THE IMPACT OF TOURISM DEVELOPMENT ON UPGRADING INDUSTRIAL STRUCTURE IN CHINA-ASEAN REGION

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2024

ผลกระทบของการพัฒนาการท่องเที่ยวต่อการปรับโครงสร้างอุตสาหกรรมของจีน-อาเซียน

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ปีการศึกษา 2567

THE IMPACT OF TOURISM DEVELOPMENT ON UPGRADING INDUSTRIAL STRUCTURE IN CHINA-ASEAN REGION

QIAN WU

A Dissertation Submitted in Partial Fulfillment of the Requirements

for the Degree of DOCTOR OF PHILOSOPHY

(Doctor of Philosophy Program in Economics (International Program))

Faculty of Economics, Srinakharinwirot University

2024

THE DISSERTATION TITLED

THE IMPACT OF TOURISM DEVELOPMENT ON UPGRADING INDUSTRIAL STRUCTURE IN CHINA-ASEAN REGION

BY

QIAN WU

HAS BEEN APPROVED BY THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY IN DOCTOR OF PHILOSOPHY PROGRAM IN ECONOMICS (INTERNATIONAL PROGRAM) AT SRINAKHARINWIROT UNIVERSITY

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Title	THE IMPACT OF TOURISM DEVELOPMENT ON UPGRADING INDUSTRIAL STRUCTURE IN CHINA-ASEAN REGION
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Degree	DOCTOR OF PHILOSOPHY
Academic Year	2024
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Based on the economic value and functional evolution characteristics of the tourism industry, this paper systematically examines the impact mechanism of tourism development on the upgrading of the industrial structure in the China-ASEAN region. Utilizing panel data from 10 countries in the China-ASEAN region from 2000 to 2020, empirical research through mediation and moderation effect models reveals that: (1) Tourism development significantly promotes the upgrading of the industrial structure in the China-ASEAN region, with varying degrees of impact intensity: the effect on the ecological transformation of the industrial structure is the strongest, followed by the enhancement of industrial sophistication, while the rationalization of the industrial structure has a relatively weaker effect.(2) Mediation mechanism tests show that the employment effect has a significant positive mediating role in the impact of tourism development on the three types of industrial upgrades , and the capital effect also confirms the key role of resource redistribution through significance tests . (3) Moderation effect analysis indicates that theurbanization effect plays a significant positive moderating role, while the environmental effect shows a suppressive moderation all dimensions significantly negative, reflecting that environmental constraints may lead to resource competition between tourism and other industries.(4) Heterogeneity analysis finds that in economically developed areas the industrial upgrading effect of tourism development is more pronounced, confirming the threshold effect of regional economic levels. This study provides precise decision-making basis for the coordinated development of tourism policies and industries in the China-ASEAN region by revealing the dual-path mediation of employment-capital and the moderation paradox of environment-urbanization.

Keyword : Tourism development， Industrial structure upgrading， China-ASEAN region，
Regional economic development， Structural transformation

ACKNOWLEDGEMENTS

Completing this dissertation would not have been possible without the support of so many people to whom I owe my deepest gratitude.

My deepest appreciation goes to my advisor, Prof. Sivalap, whose door was always open to my endless questions. Your patience in guiding me through theoretical frameworks and your meticulous feedback on every draft transformed my raw ideas into rigorous research.

Special thanks to Prof. Aotip for challenging my methodologies and pushing me to consider alternative approaches. Your insightful critiques during our seminar discussions fundamentally improved this work's quality.

To my committee members, thank you for your time, insightful feedback, and encouragement. Your perspectives shaped this work in ways I couldn't have achieved alone.

My heartfelt thanks to my fellow PhD students—especially Ading, Liyang, Jiji, Lingling, and Xuyang—for the late-night study sessions, shared frustrations, and much-needed laughter. You made this journey less lonely.

To my family, thank you for your unconditional love and for reminding me there's life beyond research. Your support, whether a phone call or a care package, kept me going.

Finally, to Mr. Chen, my sweet Jiajia, my rock through it all—thank you for the endless cups of coffee, pep talks, and for understanding when I disappeared into "writing mode." None of this would have been possible without you.

As I close this chapter, I carry with me not just the knowledge gained but the countless acts of kindness that made it possible. To all who walked this path with me—thank you for being part of my story.

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CHAPTER 1
INTRODUCTION

1.1 Research background

In the context of global economic integration, the relationship between China with ASEAN has significantly developed over the past few decades, particularly in the economic domain. Tourism, as an essential component of economic exchanges between the two parties, not only injects vitality into regional economic cooperation but also promotes cultural exchange and integration. With the deepening of regional cooperation, tourism development has become an indispensable element in driving economic growth in the China-ASEAN region, and it is poised to have a profound impact on the upgrading of the industrial structure in this area. There are four parts:

Firstly, economic Integration and Regional Cooperation. The geographical proximity between China and ASEAN provides a natural advantage and convenience for economic exchanges between the two. China shares land borders with Vietnam, Laos, and Myanmar, facilitating connectivity through various border ports. Furthermore, it depends on the crucial international shipping lanes of the South China Sea for trade and tourism interactions with the Philippines and Malaysia. This greatly enhances cross-border exchanges, the flow of individuals, and the shipment of goods between the two regions (Chang, T. C. ,2004). China's industrial demand is complementary to ASEAN's abundant natural resources and labor market. The minerals, forest products, and agricultural and marine products provided by ASEAN are crucial to the Chinese market, deepening economic cooperation and development between the two regions.

Economic integration is the process of coordination and harmonization of economic policies, laws, markets and resource allocation across countries or regions, which is achieved mainly through the lowering or elimination of trade barriers, investment restrictions and border controls, so that capital, goods, services and labor can move freely. It encompasses various tiers, including free trade areas, customs unions, common markets, economic unions, and even comprehensive economic and monetary integration (Dong & Qiu, 2008). In contrast, regional collaboration involves nations that share

geographical proximity and economic interests. By lowering barriers to trade and investment and increasing market access, economic integration and regional cooperation help to expand trade and attract foreign direct investment, thereby accelerating the development of regional economies. These co-operations also promote the integration of resources and markets, helping to build larger economic entities and enhance their competitiveness and bargaining power in the global market (Guo&Wang,2019). In addition, in the face of transnational challenges such as environmental, health and financial challenges brought about by globalization, regional cooperation provides a platform for member states to jointly formulate strategies and share resources in order to coordinate and cooperate in addressing these challenges. In the context of globalization, economic integration and regional cooperation are not only a key force for economic growth, but also an important mechanism for building a more open, inclusive and stable international society.

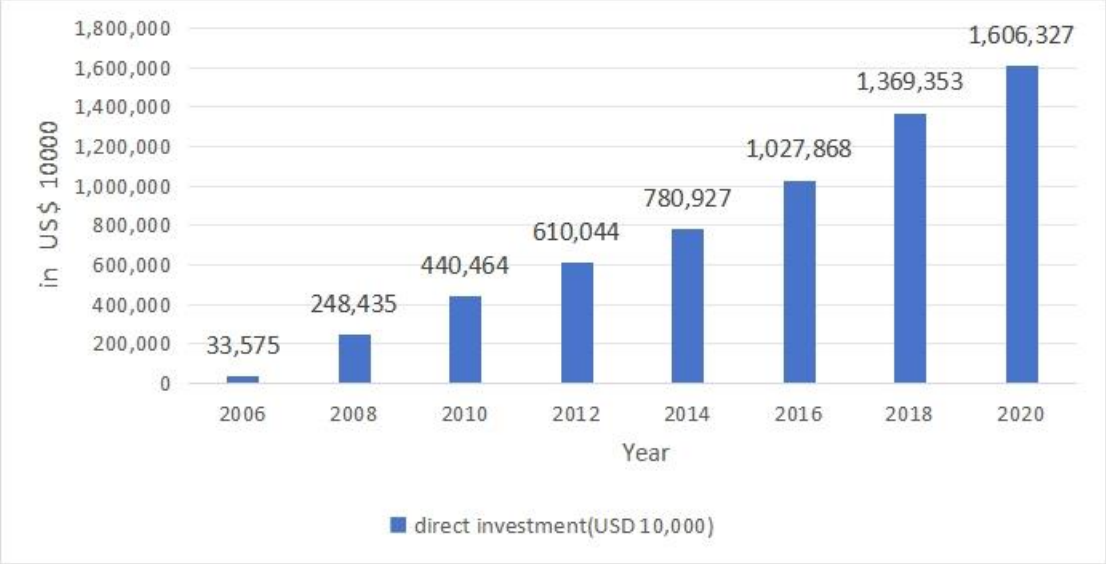

Figure 1 China's Investment In ASEAN (2006-2020) (in US$ 10,000)

Source: MOFCOM

Between 2006 and 2020, China's investment in ASEAN experienced significant growth, closely related to strengthened regional cooperation measures. In 2006, China's investment in ASEAN was only USD 0.335 billion, but by 2020, this figure

had increased to USD 16.063 billion. During this period, the signing and implementation of the CAFTA and RCEP greatly facilitated the free flow to goods and capital (Fu, Chen&Xue,2018). CAFTA has effectively promoted economic growth and structural optimization within the region, enhancing the entire area's competitiveness in the global economy (Jiang&Wang,2014). The investment environment between them became more favorable, and policy coordination became tighter, further promoting sustained growth in bilateral investment. Investments in infrastructure through the Belt and Road Initiative improved regional links and economic collaboration, highlighting the ongoing strengthening and development of these ties. They should strengthen intra-regional cooperation, further enhance integration levels, properly handle disputes, optimize the business environment, and promote the comprehensive implementation of an upgraded version of the China-ASEAN Free Trade Area (He, Han & Qi, 2020).

ASEAN's GDP per capita rose from US$1,912 in 2006 to US$4,827.4 in 2019. In 2020, per capita of ASEAN's GDP, at US$4,677.30 due to the impact of the novel coronavirus, is still more than four times that of 2000, at US$1,200.3. This dynamic underscores that regional economic cooperation has not only facilitated the expansion of Chinese foreign investment but has also catalyzed the ongoing enhancement of internal economies within ASEAN member states.

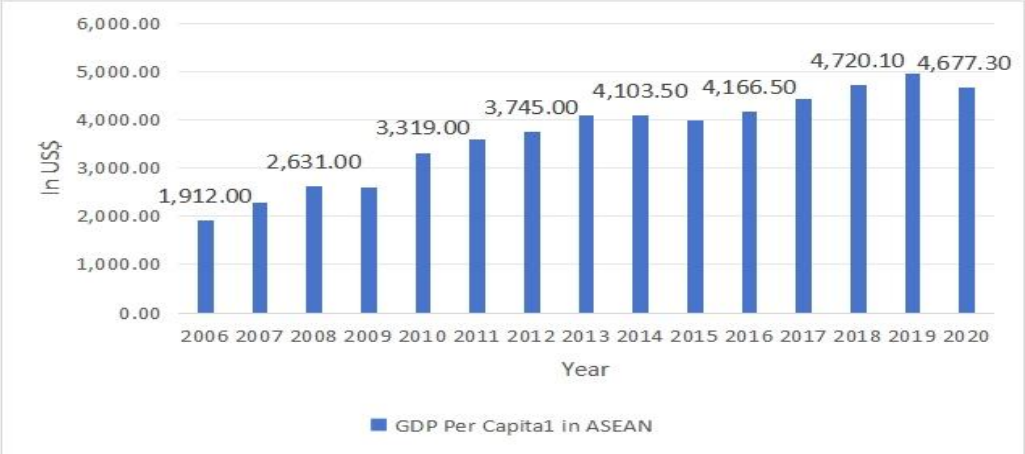

Figure 2 GDP per capital in ASEAN (in US $), 2006-2020

Source: ASEAN Statistical Yearbook 2013, ASEAN Statistical Yearbook 2023.

China and ASEAN have extensive and in-depth cooperation at the policy level, particularly in areas such as tourism policy, environmental protection, and sustainable tourism development. This includes promoting green tourism practices, enhancing ecotourism projects, and improving environmental management in the regional tourism industry through the sharing of technology and information (Ye & Chen, 2013).

Additionally, both sides cooperate in developing transnational tourism products and markets, simplifying visa procedures, increasing direct flights, and jointly promoting cultural and ecotourism. These efforts aim to enhance tourism attractiveness while ensuring sustainable resource use and environmental protection, thereby fostering regional economic development and preserving natural resources and cultural heritage. This enhanced connectivity not only boosts the competitiveness of ASEAN's tourism industry but also stimulates local economic development, increasing the region's economic vitality and cultural exchanges (Yin, Bi&Ji,2020).

In 2020, the combined GDP of ASEAN member countries reached USD 3.2 trillion, placing it just after the United States (US$ 21.4 trillion), China (US$ 14.3 trillion), Japan (US$ 5.1 trillion), and Germany (US$ 3.8 trillion). ASEAN advanced from being the twelfth largest economy in 2008 to the fifth largest by 2020.

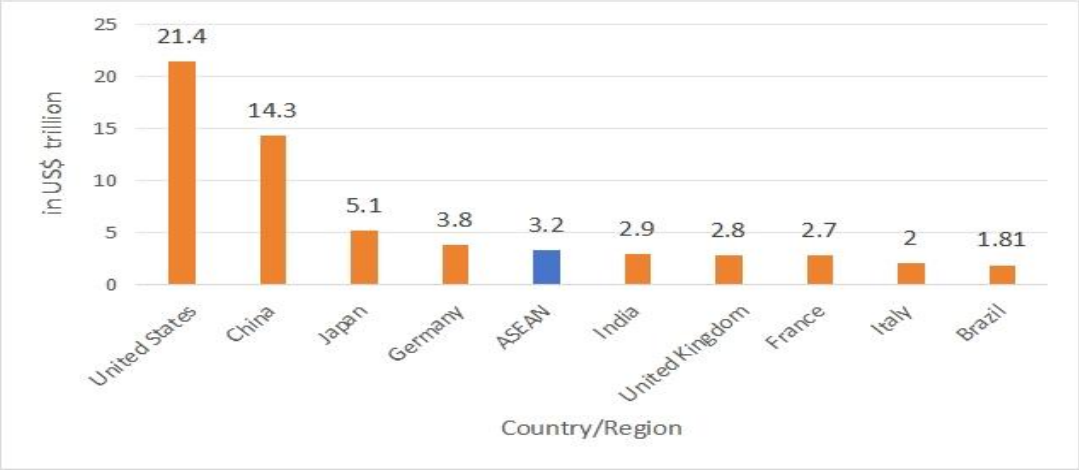

Figure 3 Top 10 largest Economy (in US$ trillion), 2020

Source: ASEC, World Economic Forum

By deepening economic integration and regional cooperation, new tourism markets and business models can be effectively explored, leading to shared regional economic prosperity. More concrete actions and practical measures are needed to enhance regional tourism, including improved infrastructure, coordinated marketing strategies and addressing non-tariff barriers that impede international tourist flows. (Koh S.G. M & Kwok A.O.J,2016).

