, while noting that institutional quality, investment, and control variables strongly influence outcomes.

Empirical evidence across various contexts supports this hypothesis. For instance, tourism positively affects long-run GDP growth and exhibits bidirectional causality in BRICS countries (Haroon Rasool et al., 2021), while in Saudi Arabia, tourism plays a significant role in national growth (Sana Naseem, 2021). Recent research also links tourism prosperity with high-quality economic development, reducing inequality and improving infrastructure (Meiyi Li et al., 2025).

However, findings are not universally consistent. C. C. Lee and M. S. Chien (2008) reported a two-way relationship between tourism and growth, yet noted that shocks in politics, economics, or policy changes could disrupt stability. Moreover, Sihan Liu et al. (2025) highlighted the asymmetric effects of economic growth on tourism demand and the moderating influence of sustainable development goals. Using the AARDL model for

Singapore (1983–2020), (Mohammad Sharif Karimi et al., 2024) also found that tourism's positive impact is more pronounced in the long run, while short-run effects are weak or slightly negative.

In summary, tourism holds substantial potential to promote economic growth, but its real impact depends on domestic conditions, supportive legal–policy frameworks, and the ability to manage spillover effects and systemic risks.

1.2 Tourism and the Service Sector

Previous studies have examined the tourism–service nexus from multiple perspectives, often focusing on service quality, customer satisfaction, and broader economic impacts. In Vietnam, Mai Ngoc Khuong and Nguyen Phuong Quyen (2016) analyzed international visitors in Ho Chi Minh City and found that entertainment, cultural–historical attractions, cuisine, safety, and destination image significantly influence perceived service quality and revisit intention, while infrastructure exerts a negative effect. Similarly, Nguyen Minh Hue et al. (2015) applied the SERVQUAL model to three-star hotels and showed that reliability, responsiveness, assurance, and empathy positively affect satisfaction, whereas tangibility is less important. More recently, Hoang Dam Luong Thuy and Nguyen Thu Ha (2021) developed an integrated framework emphasizing how employee–customer interaction, service environment, and brand style shape satisfaction, loyalty, positive word-of-mouth, and co-creation.

At the macro level, Avishek Khanal et al. (2022) analyzed data from Australia (1991–2019) and confirmed that tourism has a long-term positive impact on service-sector employment, with both symmetric and asymmetric effects validated through ARDL and NARDL models. The study also highlighted the complementary role of financial development, market capital, and trade, recommending stable international arrivals and simplified entry procedures to sustain service-sector growth.

Mengzhen Zhou and Xiaofeng Wang (2024) examined the “experiencescape” of tourism—linking physical facilities and staff–guest interaction to emotional experiences that drive behavioral intentions. Erose Sthapit et al. (2023) warned that poorly managed services may cause “co-destruction,” undermining visitor satisfaction. Meanwhile, Jacques Bulchand-Gidumal et al. (2024) found that artificial intelligence enhances efficiency and customer engagement in tourism marketing but also raises challenges related to service quality and personalization.

Overall, these findings reinforce the critical role of tourism in expanding and upgrading the service sector, thereby supporting sustainable economic development through effective management, innovation, and legal–policy facilitation.

2 RESEARCH METHODOLOGY

2.1 Wavelet Coherence Method

The wavelet approach originated with Haar (1910), who introduced the first discrete wavelet, later expanded mathematically by Littlewood and Paley (1931). A. Grossmann and J. Morlet (1984) then developed the Continuous Wavelet Transform (CWT). Christopher Torrence and Gilbert P. Compo (1998) extended it to the Cross-Wavelet Transform (XWT) and Wavelet Coherence (WTC), allowing time–frequency analysis of co-movements between two time series. Their framework was further popularized by Grinsted et al. (2004). Hrvoje Mihanović et al. (2009) later applied multivariate cross-wavelet analysis to separate tidal and wind effects on thermocline oscillations in the Adriatic Sea—an innovation that inspired the Partial Wavelet Coherence (PWC) method..

The Continuous Wavelet Transform (CWT) is defined as:

$$W_x(\tau, s) = \int_{-\infty}^{\infty} x_t \frac{1}{\sqrt{|s|}} \omega^* \left(\frac{t - \tau}{s} \right) dt$$

where, ω^* is the mother wavelet, τ represents time translation, s the scale parameter, and $*$ denotes the complex conjugate.