Moreover, member states can jointly develop multi-destination travel routes and regional tourism brands, increasing their recognition and appeal in the global market. By sharing market data and marketing resources, countries can more effectively tailor their marketing efforts to international travelers and use digital technology to offer personalized tourism services and experiences. Furthermore, regional cooperation encourages the development of sustainable tourism practices and green tourism projects, enhancing tourism attractiveness through environmental and cultural heritage protection.

This multifaceted cooperation not only attracts more international tourists but also improves economic connectivity within the region, ultimately achieving long-term and shared economic prosperity.

Secondly, current Situation of Tourism Development in the China-ASEAN Region. Since the 1990s, tourism between the two regions has developed rapidly. Initially, tourism was primarily focused on traditional sightseeing and business travel. In the early 2000s, after China joined the World Trade Organization, its economy further opened, deepening exchanges and cooperation with ASEAN. During this period, the number of tourists and tourism revenue steadily increased, with tourism projects centered on cultural exchanges and leisure vacations beginning to emerge (Zheng, 2000).

After 2010, the establishment of the China-ASEAN Free Trade Area accelerated the cooperation and development of tourism between the two regions. In 2016, approximately 38 million tourists traveled between China and ASEAN countries, highlighting the strong interest and participation in tourism activities in these regions (Luo,2012). The number of tourists and tourism revenue achieved rapid growth, particularly with the expansion of the middle class and the surge in outbound tourism

demand. The tourism industry in China and ASEAN countries is vibrant and continuously growing, playing a crucial role in fostering closer ties and economic growth.

As the number of tourists increased, tourism revenue also saw significant growth, becoming an important source of foreign exchange for China and ASEAN countries (Deng,2015). The tourism industry not only created a large number of job opportunities but also boosted related sectors such as hotels, catering, transportation, and retail, thereby promoting overall economic growth (Cui& Huang, 2009). The growth of the tourism sector has improved the skills and knowledge of workers, creating job opportunities for cultural performers, artisans, and local food producers (Deng, 2008). Moreover, to attract tourists, China and ASEAN countries have made substantial investments in tourism infrastructure and project development, including the construction of airports, hotels, and the upgrading of tourist attractions (Yi & Li， 2021).

In recent years, with the rise of online travel service platforms, travel booking and payment have become more convenient, and emerging technologies such as virtual reality and artificial intelligence are enhancing the travel experience and management efficiency (Hu,2014). More and more tourists are seeking personalized travel experiences, making customized tourism a development trend. Increasing awareness of environmental protection and cultural heritage conservation has made sustainable tourism a focus (Yang, Y., 2010). In the future, as cooperation in tourism between China and ASEAN countries deepens, the tourism industry in both regions is expected to achieve more diversified and high-quality development (Chen, 2020).

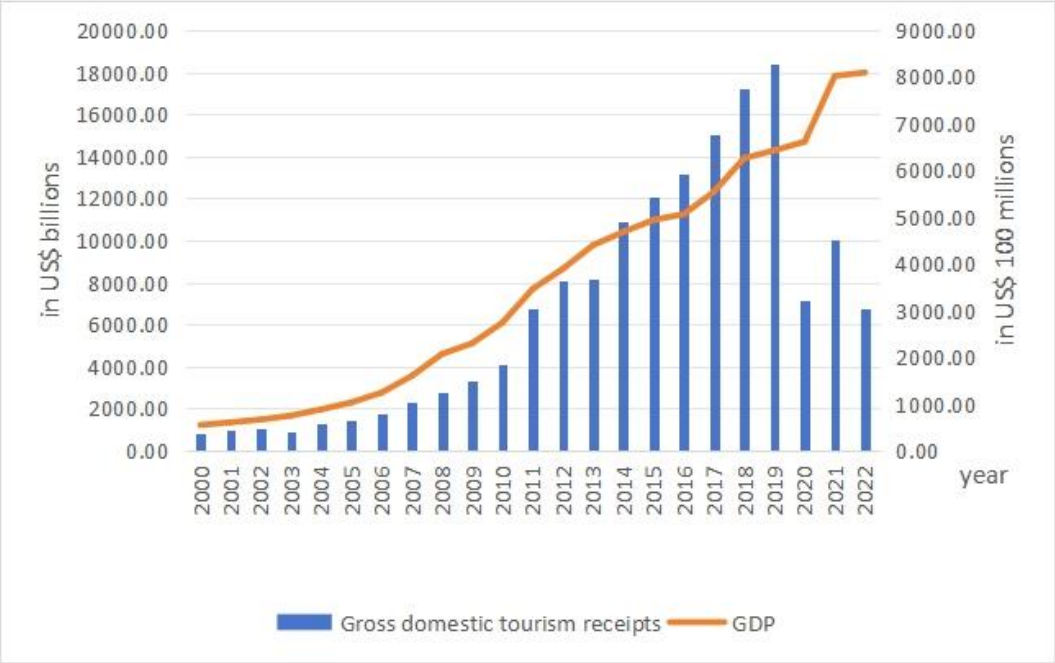

Figure 4 China's tourism revenue and GDP growth curve (2000-2022)

Source: China Tourism Statistics Yearbook (CTSY).

Between 2000 and 2019, China's total tourism revenue grows significantly, from US$38,352 billion to US$828,523 billion. in 2022, it plummets to US$303,774 billion due to the New Crown Epidemic. Meanwhile, GDP grows from US$121,111 billion in 2000 to US$179,828billion in 2022, demonstrating strong growth momentum.

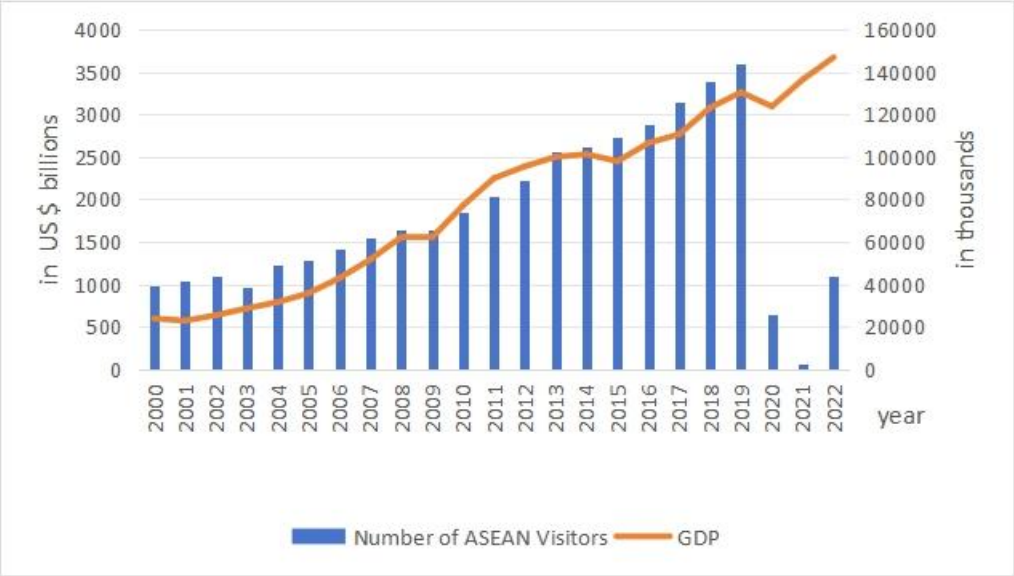

Figure 5 Number of ASEAN Visitors and GDP growth curve (2000-2022)

Source: ASEAN Statistical Yearbook (2006-2023).

At the same time, from 2000 to 2022, the number of ASEAN visitors significantly increased from 39,136 to 143,606. In 2020, due to the COVID-19 pandemic, the visitors plummeted to 26,158. By 2022, there has been a noticeable trend of gradual recovery. Meanwhile, ASEAN's GDP grew from 598 billion USD in 2000 to 3,670 billion USD in 2022, reflecting the synchronized growth momentum of tourism development and economic stability in the region.

Looking back over the past twenty years, both tourism revenue and GDP in the China-ASEAN region have seen significant growth, indicating that tourism growth and economic development are complementary.

Despite the sharp decline in tourism revenue and visitor numbers in China and ASEAN countries in 2020 due to the pandemic, which highlights the sensitivity of the tourism industry to changes in external environments—especially global events like COVID-19, GDP remained at a high level. While the tourism industry was severely affected by the pandemic, other sectors continued to make stable or even increasing contributions to GDP, thus supporting overall economic performance. This reflects the effectiveness of

the policies implemented by the governments of China and ASEAN countries in promoting economic diversification and enhancing overall economic resilience. As the pandemic gradually comes under control and the tourism industry recovers, future tourism revenue is expected to resume growth. As the economy recovers, tourism revenue is anticipated to grow again. A robust overall economic performance will persist in fostering the tourism sector's growth, while also propelling the advancement of associated service industries, thus becoming a key driver of regional economic development (Song & Liu, 2023).

Thirdly, an examination of the existing industrial structure in the China-ASEAN region. Since 2000, China's industrial structure has undergone a significant shift from labor-intensive to technology intensive. By 2021, the service sector accounted for over 54.5% of China's GDP, with the value added by the financial industry growing by 7.8%, indicating a clear transition of the Chinese economy towards a high-tech and service-oriented structure. The swift advancement of the service sector has emerged as the primary catalyst for China's economic growth (Xia & Yao, 2013), especially with the rapid growth of industries like finance, insurance, e-commerce, and tourism (Shu & Xu, 2022).

Table 1 China GDP and Growth Rate (2006-2020)

Year	GDP (in US $ billion)	Growth over the previous year (%)
2006	2753.31	12.7
2007	3550.32	14.2
2008	4593.45	9.7
2009	5102.75	9.4
2010	6087.43	10.6
2011	7684.10	9.6
2012	8644.94	7.9
2013	9768.75	7.8

Table 1 (Continued)

Year	GDP (in US $ billion)	Growth over the previous year (%)
2014	10396.82	7.4
2015	10969.08	7.0
2016	11240.89	6.8
2017	12308.22	6.9
2018	13907.43	6.7
2019	14276.63	6.0
2020	14689.38	2.2

Source: China National Bureau of Statistics (NBS).

Table 2 Proportion of China's total GDP accounted for by the three industrial sectors (%) 2006-2020.

Year	Primary sector (%)	Secondary sector (%)	Tertiary sector (%)	Total (%)
2006	10.6	47.6	41.8	100.0
2007	10.2	46.9	42.9	100.0
2008	10.2	47.0	42.9	100.0
2009	9.6	46.0	44.4	100.0
2010	9.3	46.5	44.2	100.0
2011	9.2	46.5	44.3	100.0
2012	9.1	45.4	45.5	100.0
2013	8.9	44.2	46.9	100.0
2014	8.6	43.1	48.3	100.0
2015	8.4	40.8	50.8	100.0
2016	8.1	39.6	52.3	100.0
2017	7.5	39.6	52.9	100.0
2018	7.0	39.7	53.3	100.0
2019	7.1	39	53.9	100.0
2020	7.7	37.8	54.5	100.0

Source: CNBS.

From 2006 to 2020, China's economic structure saw significant changes in the contributions of the primary, secondary, and tertiary sectors to GDP. The primary sector, including agriculture and fisheries, supplies raw materials. The secondary sector involves manufacturing and construction, essential for value addition. The tertiary sector, or service industry, encompasses services like finance, tourism, and IT, highlighting the shift towards a service-oriented economy.

Over this period, the share of the primary sector contracted from 10.6% to 7.7%, reflecting a gradual structural transition away from agrarian-based activities. Despite this relative decline, the sector remains integral for ensuring food security and sustaining rural livelihoods. The secondary sector's contribution decreased from 47.6% to 37.8%, indicating a moderate yet still critical role in driving technological advancement and industrial development. Conversely, the tertiary sector expanded substantially from 41.8% to 54.5%, structural optimization, and sustainable development. Emerging industries such as tourism, finance, technology-enabled services, and e-commerce have evolved from being mere byproducts of economic expansion prior to 2004 to becoming key endogenous drivers of growth thereafter (Chen, Li & Qiao, 2013).

This sectoral evolution is illustrative of China's ongoing economic transformation, characterized by deindustrialization in relative terms and a concurrent rise in the service economy, aligning with global trends in advanced economic systems.

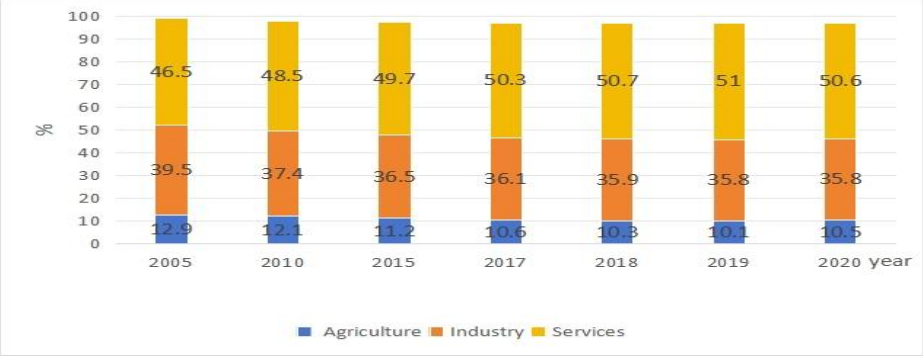

Figure 6 Contributions of key economic sectors to total ASEAN GDP (%), 2005-2020.

Source: ASEAN Sec, ASEAN Stats DB （2020）

By 2020, the industrial structure of ASEAN countries exhibited diversified development, with the service sector's GDP share rising from 46.6% in 2005 to 50.6%. During this time, the service sector (including trade, government, communications, transportation, finance, and tourism) became the dominant force in the ASEAN economy. In contrast, the industrial sector's contribution fell to 35.8% from 39.5%, while agriculture decreased from 12.9% to 10.5%.

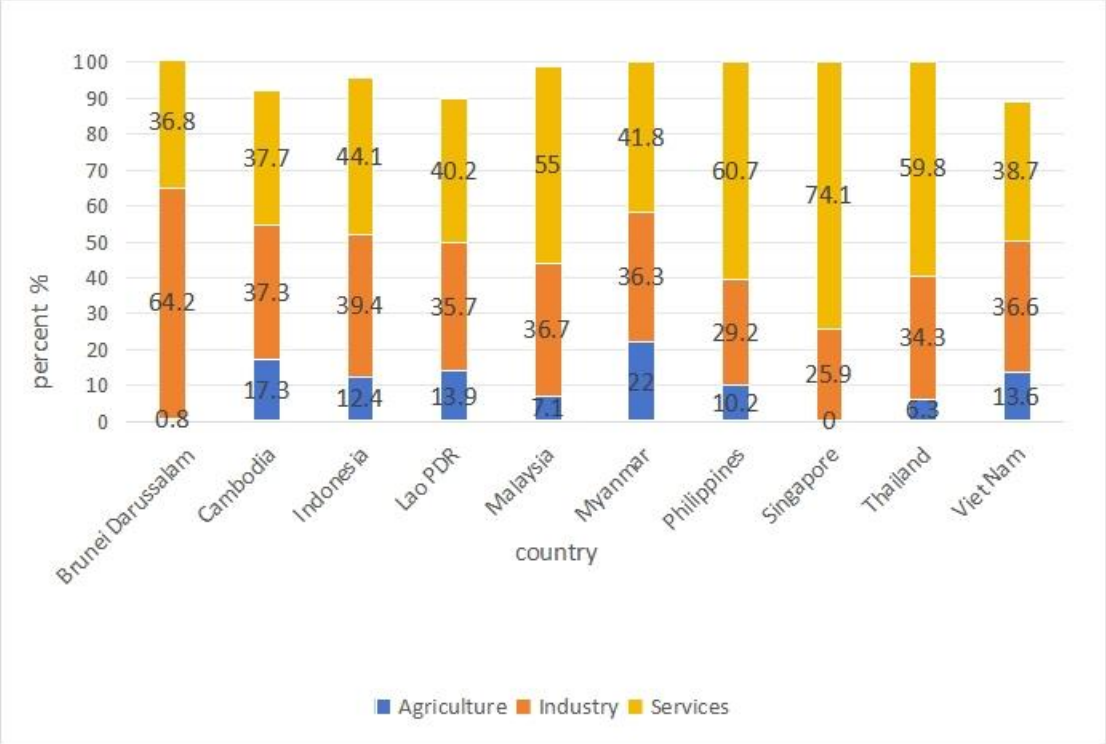

Figure 7 Contributions of key economic sectors to total GDP (%) by ASEAN Member States, 2020.

Source: ASEAN Sec, ASEAN Stats DB

Note: The total of these three sectors may not equal 100% due to variations in statistical discrepancies among AMS.

The figure illustrates the economic structure differences among ASEAN member states in 2020. With the exception of Brunei, the service sector is the leading sector across all ASEAN countries. Singapore has the highest share at 74.1% of its GDP,

followed by the Philippines at 60.7%, Thailand at 59.8%, and Malaysia at 55%. Trends in macroeconomic development show that the service sector is crucial for economic growth and industrial upgrades. More developed nations, like Singapore and Thailand, have a larger service sector share. Overall, ASEAN countries are shifting from agriculture to a modern economy focused on industry and services, emphasizing the service sector's importance in economic development.

Fourthly, the mechanism of tourism development on industrial structure upgrading. Upgrading industrial structure is essential for driving economic growth. (Pened-er,2003) and is central to building a modern economic system. Its mechanisms are primarily reflected in the following aspects: ①Direct Economic Contributions: Tourism attracts visitors, directly driving their consumption behavior at the destination, involving dining, accommodation, transportation, shopping, and entertainment. These consumption activities not only increase the income of local businesses but also promote employment. Additionally, increased tourism consumption can stimulate new business models and consumer demands, such as specialty lodging and experiential tourism, further pushing the industrial structure towards the service and experience economy. ②High Investment Returns and Growth Potential: Tourism offers a high return on investment and considerable growth potential, attracting significant foreign direct investment (FDI). This investment not only funds the tourism sector but also introduces advanced management practices and technology, improving service quality and efficiency. Additionally, foreign investment fosters the growth of related local industries, such as hotel construction and attraction development, further diversifying the local economy. ③Infrastructure Development: The development of tourism requires robust infrastructure support, including transportation, communication, and public services. To attract more tourists, local governments and private sectors invest in improving and expanding infrastructure. These infrastructure developments and upgrades not only serve the tourism industry but also benefit other industries and local residents, improving overall economic efficiency and quality of life. ④Industrial Chain Integration: The growth of tourism necessitates a convenient transportation network, promoting the construction and upgrading of road, rail,

and air transport infrastructure, while also driving the development of the transportation service industry. The growth of these industries, in turn, creates numerous employment opportunities, enhancing employment levels. Additionally, tourism fosters the diversification of cultural products and entertainment services, such as performances, theme parks, museums, and art exhibitions, enriching tourism products and promoting the development of the cultural and creative industries.

Tourism development directly stimulates related industries like transportation, catering, accommodation, and cultural entertainment. By promoting industrial integration, tourism serves as a key driver for upgrading industrial structures (Li et al., 2013).

Tourism plays a crucial role in optimizing regional industrial structures by boosting consumption, attracting foreign investment, and enhancing infrastructure. It not only fosters related industries, increases economic income, and creates jobs but also encourages economic diversification and sustainable development. Overall, tourism is essential for regional economic growth and upgrading industrial structures (Wu & Zhao, 2019).

1.2 Objectives of the Study

1.2.1 Impact of Tourism on Industrial Upgrading

To analyze the impact of tourism on the industrial structure upgrading in the China-ASEAN Region.

1.2.2 Mediating Effects of Employment and Capital To explore mediating effects of employment level and capital accumulation in tourism development on industrial structure upgrading in China-ASEAN region.

1.2.3 Moderating Effects of Urbanization and Environment

To analyze moderating effects of urbanization and environmental quality on the upgrading of industrial structure in the China-ASEAN region through tourism development.

1.3 Significance of the Study

1.3.1 Theoretical Support and Policy Guidance

Tourism development in the China-ASEAN region can drive industrial upgrading through cross-sector synergy and value chain integration. Key measures include enhancing tourism product quality, fostering cultural-creative industry convergence, and implementing green development practices. These strategies offer policy insights to optimize industrial structures and boost regional sustainable growth.

1.3.2 Analyzing the Mediating Effects

This study examines how tourism drives industrial upgrading in the China-ASEAN region through employment growth and capital accumulation. Tourism expands service-sector jobs (e.g., hospitality, transport) while attracting infrastructure investments, shifting economies from agriculture to higher-value sectors. These mechanisms enhance industrial diversification and regional competitiveness, offering policymakers insights for aligning tourism development with economic restructuring.

1.3.3 Analyzing the Moderating Effects

This study investigates how urbanization and environmental quality shape tourism's impact on industrial upgrading in the China-ASEAN region. While tourism accelerates urbanization and service-sector growth, it also intensifies resource pressures. Similarly, it poses ecological risks yet can incentivize sustainable practices. These findings offer policymakers critical insights for balancing tourism development, urban expansion, and environmental protection to achieve green economic transformation.

1.4 Scope of the Study

1.4.1 Spatial Scope

The study will collect and analyze data from China and nine ASEAN countries—Singapore, Thailand, Malaysia, the Philippines, Indonesia, Cambodia, Laos, Vietnam, and Myanmar—covering the period from 2000 to 2020, using statistical data, policy documents, and literature to assess the impact of tourism development on industrial structure upgrading in the China-ASEAN region. Brunei has been excluded from the study due to its small economic scale, singular industrial structure that does not represent

ASEAN's overall industrial upgrading characteristics, limited data availability, and weak regional economic ties.

1.4.2 Time Range

The study period (2000-2020) was selected for three reasons: (1) pre-2000 ASEAN tourism data were incomplete and economically insignificant; (2) post-2000 data became more comparable due to enhanced China-ASEAN tourism cooperation; (3) post-2020 data were excluded due to COVID-19 distortions and reporting lags. This timeframe ensures data reliability while capturing tourism's key development phase

1.5 Definition of terms

1.5.1 Tourism development

Tourism development encompasses the sector's growth and its multifaceted impacts—economic, social, cultural, and environmental—on host regions. These impacts, positive or negative, hinge on management effectiveness. This analysis emphasizes tourism's role in reshaping regional industrial structures through economic growth, employment, technology, and sustainability.

1.5.2 Mediating effect

It refers to the phenomenon where one or more variables (mediating variables) act as intermediaries in the relationship between an independent variable and a dependent variable. Simply put, the mediation effect reveals how one variable affects a third variable through another variable. In this context, the analysis of mediation effects explores the specific mechanisms by which tourism development (independent variable) influences industrial structure upgrading (dependent variable) through certain mediating variables (such as increased employment opportunities, technological progress, capital investment, etc.). These mediating variables play a role in transmitting the effects of tourism development to the outcomes of industrial structure upgrading.

1.5.3 Moderating effect

Moderation effects describe how external factors alter the strength direction of a relationship between two variables. Unlike mediators, moderators don't explain the relationship but show when or under what conditions it changes. In tourism-driven

industrial upgrading, factors like urbanization, infrastructure, or technology can intensify or weaken this effect. Recognizing these conditional relationships helps policymakers target interventions more precisely.

1.5.4 Upgrading of industrial structure

Industrial Upgrading shifts economies from manufacturing toward high-tech and advanced services. As modern sectors like finance and IT grow, they boost productivity, global competitiveness, and sustainability by reducing resource dependence and pollution. This transition marks critical economic progress.

1.6 Conceptual Framework

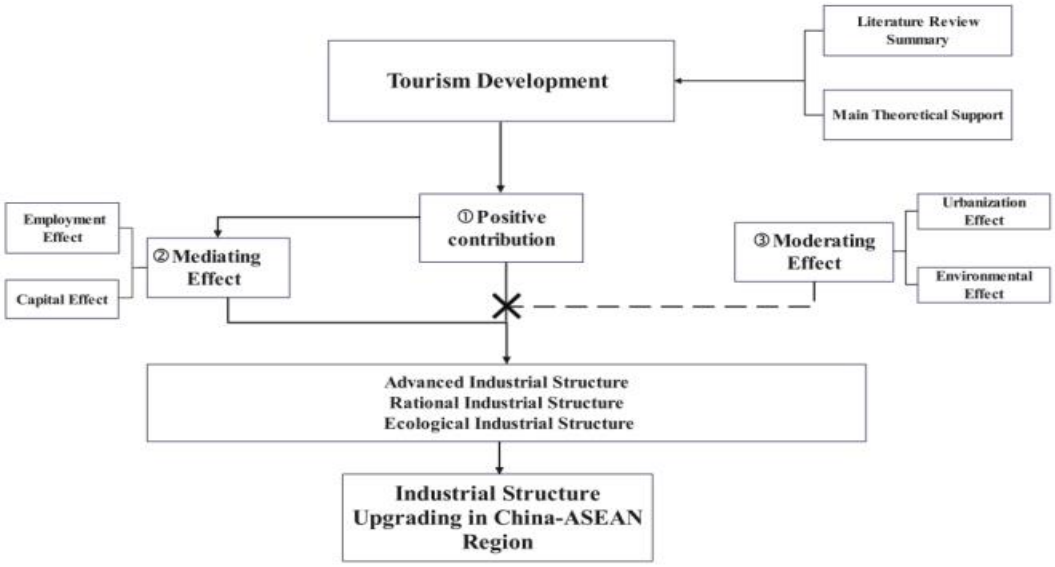

Figure 8 Conceptual Framework

Source: Determined by the researcher.

Remark: ①Positive contribution is Objective 1.

②Mediating effect is Objective 2.

③Moderating effect is Objective 3.

CHAPTER 2
REVIEW OF THE LITERATURE

Literature review related to this investigation, the researcher reviewed relevant theory and literature review in order to introduce the following topics.

2.1 Theoretical concepts

2.1.1 Stages of economic growth theory.

2.1.2 New Structural Economics Theory.

2.1.3 The Solow Neoclassical Growth Model.

2.1.4 Endogenous Growth Theory.

2.2 Related Research

2.2.1 Research on China-ASEAN tourism Development.

2.2.2 Relevant Research on Industrial Structure Upgrading.

2.2.3 Research on the relationship between tourism development and industrial structure upgrading.

2.1 Theoretical Concepts

The study using the economic growth stage theory, new structural economic theory, Solow's neoclassical growth model, and the endogenous growth theory as the research foundation. These theories collectively provide a comprehensive explanation of tourism's support for China-ASEAN industrial upgrading. The economic growth stage theory analyzes the impact of tourism at different development stages, while new structural economics emphasizes the dynamic evolution of industries and comparative advantages. Solow's model links tourism growth to capital/technology gains, while endogenous theory emphasizes knowledge and human capital as drivers of industrial advancement. Together, these four theories offer a robust framework, revealing how tourism can promote China-ASEAN industrial upgrading through multiple pathways. The detailed analysis is as follows.

2.1.1 Stages of Economic Growth Theory

Economic Growth Stages Theory (Rostow, 1960) categorizes development into five phases in The Stages of Economic Growth: A Non-Communist Manifesto.

1. Traditional Society Stage: The economy mainly relies on agriculture and hunting, with low levels of technological development and limited capital accumulation.

2. Preconditions for Take-off Stage: Manufacturing industries begin to emerge, infrastructure develops, and the groundwork for industrialization is laid.

3. Take-off Stage: Rapid industrialization occurs, with significant increases in investment and accelerated urbanization.

4. Drive to Maturity Stage: The economy starts to diversify, with high-value-added industries and services gradually dominating.

5. Age of High Mass Consumption Stage: Consumption becomes the main driver of economic growth, with the service sector taking a leading role.

Rostow's Growth Theory outlines the transition from agrarian to industrial societies, with tourism development during the take-off stage requiring enhanced infrastructure and services. Infrastructure construction not only directly creates job opportunities and economic activities but also indirectly promotes the development of the construction and manufacturing industries. Additionally, as a labor-intensive industry, tourism provides employment opportunities for a large labor force, which is particularly important for alleviating high unemployment rates in rural areas during the take-off stage. It also offers significant retraining and transfer opportunities for the workforce. Foreign investors' investment in tourism-related projects such as hotels and resorts not only increases foreign capital inflow but also introduces new technologies and management skills, including cultural exchange, business cooperation, and technology transfer, helping to enhance the region's international standing and economic development level. Therefore, the vigorous development of tourism not only promotes regional economic growth but also enhances the region's international image and competitiveness, demonstrating its potential and importance in modern economic development.

Moreover, developing tourism during the economic maturity stage not only promotes economic development but also significantly advances cultural dissemination and environmental protection. Through ecotourism and cultural tourism, tourism helps protect natural resources and cultural heritage, while promoting the concept of sustainable tourism, providing long-term sustainable support for the region's economic and social development. Tourism plays a crucial role in the economic transformation of the China-ASEAN region, effectively facilitating the shift from a traditional agricultural economy to a modern, service-oriented economy.