Torrence & Compo (1998) extended CWT to the Cross-Wavelet Transform (XWT) between two series x_t and y_t :

$$W_{xy}(\tau, s) = W_x(\tau, s)W_y^*(\tau, s)$$

They defined Wavelet Coherence (WTC) as the normalized correlation in the time–frequency domain:

$$R_{xy}^2(\tau, s) = \frac{|S(W_{xy}(\tau, s))|^2}{S(|W_x(\tau, s)|^2)S(|W_y(\tau, s)|^2)}$$

where S is a smoothing operator in both time and scale.

The Partial Wavelet Coherence (PWC) allows isolation of the “pure” relationship between two series by controlling for a third variable z_t .

$$\rho_{xy|z}^2(\tau, s) = \frac{|\gamma_{xy} - \gamma_{xz}\gamma_{yz}^*|}{(1 - R_{xz}^2)(1 - R_{yz}^2)}$$

with:

$$\gamma_{xy} = \frac{S(W_{xy})}{\sqrt{S(|W_x|^2)S(|W_y|^2)}}$$

This method isolates genuine dynamic linkages by removing confounding effects. Wavelet analysis further identifies lead–lag relationships, where arrow directions in XWT/WTC plots indicate correlation and direction of influence (\rightarrow positive, \leftarrow negative, \nearrow lead, \searrow lag)

Compared with traditional models like OLS or ARDL, wavelet techniques capture time-varying, nonlinear, and multi-frequency interactions—allowing richer insights into how tourism, services, and growth co-move across short, medium, and long-term horizons.

2.2 Data

This study employs annual time-series data for Vietnam spanning the period 1995–2024. Three main variables were selected based on both theoretical reasoning and empirical evidence. GDP per capita (GDPPC), obtained from the World Development Indicators (WDI) of the World Bank, serves as a standard measure of living standards and economic growth and is commonly used in testing the Tourism-Led Growth Hypothesis (TLGH). The share of services in GDP (SERVICES), also sourced from WDI, reflects the level of development in the service sector — the key channel through which international tourism transmits its effects to the wider economy. The number of international tourist arrivals (ARRIVAL), collected from the General Statistics Office of Vietnam, represents the performance of the tourism industry, indicating destination attractiveness and its contribution to national growth. Integrating these three indicators enables the analysis of both the direct link between tourism and economic growth and the indirect transmission mechanism through services, offering a comprehensive view of tourism’s role in Vietnam’s economic development.

Table 1 - Descriptive Statistics of Variables

Indicator	GDPPC GDP per capita (USD/person, constant 2015)	ARRIVAL Number of international tourist arrivals to Vietnam (thousand persons)	SERVICES Share of services in GDP (%)
Mean	2151.81	5845.90	41.26
Median	1977.36	3792.35	41.99
Standard deviation	915.61	4962.15	1.74
Kurtosis	-0.92	0.72	-0.81
Skewness	0.48	1.29	-0.64
Minimum	927.63	157.30	37.98
Maximum	4017.75	18008.60	44.06
Observations	30	30	30

Source: World Bank (WDI) and General Statistics Office of Vietnam

The original dataset, published at an annual frequency, was interpolated into a semi-annual series to increase the number of observations from 30 to 60. This adjustment allows the wavelet analysis to better capture short-term fluctuations (2–4 years) while preserving long-term trends. The conversion follows the recommendations of (Christopher Torrence & Gilbert P. Compo, 1998) and (Grinsted et al., 2004) regarding data density requirements for wavelet analysis and is a practical solution given the absence of quarterly data on international tourist arrivals and service-sector shares for Vietnam over an extended period. This approach enables the study to examine not only the direct relationship between tourism and economic growth but also the indirect transmission mechanism through the service sector.

3 RESULTS AND DISCUSSION

3.1 Trends in GDP, Services, and International Tourism in Vietnam

To provide an overview of the relationship between tourism and economic growth, Figure 4.1 illustrates the trends in GDP per capita (GDPPC) and international tourist arrivals (ARRIVAL) in Vietnam from 1995 to 2024. GDP per capita shows a stable upward trend, reflecting improvements in productivity and average income across the Vietnamese economy. In contrast, international tourist arrivals exhibit greater volatility—rising steadily from the late 1990s to 2019, plunging sharply during 2020–2021 due to the COVID-19 pandemic, and then recovering rapidly after 2022. This pattern highlights that international tourism plays a vital role in Vietnam's economy while remaining highly sensitive to global shocks.