Given the importance of tourism at various stages of economic development, policymakers should consider designing strategies aimed at improving the quality of tourism services, expanding international market access, and promoting regional tourism cooperation to maximize its positive impact on industrial upgrading. These include enhancing service quality through more training for tourism practitioners and implementing quality certification systems; expanding international market access through more open visa policies and enhanced digital marketing to attract international tourists; promoting regional tourism cooperation by establishing multilateral tourism cooperation frameworks and improving cross-border transportation to increase tourism flow; leveraging technological innovations such as virtual reality and artificial intelligence to enhance tourism experiences and optimize management; and continuously focusing on sustainable tourism development by promoting environmentally friendly policies and regulating the impact of tourism on natural resources. These strategies will help enhance the global competitiveness and attractiveness of the China-ASEAN region's tourism market, thereby promoting economic development and industrial upgrading.

The paper uses data from the China-ASEAN region to validate the applicability and limitations of the Rostow model in the modern economic environment. The following steps and analytical methods can be followed:

The collection of statistical data on tourism development in the China-ASEAN region is essential. This data should include, but not be limited to, the contribution of tourism to GDP, the proportion of tourism-related employment relative to total employment,

the volume of foreign tourist arrivals, tourism revenue, and investments in tourism-related infrastructure, such as hotels and transportation facilities. Additionally, data on industrial structure should be gathered, focusing particularly on output and employment figures from the service, manufacturing, and agricultural sectors.

The study contrasts nations with developed versus underdeveloped tourism sectors to examine tourism's role in economic growth stages. It specifically evaluates how tourism accelerates the "take-off" phase in Rostow's model, facilitating the shift from agrarian to service-based economies. It is important to highlight that the Rostow model does not fully incorporate contemporary economic factors such as globalization, technological innovation, and policy changes that significantly impact tourism and economic development. The research will also discuss the discrepancies between the linear development trajectory proposed by the Rostow model and the nonlinear, dynamic transformations observed in real-world industrial development.

Based on the analysis results, this study assesses tourism's structural impact on the China-ASEAN economy, tests Rostow's theory in modern contexts, and provides actionable recommendations for leveraging tourism-driven growth.

2.1.2 New Structural Economics Theory

New Structural Economics (Lin, 2010) attempts to integrate the strengths of both neoclassical economics and structuralist economics, providing a theoretical framework and policy recommendations for economic development and transformation in developing countries. Against the backdrop of globalization, Lin observed that traditional economic development theories did not fully explain the challenges faced by developing countries, particularly in addressing their comparative disadvantages and choosing suitable development paths. New Structural Economics advocates leveraging existing comparative advantages, with moderate government intervention to address market failures, and gradually promoting industrial upgrading. This theoretical framework also focuses on structural constraints of the market and pursues economic efficiency. Through empirical research by Lin and other scholars, New Structural Economics has been applied

and validated in the development strategies of multiple countries, continuously enriching and improving its theoretical foundation and practical impact.

New Structural Economics posits that countries should devise development strategies tailored to their resource endowments and comparative advantages. In the context of the China-ASEAN region, both areas exhibit unique comparative advantages in terms of tourism resources, cultural heritage, geographical attributes, and varying economic conditions, which collectively provide guidance for tourism development.

China boasts a diverse array of natural landscapes, ranging from the snow-covered vistas in the north to the tropical rainforests in the south, exemplified by iconic locations such as the Yellow Mountains and Jiu zhai gou National Park. The country is also home to significant cultural landmarks, including the Great Wall, the Forbidden City, and the Terracotta Warriors, all of which reflect its rich history and profound cultural heritage. With its diverse climate zones, China offers a wide variety of tourism activities, accommodating everything from winter sports to year-round travel; the well-developed infrastructure further ensures high-quality experiences for tourists. In contrast, ASEAN countries such as Bali, Boracay, and Phuket are celebrated for their stunning beaches, while historical sites like Angkor Wat and Borobudur showcase the cultural depth of the region. Positioned near the equator, these countries enjoy consistently warm climates that are ideal for winter retreats. Although infrastructure development may be uneven across the region, the relatively low costs attract backpackers and younger travelers.

In addition to recognizing the pivotal role of market dynamics in resource allocation, New Structural Economics emphasizes the constructive role of government in fostering economic development. It is imperative for governments to enhance infrastructure, provide education and training, support research and development, and assist enterprises in overcoming market failures, thereby promoting industrial upgrading and technological advancement. In the China-ASEAN region, government entities play vital roles in tourism development by establishing legal and regulatory frameworks that facilitate sustainable tourism practices. For instance, China's Tourism Law and various tourism cooperation agreements among ASEAN countries aim to enhance service quality

and protect tourist rights. Investments in infrastructure—such as expanding airports, constructing highways, and upgrading tourist sites—directly improve accessibility and enhance visitor experiences. Additionally, tax incentives aimed at tourism-related businesses reduce operational costs and encourage further investment and expansion.

The application of industrial policies is advocated within New Structural Economics to promote sectors that leverage comparative advantages, guided by government support and direction. These industrial policies must be adaptable, responding to actual conditions and shifting market dynamics to achieve ongoing economic optimization. Changes in market demand compel tourism service providers to continuously innovate and refine their offerings to align with evolving consumer preferences. The emergence of eco-tourism and low-carbon tourism, for example, has prompted many companies to develop environmentally friendly and socially responsible travel options. Public-private partnerships are crucial for sustainable tourism development, as they synergize the private sector's innovative capabilities with government resources and policy support. This collaboration effectively facilitates infrastructure projects, enhances service quality, and encourages the implementation of new technologies and management practices within the tourism sector. The interplay of government intervention, effective market mechanisms, and public-private collaborations has bolstered tourism growth in both China and the ASEAN countries, enhancing economic contributions and increasing international competitiveness.

As economies advance and factor endowments undergo transformation, a country's comparative advantages are subject to dynamic change. Consequently, it is essential for governments to continually adjust and optimize their industrial policies, fostering a transition from low to high-value-added industries to ensure sustainable economic growth. Tourism, given its multifaceted nature, stimulates not only the growth of the hotel, catering, transportation, entertainment, and cultural sectors but also indirectly influences broader economic landscapes and the optimization of industrial structures. Moreover, tourism stimulates the production of local agricultural goods, handicrafts, and cultural products, which often become significant souvenirs that boost revenue and

development prospects in these sectors. The demand generated by tourism also fuels the entertainment and cultural industries, promoting local theater performances, music shows, and art exhibitions, thus further enhancing the allure of tourist destinations.

Emphasizing inclusive development, New Structural Economics advocates for social equity and environmental sustainability alongside economic growth. By fostering employment opportunities, improving income distribution, and ensuring environmental sustainability, the framework aims to ensure that economic development benefits a broader population. The employment and capital effects generated by tourism development have profound implications for regional economies. As a labor-intensive industry, tourism creates numerous job opportunities across various roles, including front desk receptionists, tour guides, and hotel service staff, offering diverse employment options for local communities. The capital effects manifest in increased tourism revenue, which promotes capital investment and technological advancements, thereby enhancing service quality and operational efficiency. Moreover, tourism development can facilitate economic diversification, reducing reliance on singular economic activities while promoting more stable economic growth.

In the context of vigorous tourism development, balancing economic growth, environmental protection, and community development is essential. Ecotourism emphasizes minimal environmental impact while providing educational experiences and promoting community well-being. Through ecotourism, natural resources can be protected while raising visitors' environmental awareness. For example, establishing protected areas or nature parks not only preserves biodiversity but also generates stable income through entrance fees, guided services, and other activities. Additionally, tourism projects can support local agricultural and artisanal products, promoting economic diversification. As tourism develops, urbanization may accelerate, leading to uneven resource distribution and environmental pressures. Measures can be taken to guide orderly tourism development, such as strict urban planning policies, protecting historical and cultural heritage, natural landscapes, and promoting infrastructure construction to ensure tourism development aligns with urbanization. From the perspective of New

Structural Economics, promoting sustainable tourism development involves pursuing economic benefits while considering the long-term well-being of the environment and communities. Implementing ecotourism, encouraging community participation, and using tourism to promote environmental protection and community development can ensure economic growth while effectively managing and mitigating the potential environmental and social costs of tourism. Through effective regional cooperation, policies can be better coordinated, resource allocation optimized, and the overall attractiveness and competitiveness of the region enhanced, promoting sustained growth and prosperity in the tourism industry.

2.1.3 The Solow Neoclassical Growth Model

The Solow Neoclassical Growth Model (Robert Solow,1956) is an important theory for explaining economic growth. The model primarily analyzes the impact of capital accumulation, labor force growth, and technological progress on output, using the Cobb-Douglas production function.

$$Y = AK^{\alpha}L^{1-\alpha}$$

where Y is output,

A is the technology level,

K is capital stock,

L is labor.

α is capital's share, $0 < \alpha < 1$

$1 - \alpha$ is labor's share

This model provides theoretical support for promoting industrial structure upgrading in the China-ASEAN region through tourism development from several aspects: tourism investment and capital accumulation, labor force growth and transfer, technological progress and innovation, government support, and regional cooperation.

The development of tourism necessitates significant investments in infrastructure and service facilities, including hotels, resorts, attractions, and transportation systems. Such investments contribute directly to an increase in capital stock, thereby fostering the growth of the tourism sector and its related industries. For instance, the Chinese government has actively promoted tourism development through

substantial investments in transportation infrastructure, including high-speed railways and airports, which significantly enhance accessibility for tourists.

Investment in infrastructure not only bolsters the capital stock within the tourism industry but also stimulates capital accumulation in related sectors, such as construction and real estate. The development of integrated resorts like Marina Bay Sands in Singapore exemplifies this phenomenon; it has not only enhanced the allure of the destination for tourists but has also spurred growth in the surrounding commercial and housing markets.

Moreover, tourism development generates substantial spillover effects that drive investment in ancillary industries. For example, following the opening of Shanghai Disneyland in China, there was a notable acceleration in the development of nearby catering and retail sectors, which attracted a significant influx of tourists and consumer spending, thus promoting local economic growth. These spillover effects extend beyond industries directly associated with tourism and can influence a broader range of economic sectors. For instance, Singapore's ecological tourism initiatives, such as Jurong Bird Park and the Singapore Zoo, have facilitated capital accumulation in the environmental protection and education industries.

Tourism investments and industry spillovers have driven structural optimization in China-ASEAN, fostering economic diversification and technological advancement. These effects mirror the Solow Model's growth trajectory, demonstrating tourism's catalytic role in regional industrial upgrading.

The development of tourism creates numerous employment opportunities, attracting labor from traditional agriculture and manufacturing to high value-added industries related to services and tourism. This labor reallocation improves overall labor productivity, consistent with the labor growth and shift theory in the Sol ow Model. In Thailand, tourism has become a vital employment source, shifting a large amount of labor from agriculture to tourism and services, particularly in tourist hot spots like Phuket and Chang Mai. This transition significantly enhances local residents' income levels and living standards. Singapore attracts a large number of high-quality labors through the

development of high-end tourism and the convention economy, with the government and enterprises providing ample training and educational opportunities, enhancing labor skills and human capital accumulation. The tourism industry requires labor to possess higher service skills and quality, prompting educational and training resources to tilt towards tourism-related sectors. Through labor transfer and skill enhancement, tourism plays a crucial role in promoting economic growth and industrial structure upgrading in the China-ASEAN region.

As tourism upgrades and becomes more high-end, it spawns many high value-added industries and services, such as cultural creativity, health tourism, and customized tourism. These industries' development drives the overall economic structure towards high value-added and high-tech directions. Various regions in China have developed cultural tourism projects, leveraging local historical and cultural resources to promote the development of the cultural and creative industries. Singapore attracts a large number of international tourists by promoting health tourism and medical tourism, enhancing the added value and technological content of the tourism industry. While providing customized tourism services, Thailand has developed related training and certification systems, improving the quality and professionalism of tourism services.

China-ASEAN governments drive tourism growth through infrastructure upgrades and strategies like China's Belt and Road and Thailand 4.0. Regional cooperation (e.g., ASEAN-China FTA, joint tourism routes like GMS projects) enhances market integration and resource sharing. These efforts collectively boost industrial upgrading and sustainable economic diversification.

Tourism drives industrial upgrading in China-ASEAN via capital accumulation, labor growth, and technological progress—core elements of the Solow framework. This catalytic role advances regional economies toward efficiency and diversification, aligning with the model's growth trajectory.

2.1.4 Endogenous Growth Theory

This theory is an extension of traditional neoclassical growth models, emphasizing that economic growth is not solely dependent on external factors like

technological progress but can be achieved through endogenous economic activities. It posits that sources economic growth is inherent within the economic system itself. This primarily includes the following aspects: (1) Human capital development enhances labor productivity through education and training, serving as a cornerstone of long-term economic expansion. (2) Corporate-led technological innovation, driven by R&D investments, elevates production efficiency to propel economic growth. (3) Knowledge diffusion. Knowledge has spillover effects; an innovation by one firm can influence other firms through imitation and technological diffusion, thereby improving overall economic productivity.

Models within endogenous growth theory include the Romer model and the Lucas model. The Romer model establishes technological innovation as an endogenous engine of economic growth, where knowledge accumulation and diffusion stem directly from dedicated R&D investments. The production function in this model typically takes the form.

$$Y = AK^{\alpha}L^{\beta}$$

where Y is output,

A is the technology level,

K is capital stock,

L is labor.

α is capital's share, $0 < \alpha < 1$

β is labor's share.

A increases overtime through R&D activities. This model suggests that sustained R&D investment and technological innovation can achieve long-term endogenous economic growth. The Lucas model highlights the importance of human capital in economic growth, asserting that education and training enhance labor skills, thereby increasing productivity.

The production function in this model is,

$$Y = AK^{\alpha}(\mu H)^{1-\alpha}$$

where Y is output,

A is the technology level,

K is the capital stock,

L is the labor.

α is the capital's share, $0 < \alpha < 1$

$1 - \alpha$ is human capital's share

μ is the time fraction devoted to production,

H is level of human capital.

By increasing investment in education and training, human capital can be enhanced, enabling long-term endogenous economic growth. Endogenous growth theory proposes that governments can intervene to promote economic growth, for example, by investing in education and training to improve human capital quality, encouraging R&D and innovation to drive technological progress, and protecting intellectual property to incentive innovative activities while facilitating knowledge diffusion and application.

Endogenous growth theory emphasizes achieving long-term economic growth through human capital accumulation, technological innovation, and knowledge diffusion. This provides a theoretical framework for understanding how the tourism industry can promote industrial structure upgrading in the China-ASEAN region. By enhancing labor quality through education and training, stimulating R&D and innovation to drive technological progress, and facilitating the diffusion and application of knowledge, tourism plays a crucial role in driving economic growth and optimizing industrial structures.