According to the latest data from the (NSO, 2025), Vietnam welcomed nearly 10.7 million international visitors in the first half of 2025—up 20.7% from the same period in 2024—with 85.2% arriving by air. Major source markets include China, South Korea, Taiwan, the United States, and Japan, alongside emerging markets such as India and Australia. These results indicate that Vietnam's tourism sector achieved nearly half of its annual target within just six months, setting a strong foundation for year-end growth. Overall, Figure 4.1 reflects the parallel trends between economic growth and international tourism, underscoring the crucial role of tourism in Vietnam's post-pandemic economic recovery and development.

Figure 1 - Trends in GDP per Capita and International Tourist Arrivals to Vietnam, 1995–2024

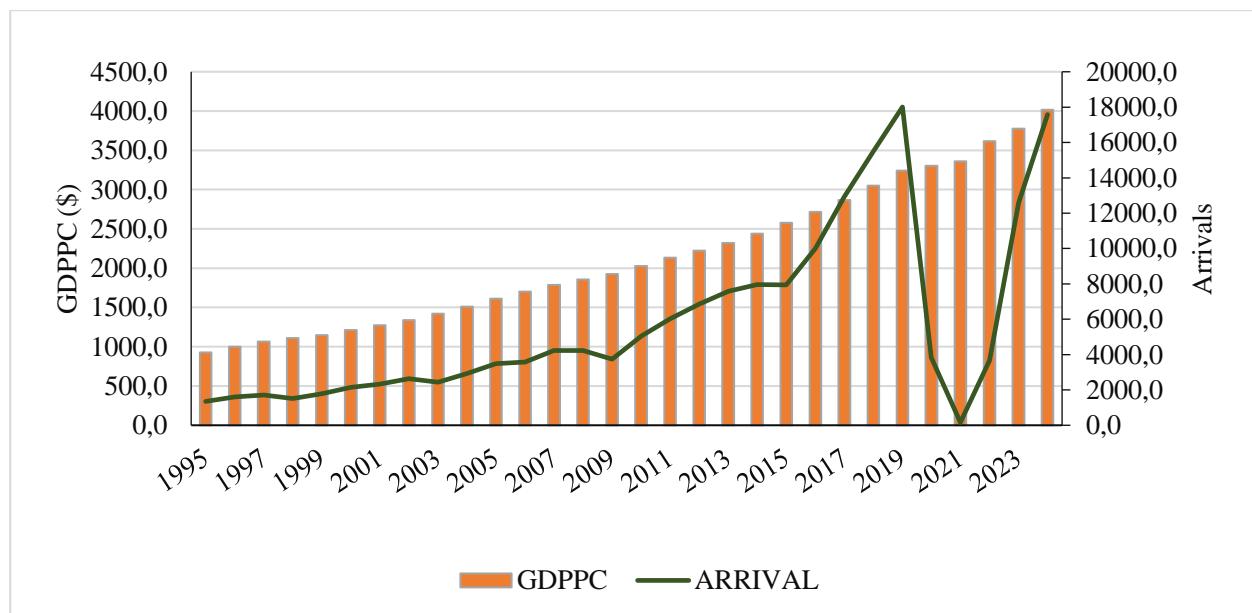
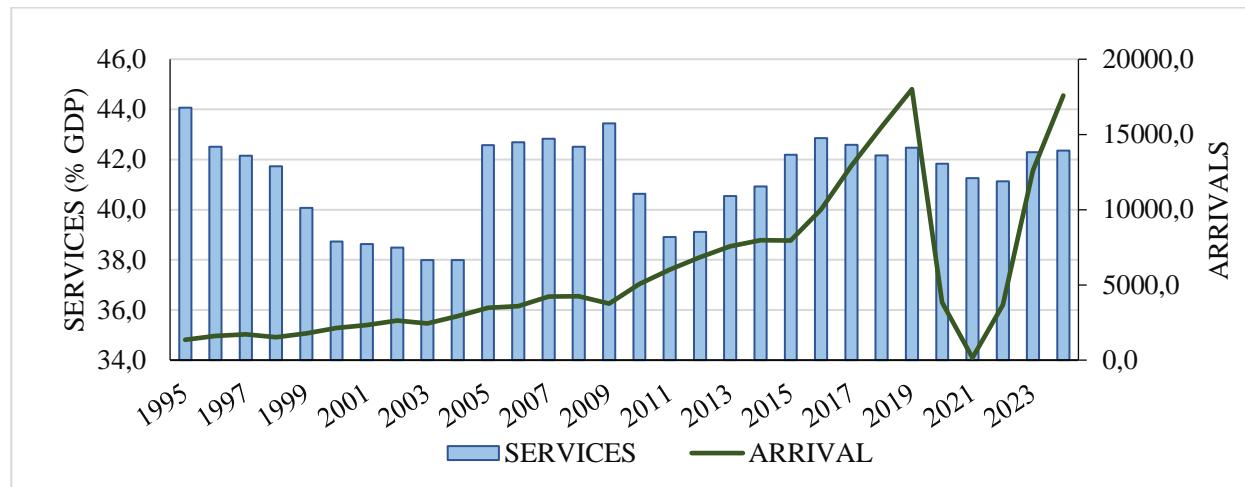


Figure 2 shows that the share of services in GDP remained relatively stable, fluctuating between 38% and 44%, reflecting the sector's steady contribution to Vietnam's economic structure. Meanwhile, international tourist arrivals (ARRIVAL) surged significantly after 2005, peaked in 2019, dropped sharply during the COVID-19 period

(2020–2021), and then rebounded rapidly after 2022. This pattern suggests a strong linkage between the expansion of the service sector and the growth of international tourism, as tourism development has generated spillover effects on accommodation, food services, transportation, and trade. The trend reinforces the view that international tourism serves as a key driver for the service sector, thereby making a substantial contribution to Vietnam's overall economic growth.

Figure 2 -Trends in the Share of Services in GDP and International Tourist Arrivals to Vietnam, 1995–2024



3.2 Empirical Results Based on Cross Wavelet Transform

The Cross Wavelet Transform (XWT) results reveal that most of the spectrum appears in dark blue regions, indicating a generally weak relationship between international tourist arrivals and GDP across much of the observation period. Brighter areas (yellow–orange) are most prominent during 2010–2015, particularly within the 4–8-year cycles, suggesting a relatively strong medium-term co-movement between the two variables. The rightward-pointing arrows in this region indicate an in-phase relationship, meaning that increases in international arrivals coincide with higher GDP growth. However, after 2015, this linkage weakens rapidly, and during the COVID-19 period (2020–2021), no significant coherence is observed, implying that the impact of tourism on Vietnam's economic growth is episodic and lacks long-term stability.

These findings are consistent with international evidence: in Spain, tourism was identified as a long-term growth DRIVER (Jacint Balaguer & Manuel Cantavella-Jordá, 2002), whereas in Taiwan, the relationship was disrupted by political and economic shocks (Chien-Chiang Lee & Mei-Se Chien, 2008). Similarly, for Vietnam, Shih W. and Do N. (2016) found that tourism's positive influence on growth occurs only during specific periods. Hence, the XWT analysis in this study provides additional evidence that international tourism can contribute positively to GDP growth, but its effects are highly context-dependent and vulnerable to external disruptions.

Figure 3 - Cross Wavelet Transform (XWT) between International Tourist Arrivals and GDP per Capita in Vietnam, 1995–2024