2.2 Relevant studies

The literature relevant to this study consists of three main areas, specifically:

2.2.1 Research on China-ASEAN Tourism Development.

Current research on tourism development in the China-ASEAN region mainly focuses on the following aspects.

Regional Tourism Cooperation: (Bowerman,2014) pointed out that regional tourism cooperation has become a critical trend in global tourism development. With the

increasing importance of the Chinese market, more and more ASEAN countries are paying attention to tourism cooperation with China. This cooperation promotes the development of the tourism industry and fosters regional economic integration. (T. Chang 2004), through a case study of Singapore, noted that regional tourism cooperation can fully utilize the strengths of each country, achieving resource sharing and complementarity.

Economic Contribution of Tourism: (Yunitaningtyas, K., Yolanda, A., & Indahwati. 2019) found through the panel data regression analysis domestic tourism and tourism consumption have a positive impact on the GDP for ASEAN countries. (Ariff, M., Selvaraju, M. A. P., & Yusop, M. ,2005) further pointed out that internal tourism cooperation within ASEAN positively contributes to regional economic growth. This contribution is not limited to increased tourism revenue but also includes infrastructure development, job creation, and other comprehensive effects. (Li&L. Lye ,2012) discussed the challenges and strategies of China-ASEAN connectivity, emphasizing the importance of infrastructure development and policy coordination.

Regional Development Contribution: (Sadi, M. A. & Bartels, F. L.,1999) pointed out that the development of human resources in the ASEAN tourism industry is insufficient, which to some extent limits the competitiveness of the regional tourism industry. They suggested that governments should enhance the training and capacity building of tourism industry practitioners to improve service quality and market competitiveness. (Wang, Huang, Yu, & Cao,2016) indicated that the scale and quality of urbanization have positive impact on tourism development, with neighboring areas' urbanization having a positive impact on tourism economic development.

Green Tourism Development: In China's Jiuzhaigou Nature Reserve, tourism development has not led to environmental degradation; some indicators have even shown improvement. This is because residents' participation in tourism has reduced agricultural and hunting activities (Li, Zhang, Liu & Xue, 2006). (Santos-Roldán et al.,2020) pointed out that health tourism, as a part of sustainable tourism, can effectively promote tourism industry, especially in context of the COVID-19 pandemic, which has increased

interest in sustainable tourism. Green tourism development projects, by utilizing natural and cultural resources, can effectively promote economic sustainability while demonstrating significant potential in the digital age and environmental protection.

Currently, research methods on the tourism economic development of China-ASEAN are diverse, including literature reviews, panel data regression analysis, SWOT analysis, social network analysis, case studies, and historical analysis. These methods can reveal the current state and issues of regional tourism cooperation from different perspectives.

Through these studies, it is evident that the China-ASEAN tourism economy has achieved significant results in regional cooperation, economic contribution, urbanization process, and green development. These findings fully affirm the positive contribution to the regional economy and reflect the diversity and complexity of tourism economic cooperation, development, and sustainability in the China-ASEAN region, providing a solid theoretical foundation for this study.

Table 3 Summary of China-ASEAN tourism development.

Authors	Year	Title	Main Findings	Research Methodology
G. Bowerman	2014	All Around the World: Tourism Marketers Target China.	Regional tourism collaboration is gaining global traction.	Literature review and strategic analysis
T. Chang	2004	Tourism in a 'borderless' world: the Singapore experience	Regional tourism cooperation can build on national	Case study and strategic analysis

Authors	Year	Title	Main Findings	Research Methodology
			strengths.	
M. Ariff, Mala A P elvaraju& M. Yusop	2005	Commonalities in ASEAN Tourism Development: Harnessing the Power of Cooperation.	Intra-ASEAN tourism cooperation contributes positively to regional growth.	Statistical analysis
Chenyang Li& L. Lye	2012	China-ASEAN Connectivity: China's Objectives, Strategies, Projects and Challenges.	Explores challenges and strategies for China-ASEAN connectivity.	Strategic analysis
Yunitaningtyas &Indahwati	2019	Impact of Domestic Tourism and Tourism Consumption on ASEAN Countries' GDP.	Domestic tourism and tourism consumption have a significant positive impact on the GDP of ASEAN countries.	Panel data regression analysis
Wang Kun, Huang Zhenfang, Yu Fenglong& Cao Fangdong	2016	The Spatial Effects of Urbanization on Tourism Economy in China.	Urbanization has significant spatial effects on the tourism economy, with economic agglomeration and infrastructure construction	Spatial Econometric Model, Empirical Analysis

Authors	Year	Title	Main Findings	Research Methodology
			jointly promoting tourism development.	
Santos-Roldán et al.	2020	Sustainable Tourism as a Source of Healthy Tourism	Sustainable tourism, especially in the context of COVID-19, promotes less crowded destinations and responsible tourism.	Literature review and Structural Equation Modeling
M. A. Sadi, Frank L& Bartels	1999	Recent Developments in the Association of South East Asian Nations (ASEAN) Tourist Industry.	Manpower development in ASEAN tourism industry is insufficient.	Historical analysis and strategic recommendations

Source: Determined by the researcher.

2.2.2 Relevant Research on Industrial Structure Upgrading.

Optimization and upgrading of industrial structure are generally considered closely linked to economic development, aiming to promote the sustainable and coordinated development of the three major industries. In the process of promoting industrial upgrading, the matching and coordination of industrial structure with resource allocation structure, technological structure, and supply-demand structure are particularly important.

The economic growth of a country or region is closely related to the degree of industrial structure upgrading. (Walt W. Rostow,1960), American economic historian

Walt Whitman Rostow divided the development of industrial economics into six stages that must be experienced. He laying a solid foundation for future theoretical research in this area. After analyzing and investigating the productivity gaps between countries at different development stages, he concluded the relationship between the inevitable stages of economic development and the renewal of leading industries: At any stage of economic development, whether at the initial or advanced stage, there is a leading industry whose development and progress not only promote the enhancement and progress of related industrial chains through spillover effects but also drive the development of the entire industry and society.

American development economist (A.O. Hirschman,1958) pointed out that developing countries and regions should concentrate their relatively advantageous capital and resources to develop potential industries and gradually extend to other sectors to achieve common progress in the entire economic sector. Japanese economist (Sanpei Shinohara ,1955). Hirschman's unbalanced growth theory prioritizes industrial upgrading in sectors with high ROI, subsequently extending to related industries. It further designates demand-elastic sectors as leading industries amid rising incomes, directly informing Japan's 1960s industrial policies.

Industrial structure upgrading in China-ASEAN's economic development represents a dynamic evolution aligned with economic trends. Chinese scholars have extensively researched this field: (Gan, Zheng & Yu, 2011) analyzed correlations between industrial upgrading and regional economic growth, while (Zhou, 1992) proposed dual adjustment paths: transitioning to higher industrial tiers and enhancing cross-sectoral resource integration and correlation.

Among these, industrial structure upgrading is an important indicator to measure the economic development level and industrial upgrading capacity of a country or region. It involves the transition of the industrial structure from being dominated by agriculture and manufacturing to being dominated by services and high-tech industries, reflecting the economy in terms of knowledge, technology content, and added value. Industrial structure upgrading can be evaluated in three ways: Through the proportion of

industrial added value, i.e., the percentage of added value of a specific industry to GDP. Through the industrial employment structure, i.e., the percentage of employment in a specific industry to total employment. Through labor productivity, i.e., the ratio of industry added value to industrial employment, with particular attention to high-tech industries and services. (W, Pan& Liu,2017) studied the method of measuring industrial upgrading through the changes in the angles between the value-added proportions of the three industries and their corresponding coordinate systems. This measurement method provides a new quantitative approach to industrial structure upgrading by calculating the angle changes of the value-added proportions of the three industries with the coordinate system. The cosine method of angles can effectively capture the subtle differences in internal economic structure changes, providing a relatively objective and precise measurement tool for assessing the industrial upgrading process.

Industrial structure rationalization constitutes a multifaceted process assessing sectoral distribution, development levels, and growth potential. It aims to achieve sustainable economic efficiency through sectoral rebalancing. For measurement, (Yao,2019) employed the tertiary-to-secondary industry output ratio—a metric indicating macroeconomic maturity and the transition toward service/knowledge-driven economies.

(Xu & Zhang, 2016) expanded industrial structure optimization to include ecological transformation—embedding sustainability principles across economic systems to foster eco-friendly restructuring. Complementing this, (Zhang, Tang, Xiao & Xiang, 2023) demonstrated in 39 Loess Plateau cities that industrial-efficiency coordination enhances green development. Concurrently, (Hu, Wang & Xia, 2023) quantified structural greening via the energy-GDP ratio (1985–2009), establishing its utility for environmental-economic synergy.

Table 4 Summary of research on Industrial structure upgrading.

Authors	Year	Title	Main Findings	Research Methodology
Walt Whitman Rostow	1995	The Stages of Economic Growth	Economic development stages are linked to leading industries; industrial	Analysis of productivity gaps and economic development stages

Authors	Year	Title	Main Findings	Research Methodology
			upgrading drives overall progress.	across different countries.
Zhou Zhenhua	1992	Securities Market and Industrial Structure Adjustment	Analyzed the role of the securities market in facilitating industrial structure adjustment.	Examination of the interaction between the securities market and industrial structure changes using financial and economic data.
Yao Zhanqi	2019	The Impact of Service Industry Opening on China's Industrial Structure Upgrading	Examined the impact of opening up the service industry on the upgrading of China's industrial structure.	Analysis of service industry data and its effects on industrial structure using statistical and empirical methods.
Hirschman, A. O.	1958	The Strategy of Economic Development	Economic development requires focused investment in key sectors to stimulate overall growth. The concept of unbalanced growth is proposed, where strategic imbalances can drive development through linkages and complementarities.	Theoretical analysis, case studies, and historical examples.
Gan Chunhui, Zheng Ruogu,&Yu Dianfan	2011	The Impact of China's Industrial Structure Changes on Economic Growth and Fluctuations	Analyzed the relationship between industrial structure changes and economic growth and fluctuations in China.	Analysis of economic data to examine the effects of industrial structure changes on economic growth and fluctuation.
W. Xiao, Jiadong Pan& Liyun Liu	2017	China's Industrial Structure Upgrade in the “New Normal”: Empirical Test and Determinants	The study identifies key factors driving the upgrade of China’s industrial structure in the context of the “New Normal.” It highlights the role of technological innovation,industrial policy.	Empirical analysis using econometric methods. Data was collected from national statistical databases and analyzed using regression models.
Yao zhanqi	2019	The Impact of Opening Up of the Service Industry on the	The study explores the impact of opening up the service sector on the	Qualitative and quantitative analysis using case studies and

Authors	Year	Title	Main Findings	Research Methodology
		Upgrading of China's Industrial Structure	upgrading of China's industrial structure. It finds that increased openness in the service sector promotes industrial structure optimization and economic growth.	statistical data from various economic reports and databases.
Xu Xianying,&Zhang Xueling	2016	Construction and Measurement of Evaluation Index System for Optimization and Upgrading of China's Industrial Structure	Developed an evaluation index system for measuring the optimization and upgrading of China's industrial structure.	Construction and application of a comprehensive index system to evaluate industrial structure optimization and upgrading.
Fu Linghui	2010	An Empirical Study on the Relationship between Industrial Structure Upgrading and Economic Growth in China	Analyzed the relationship between the advanced industrial structure and economic growth in China.	Empirical analysis using statistical methods to examine the correlation between industrial structure upgrading and economic growth.
Sanpei Shinohara	1955	Theory of Industrial Structure	Optimization should start with high input-output ratio industries and extend to others; demand drives industry leaders.	Theoretical research and analysis of economic development data, emphasizing the importance of high-demand industries in economic policies.
Zhang, Q., Tang, X., Xiao, Y., Xiang, X., & Huang, H.	2023	Coordination of Industrial Structure and Eco-efficiency in Ecologically Fragile Areas: A Case Study of the Loess Plateau, China	Explored the coordinated development level of industrial structure and ecological efficiency in 39 prefecture-level cities on the Loess Plateau.	Analysis of industrial structure and ecological efficiency using data from 39 prefecture-level cities, focusing on green development through structural adjustments.

Authors	Year	Title	Main Findings	Research Methodology
Hu, M., Wang, Y., & Xia, B.	2023	What is the relationship between energy consumption and economic development? New evidence from a rapidly growing economic development region	Examines the relationship between energy consumption and economic development, finding a significant correlation and highlighting the need for sustainable energy policies.	Empirical analysis using panel data from rapidly growing economic regions, employing statistical and econometric methods.

Source: Determined by the researcher.

2.2.3 Research on the relationship between tourism development and industrial structure upgrading.

Since the 1990s, tourism has become a leading force in the service industry of developed countries, mainly focusing on those aspects.

(William Petty & Colin Clark, 1958) established economics' tertiary-sector analytical framework based on Fisher's classification, proposing the standard industrial structure model. Subsequent service-sector expansion refocused industrial upgrading research. (Lanza & Pigliaru, 2000) quantified tourism-manufacturing interplay through a two-sector growth model, revealing tourism's conditional economic significance—informing cross-sector policy design. (Algieri, 2006) contends small economies leverage geographic advantages for tourism specialization to stimulate growth via international demand yet require manufacturing coordination for sustained prosperity.

Some scholars have explored change based on the multi-sectoral growth model in light of China's geographical characteristics and have suggested that differences in technological progress and capital deepening are the source drivers of structural change (Xu, 2010) (Guo, Hang&Yan, 2020).

Table 5 Summary of research on the relationship

Authors	Year	Title	Main Findings	Research Methodology
William Petty, Colin Clark	1958	The Conditions of Economic Progress	Analyzed the factors and conditions necessary for economic progress, emphasizing the roles of productivity and industrial structure.	Examination of economic data and historical analysis to understand the conditions necessary for economic progress and the impact of industrial structure.
Lanza A,&Pigliaru F	2000	Tourism and Sustainable Economic Development	Explored the relationship between tourism development and sustainable economic growth, highlighting the potential benefits and challenges.	Tourism data economic indicators to assess the impact of tourism on sustainable development.
Algieri R.	2006	International Tourism Specialization of Small Countries	Analyzed how small countries can specialize in international tourism to achieve economic benefits.	Empirical analysis using tourism data and economic indicators from small countries to assess specialization impacts.
Xu Chaoyang	2010	Industrialization and Post-Industrialization: "Inverted U-shaped" Industrial Structure Change	Analyzed the inverted U-shaped trajectory of industrial structure changes during the transition from industrialization to post-industrialization.	Empirical analysis of industrial structure data over time, focusing on the transition phases and economic implications.
Guo Kaiming, Hang Jing, Yan Se	2020	Capital Deepening, Structural Transformation, and Skill Premium	Analyzed the relationship between capital deepening, structural transformation, and skill premium in the economy.	Empirical analysis using economic and labor market data to examine the effects of capital deepening and structural changes on skill premiums.

Source: Determined by the researcher.

To sum up, Current research primarily focuses on analyzing industrial structure from a macroeconomic perspective. Most investigations into the impact of

tourism tend to employ qualitative analyses, with a notable scarcity of quantitative approaches. Furthermore, the exploration of the mechanisms underlying the relationship between the tourism economy and industrial structure upgrading in the China-ASEAN region requires significant enhancement.

CHAPTER 3
METHODOLOGY

The methodology of this study by using the secondary data for analyses the impact of tourism development on the upgrading of industrial structure in the China-ASEAN region. The researcher then took a quantitative investigation by the following actions.

3.1 Variable selection.

3.2 Model construction.

3.3 Source of Data Variable.

3.4 Empirical analysis verification method.

3.1 Variable selection and descriptive statistics

3.1 Variable selection

3.1.1 Dependent Variable

The dependent variable is industrial structure upgrading, which includes three major dimensions: industrial structure advancement(sh), industrial structure ecologicalization (Se), and industrial structure rationalization (sr). These are the three key indicators for assessing industrial structure upgrading(se).

Among them, industrial structure advancement (sh) refers to the ratio of the output value of the tertiary industry to that of the secondary industry, following the approach of (Fu, Linghui.2010). This measure clearly reflects the trend of service-oriented economic structure, indicating whether the industrial structure is developing towards "servitization." Industrial structure ecologicalization (Se) is based on the method of (Ye, Zongyu. 2003), where the proportion of total energy consumption to GDP is used to calculate the ecologicalization of the industrial structure in China and ASEAN countries.

Industrial structure rationalization (Sr) refers to the quality of aggregation among industries. On the one hand, it reflects the degree of coordination among industries; on the other hand, it should also reflect the effective utilization of resources. In other words, it is a measure of the coupling degree between factor input structure and

output structure. In this regard, researchers generally use structural deviation to measure industrial structure rationalization, for which the Theil index is introduced here.

The Theil Index is a statistical measure used to assess income or wealth inequality, proposed by Theil & Henri in 1967. Some scholars have applied it to the study of regional income disparities (Wang, S., & Ouyang, Z., 2007). We find that the Theil index is also a good measure of industrial structure rationality. Based on their research, this paper redefines the Theil index, taking into account the uneven distribution of output and labor among industries (or sectors). It is the geometric mean of the natural logarithm of the ratio of individual income to total income, used to measure the income or efficiency differences among various industrial sectors. The calculation formula is as follows:

$$Theil\ Index = \sum_{i=1}^{n} \left(\frac{Y_i}{Y}\right) ln \left(\frac{Y_i}{L_i} / \frac{Y}{L}\right)$$

Among them, n=3: three industries (primary industry, secondary industry, tertiary industry).

Where Y_i is Total output of the i-th industry,

Y is Total output of all three industries,

L_i is Total labor population of the i-th industry,

L is Total labor population of all three industries,

$\frac{Y_i}{L_i}$ is Per capita output of the primary industry,

$\frac{Y}{L}$ is Per capita output of the overall economy.

This formula characterizes the structural differences between sectors by measuring the extent to which the output and efficiency (or income) of various industries deviate from the overall average level. If the per capita output of all sectors is the same as the national per capita output, the Theil index equals 0, indicating a reasonable industrial structure; otherwise, if the Theil index is not equal to 0, it suggests that the industrial structure deviates from a balanced state, indicating an unreasonable industrial structure.

3.1.2 Independent variable

In this study, tourism development is the independent variable. Foreign literature typically uses three indicators to measure the level of tourism development: the first is per capita tourism income (Lee, C., & Chang, C., 2008); the second is the ratio of tourist visits (Corte, 2008); the third is tourism specialization (Robertico et al., 2020). Following the conventions of existing research, this paper selects tourism specialization (i.e., the proportion of total tourism revenue to GDP) as the main indicator for measuring regional tourism development levels.

3.1.3 Control Variables

This study selects infrastructure, government expenditure scale, foreign trade dependency, technological progress, and institutional environment as control variables.

①Infrastructure (Infra): Infrastructure helps enhance the flow of factor resources and reduce transaction costs of products, thereby accelerating industrial structure upgrading. This paper is measured by the density of highway transportation infrastructure.

②Government Expenditure Scale (Gov): Government expenditure is the main means of implementing government macroeconomic regulation and control, which helps the flow of capital and labor among different industries. This paper uses the ratio of local government fiscal expenditure to GDP to represent it.

③Foreign trade dependency (FDI): This paper uses the ratio of foreign direct investment to GDP to represent the positive technological effects of FDI through technology introduction and diffusion, which has an active and catalytic role in industrial structure upgrading.

④Technological Progress (Tech): Technological progress plays an important role in regional economic growth and industrial structure upgrading. This paper uses the number of patent applications as a proxy variable.

⑤Institutional Environment (Inst): The institutional environment is an important factor affecting the efficiency of factor resource allocation. This paper uses the Economic Freedom Index to represent the institutional environment.

3.1.4 Mediating Variables

①Employment Effect (Emp): The employment effect is measured by the ratio of employment in the Service industry to total employment in the China-ASEAN region.

②Capital Effect (Cap): This article uses the total fixed capital formation to reflect the capital effect, which directly indicates the increase in investment in productive assets, thereby enhancing economic capacity and efficiency. At the same time, the development of the tourism industry promotes investment in infrastructure and service sectors, thus driving the optimization and upgrading of the industrial structure.

3.1.5 Moderating Variables

①Urbanization Effect (Urban): This article uses the ratio of urban population to total population in the countries of the China-ASEAN region, with total population calculated based on permanent residents.

②Environmental Effect (Env): This paper uses the ratio of carbon dioxide emissions, a typical air pollutant, to GDP as an indicator to construct the environmental effect.

3.2 Model construction

In the process of model construction, to determine whether to adopt a fixed effects model or a random effects model, this study conducted a Hausman test. The statistical results show that the P-value is 0.048, which is less than the significance level of 0.05, indicating that the fixed effects model is more appropriate. Therefore, this study selects the fixed effects model for empirical analysis. The specific model construction is as follows:

3.2.1 Corresponding to research objective 1

To verify the theoretical analysis of the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region, this paper constructs a bidirectional fixed model (1) for empirical testing.

$$Isu_{it} = \alpha_0 + \alpha_1 Td_{it} + \alpha_2 C_{it} + \gamma_t + \delta_i + \varepsilon_{it} \quad (1)$$

Where Isu_{it} is a variable for industrial structure upgrading,

Td_{it} is a variable of tourism development,

C_{it} is all control variables referred to in this document,

γ_t is the time fixed effect indicates that the impact of different years on the dependent variable has been considered,

δ_i is Individual fixed effects, controlling for differences brought about by different countries (regions),

ε_{it} is a random disturbance term.

3.2.2 Corresponding to research objective 2

To investigate whether the employment effect (Emp) and capital effect (Cap) function as mediating mechanisms transmitting the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region, this study adopts a stepwise regression approach for mediation analysis, following the methodology proposed by (Zhonglin, & Ye, B.,2014). The first stage of the mediation test is represented by Model (2), while the subsequent stage is depicted in Model (3).

$$M_{it} = \beta_0 + \beta_1 Td_{it} + \beta_2 C_{it} + \gamma_t + \delta_i + \rho_{it} \quad (2)$$

$$Isu_{it} = \gamma_0 + \gamma_1 M_{it} + \gamma_2 Td_{it} + \gamma_3 C_{it} + \gamma_t + \delta_i + \varphi_{it} \quad (3)$$

Where M_{it} is a mediating variable, which is the employment effect, capital effect, respectively.

Td_{it} is a variable of tourism development,

C_{it} is all control variables referred to in this document,

Isu_{it} is a variable for industrial structure upgrading,

γ_t is Time fixed effects referring to the consideration of the impact of different periods on the dependent variable,

δ_i is Individual fixed effects, controlling for differences brought about by different countries (regions),

ρ_{it}, φ_{it} is a random disturbance term.

This article will examine the impact of tourism development on employment effects (Emp) and capital effects (Cap) based on the sign and significance level of the coefficients in models (2) and (3), thereby testing whether the employment

effects (Emp) and capital effects (Cap) serve as transmission mechanisms for the influence of tourism development on the upgrading of the industrial structure in the China-ASEAN region.

3.2.3 Corresponding to research objective 3

To empirically test whether the urbanization effect and environmental effect moderate the role of tourism development in promoting industrial structure upgrading, this article incorporates interaction terms between the moderating variables and core explanatory variables into model (1). The significance of these interaction terms will be used to verify the existence of moderating effects. Accordingly, the following moderating effect model (4) is established:

$$Isu_{it} = \theta_0 + \theta_1 Td_{it} + \theta_2 T_{it} + \theta_3 Q_{it} + \theta_4 C_{it} + \gamma_t + \delta_i + \lambda_{it} \quad (4)$$

Where Isu_{it} is a variable for industrial structure upgrading,

Td_{it} is a variable of tourism development,

T_{it} is a moderating variable, which is the urbanization effect and the environmental effect, respectively.

Q_{it} is Interaction term,

γ_t is Time fixed effects referring to the consideration of the impact of different periods on the dependent variable,

δ_i is Individual fixed effects, controlling for differences brought about by different countries (regions),

λ_{it} is a random disturbance term.

3.3 Source of Data and Variables

The data for this study comes from China and the ASEAN region, covering macroeconomic panel data from 10 countries between 2000 and 2020. Specifically, the data for China is primarily obtained from official statistical yearbooks, government reports, and macroeconomic data published by the National Bureau of Statistics of China. Data from ASEAN countries mainly comes from the World Bank, Asian Development Bank, International Monetary Fund, and the ASEAN Data Portal. Information related to tourism

development is sourced from the World Tourism Organization, the Ministry of Culture and Tourism of China, the Tourism Authority of Thailand, and relevant departments such as the "ASEAN Statistical Yearbook." Data on infrastructure, government spending, reliance on foreign trade, and technological progress are sourced from the National Development and Reform Commission, the Ministry of Finance, the People's Bank of China, the National Intellectual Property Administration, as well as international organizations like the United Nations Statistics Division and the Organization for Economic Co-operation and Development. Employment, capital, level of urbanization, and environmental protection data are mainly drawn from the Ministry of Human Resources and Social Security of China, the International Monetary Fund, the International Energy Agency, and ASEAN Statistical Bureau. Detailed data sources are listed in Table 6.

Table 6 Source of Data

Variable type	Variable Name	China Data Source	ASEAN countries data source
Dependent Variable	Industrial structure advancement	www.stats.gov.cn	data.adb.org https://data.adb.org/search/content/type/dataset
	Industrial structure ecologicalization	www.mee.gov.cn	www.aseanstats.org
	Industrial structure rationalization	www.stats.gov.cn	www.singstat.gov.sg www.nso.go.th
Independent variable	Tourism development	www.mct.gov.cn www.ctaweb.org.cn	www.tourismthailand.org
Mediating variable	Employment effect	www.mohrss.gov.cn	www.imf.org/en/Data
	Capital effect	www.worldbank.org/en/home	www.worldbank.org/en/home https://data.aseanstats.org
Moderating Variables	Urbanization effect	www.ndrc.gov.cn	https://data.aseanstats.org
	Environmental effect	www.iea.org	https://data.aseanstats.org

Variable type	Variable Name	China Data Source	ASEAN countries data source
Control variables	Infrastructure Density	www.ndrc.gov.cn	https://unstats.un.org/UNSDWebsite/
	Government Expenditure Scale	www.mof.gov.cn/index.htm	data.worldbank.org
	Foreign Trade Dependency	http://www.pbc.gov.cn/	data.worldbank.org
	Technological Advancement	www.cnipa.gov.cn	www.oecd.org
	Institutional Environment	https://ceidata.cei.cn/	https://unctadstat.unctad.org/datacentre

Source: Determined by the researcher.

3.4 Empirical analysis verification method

In the empirical analysis framework of economic research, the precise and rigorous application of methodology is key to revealing the essence of economic phenomena, validating theoretical hypotheses, and evaluating policy effects. To ensure the scientific rigor and reliability of research findings, researchers often employ a combination of statistical methods and testing techniques to thoroughly analyze the complex relationships between variables. This paper is based on this research paradigm and systematically employs methods such as correlation analysis, multicollinearity tests, baseline regression tests, robustness checks, endogeneity tests, heterogeneity analysis, mediation effect tests, and moderation effect tests to conduct an in-depth and comprehensive empirical investigation of the relationship between tourism development and industrial structure upgrading. Through the organic integration and application of this series of methods, this study aims to provide solid empirical evidence for the impact of tourism development on industrial structure upgrading, revealing the underlying mechanisms and potential influencing factors, thereby offering scientific reference for the formulation and optimization of relevant policies.

3.4.1 Correlation Analysis

In economic research, correlation analysis is an important statistical method used to measure the degree and direction of the relationship between two or more

variables. Its core involves quantifying the strength of the linear relationship between variables through the calculation of correlation coefficients, thereby providing preliminary empirical support for the research. In this paper, the significance of correlation analysis lies in its ability to reveal the direct relationships between various dimensions of tourism development and industrial structure upgrading, as well as to verify the reasonableness of the selected control variables.

When conducting correlation analysis, the setting of the significance level is crucial, typically using a significance level of 0.05 or 0.01 to determine whether the correlation coefficient is statistically significant. If the p-value of the correlation coefficient is less than the specified significance level, it indicates that the correlation coefficient is statistically significant. This provides a foundation for subsequent empirical analysis. In this paper, correlation analysis is used as a preliminary empirical method to explore the relationships between variables and to validate theoretical hypotheses. Additionally, methods such as regression analysis will be employed later to further verify hypotheses while controlling the influence of other potential factors, ensuring the accuracy and reliability of the research results.

3.4.2 Multicollinearity Test

Diagnosing and addressing multicollinearity is crucial for ensuring the accuracy and reliability of regression model estimations. Multicollinearity refers to a high degree of linear correlation among explanatory variables, which can lead to unstable estimates of regression coefficients, inflated standard errors, and consequently, weakened explanatory and predictive power of the model. To effectively detect multicollinearity, researchers widely employ the Variance Inflation Factor (VIF) as a key indicator.

The VIF is calculated as $VIF_j = \frac{1}{1-R_j^2}$

where R_j^2 represents the coefficient of determination obtained from regressing variable X_j on the remaining explanatory variables. A VIF value closer to 1 indicates less significant multicollinearity; conversely, when the VIF value exceeds 5 or 10, it typically suggests a severe multicollinearity problem within the model. This test not

only helps avoid unstable regression coefficients and improve the model's prediction accuracy but also ensures the credibility and scientific rigor of the research findings.