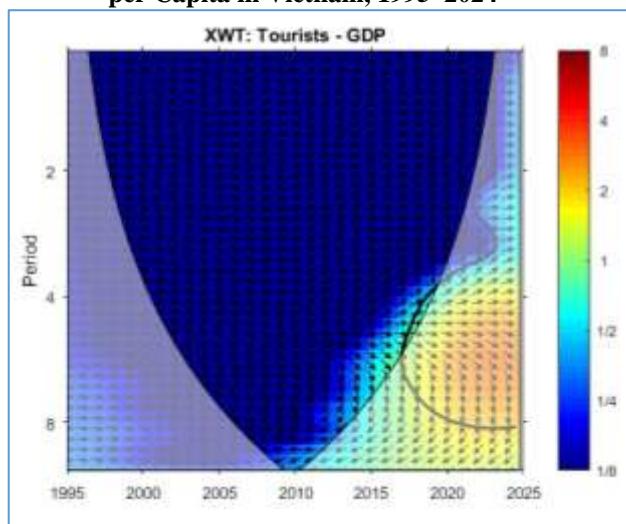
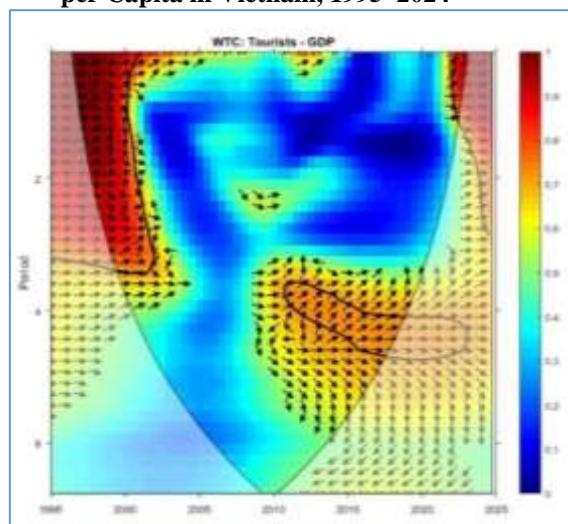


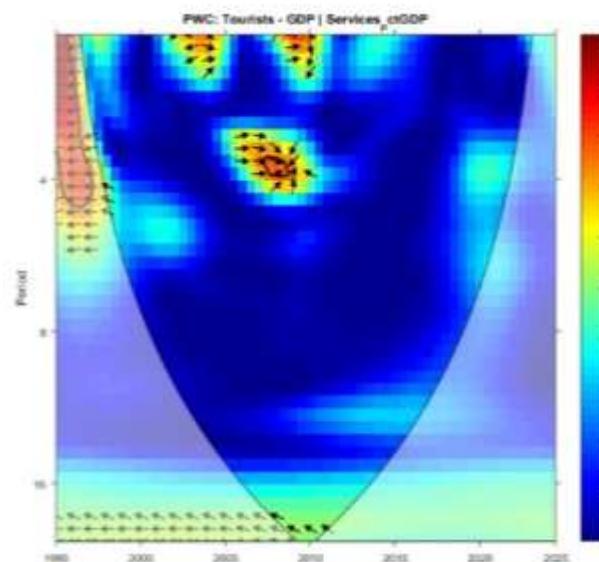
Figure 4 - Wavelet Coherence (WTC) between International Tourist Arrivals and GDP per Capita in Vietnam, 1995–2024



The Wavelet Coherence (WTC) results indicate that the relationship between international tourist arrivals and GDP is generally weak and unstable throughout most of the 1995–2024 period. Before 2010, coherence regions appear sporadically across short- and medium-term cycles, with low intensity. The 2010–2015 period stands out, showing distinct red–orange regions at 4–6-year cycles, reflecting an in-phase relationship where increases in international arrivals coincide with higher GDP growth. After 2015, this signal weakens rapidly, and during the COVID-19 period (2020–2021), it nearly disappears. These findings suggest that tourism's positive contribution to growth emerges primarily during favorable periods but lacks long-term sustainability.

This result aligns with recent studies: Paravee Maneejuk et al. (2022) found that tourism promotes economic growth across ASEAN, though the strength varies by structural context and development stage. In Vietnam, (Nguyen Hai Quang, 2021) demonstrated that investments in tourism infrastructure—especially transportation and accommodation—have long-term effects on attracting international visitors and boosting GDP. Similarly, Hoang Thi Phuong Thao (2022) showed that financial and economic growth are closely linked with tourism development, though the relationship weakens under external shocks. Therefore, the WTC analysis reinforces the view that international tourism serves as a key driver of GDP growth, but its effects depend heavily on internal economic conditions, institutional quality, income levels, and policy frameworks.

Figure 5 - Partial Wavelet Coherence (PWC) between International Tourist Arrivals and GDP per Capita Controlling for the Share of Services in GDP, 1995–2024



The Partial Wavelet Coherence (PWC) results show that when controlling for the share of services in GDP, the linkage between international tourist arrivals and GDP declines markedly—especially across medium- and long-term cycles. This suggests that the service sector plays a crucial mediating role in transforming tourism growth into real economic expansion. Supporting this view, Narasingha Das et al. (2024) using the PWC method, found that fluctuations in international tourist arrivals (not merely their average levels) significantly influence GDP variations across multiple time-frequency ranges. Similarly, Chathuni Wijesekara et al. (2022) in a global study, revealed that although tourism positively affects economic growth in many countries, the magnitude of this impact differs widely by region and structural context. These findings reinforce the current study's evidence that the impact of international tourism on GDP is not uniform but rather depends on the mediating function of the service sector and each country's specific economic and institutional conditions.