3.4.3 Benchmark Regression Test

Benchmark Regression Test is a method used to assess the performance of benchmark models, aimed at verifying the impact of key explanatory variables on the explained variable through standardized regression analysis. In economic research, benchmark regression analysis typically selects a base model, such as a fixed effects model or a random effect model, and progressively includes control variables to evaluate their effect on the results. For example, in this article, a dual fixed effects model for countries and years was chosen as the benchmark regression analysis to eliminate the influence of temporal factors. By progressively adding control variables, it is possible to more accurately assess the impact of tourism development on the upgrading of industrial structure and to validate the research hypothesis.

3.4.4 Robustness Test

Robustness tests are a series of examinations conducted to ensure the stability and reliability of research results. In economic research, robustness checks typically include a few methods: variable substitution: testing whether results are consistent by changing the measurement methods of independent variables or dependent variables; alternative econometric methods: performing regression analysis using different econometric methods (such as ordinary least squares, fixed effects models, dynamic panel data models, etc.) to verify the robustness of the results; special sample exclusion: excluding data from specific years or regions to eliminate the influence of these outliers on the results; and outlier treatment: applying winsorization to the data to reduce the impact of extreme values on regression outcomes. In this paper, the positive impact of tourism development on industrial structure upgrading is validated under different conditions by excluding data from the 2008 financial crisis and applying winsorization to the data.

3.4.5 Endogeneity Test

The Endogeneity Test is a method used to detect and address endogeneity issues. Endogeneity refers to the correlation between explanatory variables and the error

term, which results in biased estimates. Common endogeneity issues include omitted variable bias, reverse causality, and measurement error. To resolve endogeneity problems, researchers often employ methods such as Instrumental Variables (IV) and dynamic panel data models (e.g., SYS-GMM). In this paper, the positive impact of tourism development on industrial structure upgrading is verified using Two-Stage Least Squares (2SLS) and the introduction of lagged terms, ensuring the reliability of the results.

3.4.6 Heterogeneity Analysis

Heterogeneity Analysis is an analytical method used to explore whether there are heterogeneous effects between different sample populations. In economic research, heterogeneity analysis is typically conducted through grouped regression, which involves dividing samples into different groups based on a certain characteristic (such as economic development level, region, etc.) and performing regression analyses separately to examine whether the impact of explanatory variables differs across groups. In this article, by dividing the samples into two groups——high economic development level and low economic development level——we find that tourism development impacts industrial structure upgrading, indicating that economic development level plays a moderating role in the relationship between tourism development and industrial structure upgrading.

3.4.7 Mediation Effect Test

The Mediation Effect Test is a method used to examine mediation effects, aiming to verify whether one variable influences another variable through a mediator variable. In economic research, mediation effect testing is typically achieved by constructing a mediation model and conducting regression analysis. For example, in this paper, the employment effect (Emp) and capital effect (Cap) are introduced as mediator variables to verify the pathways through which tourism development impacts industrial structure upgrading via these mediators. This method helps to reveal the indirect influence mechanism of tourism development on industrial structure upgrading.

3.4.8 Moderating Effect Test

The Moderating Effect Test is a method used to examine the moderating effect, aimed at verifying whether one variable moderates the influence of another variable on the dependent variable. In economic research, the test for moderating effects is

typically conducted by incorporating interaction terms into regression models. For example, in this paper, the interaction term between economic development level and tourism development will be introduced to verify the moderating effect of economic development level on the relationship between tourism development and industrial structure upgrading. This approach helps to reveal the differences in the impact of tourism development on industrial structure upgrading under different conditions.

3.4.9 Quantile regression

Quantile regression is a method of statistical analysis that assesses the effect of an independent variable on a dependent variable by estimating the conditional distribution of the dependent variable across different quantiles. This method is able to reveal the heterogeneity of relationships between variables in different parts of the data distribution, thus providing economic research with a comprehensive view of the impact of the outcome variable. Compared with traditional least squares (OLS) regression, quantile regression can not only provide the process by which the mean level of the dependent variable is affected by the independent variable, but also further provide the effect of any quartile of the dependent variable on the independent variable. This makes quantile regression particularly useful in situations where the effect of the predictor varies at different levels of the outcome variable, thus providing a more nuanced understanding of the data.

CHAPTER 4
DATA ANALYSIS AND RESULS

The empirical analysis of this study by using the variable and model for analyses the impact of tourism development on the upgrading of industrial structure in the China-ASEAN region. The researcher then took quantitative research by the following actions.

4.1 Variable Definition, response to all objective 1,2 and 3.

4.2 Empirical Results Analysis, response objective 1.

4.3 Mediation Effect Test, response objective 2.

4.4 Moderating Effect Test, response objective 3.

4.5 Further Analysis.

4.1 Variable Definition

This past demonstrates the variable Definition which response all objective 1,2 and 3. The final selection of variables in this study is shown in Table 7.

Table 7 Selection of Variables

Variable Type	Variable Name	Variable Symbol		Measurement Methods	Hypothesize
Dependent Variable	Industrial structure advancement	Sh		Tertiary Industry Output / Secondary Industry Output	+
	Industrial structure ecologicalization	Se	Isu	Total Energy Consumption / GDP	+
	Industrial structure rationalization	Sr		Theil Index	+
Independent Variable	Tourism development	Td		Total International Tourism Revenue / GDP	+
	Employment Effect	Emp		Employment in the Service Sector / Total Employment	+

Variable Type	Variable Name	Variable Symbol	Measurement Methods	Hypothesize
Mediating Variables	Capital Effect	Cap	Total Fixed Capital Formation / GDP	+
Moderating Variables	Environmental Effect	Env	Carbon Dioxide Emissions / GDP	−
	Urbanization Effect	Urban	Urban Population / Total Regional Population	+
Control Variables	Infrastructure Density	Infra	Density of highway transportation infrastructure	+
	Government Expenditure Scale	Gov	Local government fiscal expenditure / GDP	+
	Foreign Trade Dependency	FDI	Foreign Direct Investment / GDP	+
	Institutional Environment	Inst	Economic Freedom Index	+
	Technological Advancement	Tech	Number of Patent Applications	+

Source: Author's analysis.

4.2 Empirical Results Analysis

This past demonstrates the empirical results analysis response all objective 1, by this following:

4.2.1 Descriptive Statistics

The descriptive statistical results of the variables used for empirical testing in this paper are shown in Table 8. From the descriptive statistics of the explained variable, the industrial structure advancement (Sh), it can be observed that the maximum value is 3.108, which may indicate that certain countries have achieved significant results in the advancement of their industrial structure. This could be attributed to substantial investments in technological innovation, talent development, and policy support in these regions. The minimum value is 0.778, suggesting that in some countries, the process of industrial structure advancement is relatively slow, possibly due to resource constraints,

insufficient policy support, or outdated technology. The mean value of 1.483 indicates that the overall level of industrial structure advancement in the sample regions is moderately low, showing potential for improvement.

From the descriptive statistics of the explained variable, the industrial structure ecologicalization (Se), it can be noted that after logarithmic transformation, the maximum value is 11.20, indicating that some regions perform well in terms of ecologicalization of industrial structure, likely because they have implemented effective measures for environmental protection and sustainable development, promoting eco-friendly industrial growth. The minimum value is 7.613, indicating that in some countries, the level of ecologicalization of the industrial structure is still low, possibly due to a dominance of high-pollution and high-energy-consuming secondary industries, with insufficient attention to the ecological environment. The mean value of 9.228 suggests that the overall level of ecologicalization of the industrial structure in the sample regions is moderately high, indicating a certain potential for ecological development.

From the descriptive statistics of the explained variable, the industrial structure rationalization (Sr), the maximum value is 0.757, indicating that in some countries, the level of rationalization of the industrial structure is relatively high, suggesting that these countries have a mature tertiary industry that effectively integrates with the secondary industry. The minimum value of 0.122** shows that in certain regions, the level of rationalization of the industrial structure is low, possibly due to the dominance of the secondary industry and insufficient development of the tertiary industry, leading to an overall irrational industrial structure. The mean value of 0.371 indicates that the overall level of rationalization of the industrial structure in the sample regions is moderate, with room for further optimization.

From the descriptive statistics of the explanatory variable, the tourism development index (Td), the maximum value is 0.197, which indicates that in certain countries or time periods, tourism development has reached a relatively high level. This may be due to these regions having abundant tourism resources, well-developed tourism facilities, effective marketing strategies, or hosting events that attract a large number of

visitors during certain periods. The minimum value is 0.001, which may be due to a lack of tourism resources, inadequate infrastructure, remote geographical locations, weak market competitiveness, or other adverse factors. The mean value of 0.050suggests that overall, the tourism development index is at a low level. This implies that there is significant room for improvement in tourism development in most regions, or that there is a notable imbalance in tourism development. The descriptive statistical results of the other variables are similar to previous studies, with all variables showing relatively small standard deviations, proving that the construction and preprocessing of the variables in this paper are reasonable and meet the needs for further empirical testing.

Table 8 Descriptive Statistics of Each Variable

Variable Type	Variable Name	Variable Symbol	Sample Size	Minimum Value	Maximum Value	Average Value	Standard Deviation	Median
Dependent Variable	Industrial structure advancement	Sh	210	0.778	3.108	1.483	0.526	1.360
	Industrial structure ecologicalization	Se	210	7.613	11.20	9.228	0.782	9.267
	Industrial structure rationalization	Sr	210	0.122	0.757	0.371	0.175	0.338
Independent Variable	Tourism development	Td	210	0.001	0.197	0.050	0.045	0.039
	Government Expenditure Scale	Gov	210	0.123	0.354	0.214	0.0450	0.209
	Foreign Trade Dependency	FDI	210	-0.028	0.298	0.053	0.059	0.034
	Infrastructure Density	Infra	210	0.019	4.809	0.778	1.311	0.254

Variable Type	Variable Name	Variable Symbol	Sample Size	Minimum Value	Maximum Value	Average Value	Standard Deviation	Median
Control Variables	Technological Advancement	Tech	210	0	14.25	7.696	3.057	8.514
	Institutional Environment	Inst	210	3.526	6.347	4.071	0.256	4.043
Mediating Variables	Employment Effect	Emp	210	3.058	4.555	3.783	0.359	3.751
	Capital Effect	Cap	210	0.034	0.445	0.287	0.0790	0.289
Moderating Variables	Environmental Effect	Env	210	-1.610	3.110	-0.003	1.086	-0.440
	Urbanization Effect	Urban	210	0.186	1	0.468	0.227	0.441

Source: Author's analysis

4.2.2 Correlation Analysis

The direct correlation coefficients among the variables are shown in Table 9. It can be seen that the correlation coefficients between the explanatory variable of tourism development (Td) and the explained variables of Industrial structure advancement (Sh), Industrial structure ecologicalization (Se), and industrial structure rationalization (Sr) are 0.213, 0.189, and 0.403, respectively. All are significant at the 1% significance level, indicating a positive and significant direct correlation between tourism development and Industrial structure advancement, which preliminarily supports the research hypothesis of this paper that tourism development positively influences the upgrading of industrial structure in the ASEAN region.

The correlation coefficients of each control variable with the explained variables are significant at different levels, proving that the control variables selected in models (2) and (3) are necessary and reasonable.

However, the correlation coefficients between the variables only represent their direct relationships and do not account for other control variables, industry characteristics, time characteristics, and other model issues. Therefore, testing the

hypotheses proposed in the theoretical analysis solely based on the direct correlation coefficients is not in line with the requirements of the research design. This paper will further validate the theoretical analysis through subsequent empirical results.

Table 9 Correlation Analysis

	Sh	Se	Sr	Td	Gov	FDI	Infra
Sh	1						
Se	-0.308***	1					
Sr	0.543***	-0.284***	1				
Td	0.213***	0.189***	0.403***	1			
Gov	0.0210	-0.305***	-0.0210	0.00300	1		
FDI	0.552***	-0.429***	0.343***	0.295***	0.0230	1	
Infra	0.656***	-0.555***	0.319***	0.0230	0.103	0.806***	1
Tech	-0.0920	-0.505***	-0.119*	-0.445***	0.240***	-0.0280	0.227***
Inst	0.393***	-0.529***	0.507***	0.165**	0.0480	0.415***	0.532***
	Tech	Inst					
Tech	1						
Inst	0.238***	1					

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

4.2.3 Multicollinearity Test

To prevent serious multicollinearity issues among the variables in Model (1), which could undermine the validity of the research findings, this study further examines the variance inflation factor (VIF) for each variable. The test results are shown in Table 10. It can be observed that the maximum VIF value for each variable does not exceed 5 and

is less than 10, indicating that there are no severe multicollinearity issues among the variables that would significantly affect the regression results.

Table 10 VIF Test

Variable	VIF	1/VIF
Td	1.540	0.650
FDI	3.840	0.260
Infra	4.220	0.237
Inst	1.520	0.660
Tech	1.520	0.660
gov	1.100	0.908
Median	VIF	2.290

Source: Author's analysis

4.2.4 Benchmark Regression Test

In order to eliminate the influence of time-varying factors, a double fixed effects model for countries and years (1) was selected for the baseline regression analysis. The regression results are shown in Table 11, with columns (1) to (3) presenting the regression results after controlling for country and year fixed effects, progressively adding control variables. It can be observed that the regression coefficients of the explanatory variable "Tourism Development (Td)" on the explained variables "Rationalization of Industrial Structure (Sr)", "Upgrading of Industrial Structure (Sh)", and "Ecologization of Industrial Structure (Se)" are 1.134, 3.707, and 6.363, respectively, all passing the 1% significance level test. This indicates that, in the absence of control variables, tourism development has a significant positive impact on the upgrading of the industrial structure in the ASEAN region. After adding control variables, the regression coefficient of tourism development (Td) on "Upgrading of Industrial Structure (Sh)" is

2.126, which passes the 1% significance test; the coefficient for "Ecologization of Industrial Structure (Se)" is 1.285, passing the 10% significance test; and the coefficient for "Rationalization of Industrial Structure (Sr)" is 0.050, passing the 1% significance test. Although the regression coefficients have decreased, the positive impact of tourism development on the upgrading of the industrial structure remains significant, confirming the research hypothesis of this paper. Furthermore, the impact of control variables on industrial structure upgrading varies by specific industrial indicators. For example, "Government Expenditure Scale (gov)" has a significant positive effect on "Upgrading of Industrial Structure (Sh)", but its impact on "Ecologization (Se)" and "Rationalization (Sr)" is not significant; "Foreign Direct Investment Dependence (FDI)" has a significant positive effect on "Ecologization (Se)", but its impact on the other two indicators is not significant; "Infrastructure (Infra)" has a significant positive effect on all three indicators, especially with a regression coefficient of 0.050 for "Rationalization (Sr)", at a significance level of 1%; "Technological Progress (Tech)" has a significant negative effect on both "Upgrading (Sh)" and "Ecologization (Se)", but a positive effect on "Rationalization (Sr)", passing the 1% significance test.