Table 2 - Comparison of WTC and PWC results for ARRIVAL and GDP controlling for SERVICES

Cycle Range	WTC (Before Controlling)	PWC (After Controlling for SERVICES)	Implications
ARRIVAL – GDP			
2–4 years (Short term)	Present but fragmented	Weak/unstable	Short-term effects are inconsistent and lack stability
4–8 years (Medium term)	Clear coherence during 2010–2015, mostly in-phase	Significantly reduced or disappears	SERVICES acts as the main transmission channel through which ARRIVAL affects GDP
>8 years (Long term)	Weak/outside the cone of influence (COI)	No clear evidence	Insufficient evidence of long-term linkage

Table 2 summarizes the comparison between Wavelet Coherence (WTC) and Partial Wavelet Coherence (PWC) to clarify the mediating role of the service sector in the relationship between international tourist arrivals (ARRIVAL) and economic growth (GDP). The results show that short-term effects (2–4 years) of ARRIVAL on GDP exist but are fragmented and unstable. In the medium term (4–8 years), WTC reveals a clear coherence during 2010–2015 with an in-phase relationship; however, this linkage weakens significantly or disappears once SERVICES is controlled for. This confirms that the service sector serves as the main transmission channel through which growth in international arrivals translates into economic expansion. In the long term (>8 years), the relationship remains weak and lacks sufficient evidence for a firm conclusion.

Thus, the PWC evidence strengthens the argument that international tourism contributes to economic growth only when supported by the development of the service sector, rather than exerting a direct effect on GDP.

CONCLUSION

The findings reveal that international tourism has a positive impact on Vietnam's economic growth, though this effect is unstable and highly sensitive to both domestic and external shocks. The XWT and WTC analyses indicate that 2010–2015 was the most significant period, when international arrivals and GDP per capita moved in phase within the medium-term cycle (4–6 years). However, this linkage weakened sharply after 2015 and nearly disappeared during the COVID-19 pandemic. When controlling for the share of services using PWC, the coherence between international arrivals and GDP declined substantially, confirming that the service sector serves as the main transmission channel through which tourism growth translates into economic expansion. These findings support the Tourism-Led Growth (TLG) hypothesis but also emphasize that, in Vietnam, tourism is not a direct or sustainable driver of GDP. Instead, its effectiveness depends on the country's capacity to develop the service sector and maintain a stable economic-political environment. Only when properly leveraged can tourism become a consistent source of foreign exchange and long-term economic returns.

In line with this orientation, Vietnam has implemented several key policies to strengthen tourism as a strategic economic sector. These include Resolution 08-NQ/TW (2017) on tourism development, the National Tourism Development Strategy to 2030 (Decision 147/QD-TTg), and Resolution 127/NQ-CP (2023) on visa exemption, e-visa expansion, and extended stay durations. The government also promotes digital transformation

under the National Digital Transformation Program 2020–2025 and runs global branding campaigns such as “*Live Fully in Vietnam*” and “*Vietnam Timeless Charm*.” Furthermore, Vietnam is advancing green and sustainable tourism aligned with ESG principles, alongside investment in transportation, accommodation, and service infrastructure. If implemented consistently and effectively, these measures will enable Vietnam’s tourism industry not only to contribute more substantially to GDP growth but also to become a core driver of national competitiveness and sustainable development in the coming years. However, Vietnam’s tourism law and entry policies remain fragmented and procedurally complex, lacking full legal integration and coordination across ministries. Addressing these gaps is crucial for building a transparent, efficient, and visitor-friendly legal framework that supports international tourism. To strengthen Vietnam’s position in the global tourism market, it is essential to improve existing legal regulations and entry policies—particularly by expanding e-visa programs, simplifying visa procedures, and ensuring transparent, secure entry management for international tourists. Such reforms will enhance legal predictability and make Vietnam a more open and competitive destination for global travelers.

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