Table 11 Benchmark Regression Test

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
Td	3.707***	6.363***	1.134***
	(3.50)	(2.68)	(2.89)

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
gov	2.126***	-0.907*	-0.177
	(2.94)	(-1.75)	(-1.52)
FDI	-0.718	1.285*	-0.172
	(-1.02)	(1.67)	(-0.89)
Infra	0.245***	0.253***	0.050***
	(2.84)	(2.86)	(3.58)
Tech	-0.319***	-0.267***	0.030***
	(-5.83)	(-5.36)	(3.20)
Inst	-0.118	-0.079	0.009
	(-0.84)	(-1.10)	(0.85)
Constant	3.598***	11.112***	0.064
	(5.22)	(28.30)	(0.83)
Observations	194	194	194
R-squared	0.875	0.942	0.953
id FE	YES	YES	YES
Year FE	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

The above regression results validate the research objective 1: In summary, tourism development has a significant positive impact on the upgrading of the industrial structure in the ASEAN region, and this impact remains robust after controlling for other factors. This further validates the positive role of tourism development in the upgrading of the industrial structure in the ASEAN region. Hypothesis 1 is confirmed.

4.2.5 Robustness Test

① GMM

Using a dynamic panel data model: the lagged term of industrial structure upgrading (L.Sh) is introduced, and the two-step system generalized method of moments (SYS-GMM) is employed to estimate the dynamic panel data. The regression results indicate that the explanatory variable, tourism development (Td), has a positive and significant effect on the explained variables: rationalization of industrial structure (Sh), upgrading of industrial structure (Se), and ecologicalization of industrial structure (Sr). This proves the robustness of the regression results in this paper.

Table 12 GMM Test

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
L.Sh	0.903***		
	(9.31)		
Td	1.065*	1.756**	0.219***
	(1.85)	(2.35)	(3.44)
gov	-0.173	0.183	0.005
	(-0.64)	(0.62)	(0.12)
FDI	0.098	-3.086*	0.048**
	(0.58)	(-2.15)	(2.81)
Infra	0.023	0.108*	-0.000
	(0.67)	(2.15)	(-0.04)
Tech	0.011*	-0.005	-0.000
	(2.03)	(-0.95)	(-0.77)
Inst	0.029	0.017	0.024**

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
	(1.25)	(0.46)	(2.81)
L.Se		0.972***	
		(44.37)	
L.Sr			0.846***
			(14.70)
Constant	-0.091	0.112	-0.051**
	(-0.62)	(0.32)	(-2.77)
Observations	185	185	185
Number of id	10	10	10
id FE	YES	YES	YES
Year FE	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

②Robustness Test - Excluding Special Years

The financial crisis, as a significant macroeconomic event, has had a profound impact on various aspects of countries' economies, societies, and environments, thereby significantly influencing industrial structure and tourism development. To prevent the potential negative effects of the 2008 economic crisis from skewing the regression results, this study excludes the sample data from 2008. Although the data from 2008 has been removed, the remaining sample still possesses sufficient representativeness and breadth. A new regression analysis was conducted on the remaining sample, and the results are shown in Table 13. The impact of tourism development (Td) on the upgrading of industrial structure (Sh), ecological industrial structure (Se), and rational industrial structure (Sr) remains significant and positive. Specifically, in column (1), the regression coefficient of tourism development (Td) on industrial structure upgrading (Sh) is 3.724; in column (2),

the coefficient for the impact on ecological industrial structure (Se) is 6.301; and in column (3), the coefficient for the impact on rational industrial structure (Sr) is 1.117, all of which are significant. Furthermore, the regression results for the control variables also exhibit different impact characteristics. In summary, after excluding the 2008 sample data, the positive impact of tourism development on the upgrading of the industrial structure in the ASEAN region remains significant and robust. Additionally, the effects of the control variables vary by specific indicators, further enriching the understanding of the relationship between tourism development and industrial structure upgrading presented in this paper.

Table 13 Robustness Test- Excluding Special Years

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
Td	3.724***	6.301**	1.117***
	(3.46)	(2.56)	(2.78)
gov	2.382***	-0.819	-0.181
	(3.20)	(-1.49)	(-1.49)
FDI	-0.482	1.311	-0.151
	(-0.56)	(1.36)	(-0.64)
Infra	0.246***	0.249***	0.050***
	(2.88)	(2.82)	(3.52)
Tech	-0.337***	-0.272***	0.030***
	(-5.82)	(-5.40)	(3.17)
Inst	-0.116	-0.085	0.009
	(-0.83)	(-1.12)	(0.85)
Constant	3.658***	11.163***	0.061
	(5.29)	(27.63)	(0.79)

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
Observations	185	185	185
R-squared	0.878	0.942	0.951
id FE	YES	YES	YES
Year FE	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

③Robustness Test - Winsorization

In data analysis, extreme values can have an excessive impact on results, leading to biased conclusions. Winsorization mitigates the influence of these extreme values by replacing them with values at specified percentiles, thereby reducing the potential outliers in the data and enhancing the clarity of the analysis. This method helps the data better conform to the assumptions of normal distribution, thereby improving the accuracy of statistical inferences. This paper applies Winsorization to the data based on the model and conducts a re-regression, with the results shown in Table 14. The results indicate that tourism development (Td) has a positive regression coefficient for the upgrading of industrial structure (Sh), ecologicalization of industrial structure (Se), and rationalization of industrial structure (Sr), all of which are statistically significant. Specifically, in column (1), the regression coefficient of tourism development (Td) for the upgrading of industrial structure (Sh) is 5.947. In column (2), the coefficient for the ecologicalization of industrial structure (Se) is 6.740. Additionally, in column (3), the coefficient for the rationalization of industrial structure (Sr) is 1.234, all of which pass the 1% significance level, indicating that tourism development also has a significant promoting effect on the rationalization of industrial structure.

Table 14 Robustness Test- Winsorization

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
Td	5.947***	6.740***	1.234***
	(4.74)	(2.63)	(2.96)
gov	1.216**	-2.024***	-0.130
	(2.07)	(-3.60)	(-1.03)
FDI	-1.868**	2.352***	-0.128
	(-2.52)	(2.70)	(-0.64)
Infra	0.225***	0.290***	0.051***
	(3.03)	(3.01)	(3.10)
Tech	-0.275***	-0.215***	0.043***
	(-5.10)	(-4.11)	(4.40)
Inst	-0.905**	-0.927**	0.009
	(-2.47)	(-2.30)	(0.12)
Constant	6.636***	14.336***	-0.053
	(4.23)	(9.00)	(-0.16)
Observations	194	194	194
R-squared	0.896	0.937	0.954
id FE	YES	YES	YES
Year FE	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

4.2.6 Endogeneity Test -Two-Stage Least Squares

To address potential endogeneity issues such as bidirectional causality, this study further employs the Two-Stage Least Squares (2SLS) method to test the regression results. Regarding the selection of instrumental variables, this study uses the lagged value

of the explanatory variable as the instrument. The regression results of the Two-Stage Least Squares method are shown in Table 15. The results indicate that the explanatory variable "Tourism Development (Td)" has a significant and positive impact on the upgrading of industrial structure (Sh), ecologicalization (Se), and rationalization (Sr), supporting the robustness of the hypotheses proposed in this study. Specifically, in column (2), the regression coefficient of tourism development (Td) on industrial structure upgrading (Sh) is 6.900. In column (3), the regression coefficient of tourism development on industrial structure ecologicalization (Se) is 13.691. In column (4), the regression coefficient of tourism development on industrial structure rationalization (Sr) is 2.136, indicating that the promoting effect of tourism development on the three major indicators of industrial structure upgrading is also significant.

Table 15 Endogeneity Test

	(1)	(2)	(3)	(4)
VARIABLES	Td	Sh	Se	Sr
Td		6.900***	13.691***	2.136***
		(4.46)	(8.14)	(6.66)
gov	-0.026	2.002***	-1.156**	-0.249**
	(-0.96)	(3.95)	(-2.10)	(-2.37)
FDI	-0.015	-1.026*	0.573	-0.262**
	(-0.49)	(-1.66)	(0.85)	(-2.04)
Infra	-0.006	0.220***	0.193**	0.045***
	(-0.96)	(2.60)	(2.10)	(2.58)
Tech	-0.001	-0.310***	-0.254***	0.034***
	(-0.13)	(-7.98)	(-6.01)	(4.26)
Inst	0.002	-0.053	-0.015	0.015
	(0.65)	(-0.60)	(-0.16)	(0.82)

	(1)	(2)	(3)	(4)
VARIABLES	Td	Sh	Se	Sr
tool	0.698***			
	(8.10)			
Constant	0.020	1.126**	9.306***	0.127
	(0.59)	(2.40)	(18.27)	(1.31)
Observations	185	185	185	185
R-squared	0.942	0.879	0.920	0.949
ID FE	YES			
Year FE	YES	YES	YES	YES
id FE		YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

4.2.7 Heterogeneity Analysis

Tourism development is closely related to the level of regional economic development. More economically developed areas may possess more tourism resources and better tourism facilities, thereby attracting more visitors and further promoting the development of the tourism industry. By comparing the tourism development situation in regions with different GDP levels, we can reveal the intrinsic relationship between tourism development and economic level. In this analysis, GDP is used to represent the level of economic development, and the samples are divided into two categories based on the median GDP: high economic development level and low economic development level. Regression analysis is conducted for these groups, and the results are as follows: in the high economic development level sample, the explanatory variable tourism development index (Td) shows a positive and significant relationship at the 1% level with the explained variables of (sh)(se)and (sr).

In contrast, in the low economic development level sample, the explanatory variable tourism development index (Td) shows a positive but insignificant relationship with the explained variables of Industrial structure advancement (Sh), Industrial structure ecologicalization (Se), and Industrial structure rationalization(Sr).

The results indicate that the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region is more pronounced in areas with a high level of economic development. A higher level of economic development implies stronger financial capacity and more resources available for the development of the tourism industry. These regions can invest more funds in the construction of tourism infrastructure, the development of tourism products, and the marketing of tourism markets, thereby more effectively promoting the growth of the tourism industry. Economically developed areas often have a relatively complete industrial structure, including advanced manufacturing, services, and high-tech industries. This industrial structure provides better support for the development of tourism and facilitates positive interactions with the tourism industry, promoting further upgrading of the industrial structure.

Table 16 Heterogeneity Test

	High GDP			Low GDP		
VARIABLES	Sh	Se	Sr	Sh	Se	Sr
Td	9.038***	11.346***	1.964***	1.125	1.172	0.221
	(6.78)	(5.70)	(5.64)	(1.47)	(1.04)	(1.62)
gov	0.659	-1.426*	-0.270*	-0.633	0.604	0.223***
	(1.05)	(-1.67)	(-1.97)	(-0.83)	(0.92)	(2.79)
FDI	-0.587	-0.925	-0.585***	-0.240	0.959**	0.202**
	(-0.72)	(-0.92)	(-3.16)	(-0.47)	(2.43)	(2.18)
Infra	0.110	0.288***	0.058***	0.757***	0.134	-0.023
	(1.26)	(2.90)	(3.10)	(6.20)	(1.27)	(-1.58)
Tech	-0.008	-0.419***	-0.031**	-0.114***	-0.003	0.020***

VARIABLES	High GDP			Low GDP		
	Sh	Se	Sr	Sh	Se	Sr
	(-0.13)	(-5.26)	(-2.42)	(-3.31)	(-0.08)	(3.21)
Inst	0.040	-0.057	-0.003	-2.123***	-0.617**	0.061**
	(1.07)	(-1.15)	(-0.70)	(-8.70)	(-2.41)	(2.09)
Constant	0.813	12.799***	0.613***	10.189***	11.568***	0.012
	(1.41)	(18.28)	(5.49)	(9.90)	(10.69)	(0.10)
Observations	105	105	105	89	89	89
R-squared	0.975	0.972	0.985	0.945	0.982	0.994
id FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Td	9.038***	11.346***	1.964***	1.125	1.172	0.221

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

4.3 Mediation Effect Test

This past demonstrates the mediating effect test response all objective 2, by this following:

To examine whether the mediating variables of employment effect (Emp) and capital effect (Cap) serve as transmission mechanisms for the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region, this paper tests models (2) and (3), with the regression results shown in the table below.

4.3.1 Employment Effect

As shown in column (1) of the table below, the regression coefficient of the explanatory variable tourism development index (Td) on the mediating variable employment effect (Emp) is 2.280, which is significant at the 1% level (t-value of 3.82). This indicates that as the tourism development index continues to rise, the employment

effect (Emp) will be significantly positively influenced. From columns (2) to (4) of the table below, it can be seen that after adding the mediating variable employment effect (Emp), the explanatory variable tourism development index (Td) still shows a positive and significant regression result on the explained variables of industrial structure upgrading (Sh), ecological industrial structure (Se), and rational industrial structure (Sr). Specifically, the regression coefficient of tourism development index (Td) on industrial structure upgrading (Sh) is 1.916, significant at the 10% level (t-value of 1.87); for ecological industrial structure (Se), the regression coefficient is 4.319, significant at the 1% level (t-value of 3.71); and for rational industrial structure (Sr), the regression coefficient is 0.758, significant at the 10% level (t-value of 1.86). Additionally, the mediating variable employment effect (Emp) also shows a significant positive influence in columns (2) to (4), with coefficients of 0.785 for Sh (significant at the 1% level), 0.897 for Se (significant at the 1% level), and 0.165 for Sr (significant at the 1% level). The above results indicate that after including the mediating variable employment effect (Emp), the positive impact of the tourism development index (Td) on the upgrading of the industrial structure in the ASEAN region remains significant. At the same time, the employment effect (Emp) as a mediating variable also significantly positively influences industrial structure upgrading, further validating the mediating effect of employment effect (Emp) in the impact of tourism development on industrial structure upgrading.

Table 17 Employment Effect

	(1)	(2)	(3)	(4)
VARIABLES	Emp	Sh	Se	Sr
Td	2.280***	1.916*	4.319*	0.758*
	(3.82)	(1.87)	(1.71)	(1.86)
Emp		0.785***	0.897***	0.165***
		(4.05)	(2.79)	(2.89)
gov	0.373**	1.834***	-1.241**	-0.238*
	(2.00)	(2.65)	(-2.59)	(-1.98)
FDI	0.032	-0.743	1.256*	-0.177
	(0.12)	(-1.02)	(1.92)	(-1.04)
Infra	0.015	0.233***	0.239***	0.047***
	(0.58)	(2.95)	(2.95)	(3.75)
Tech	0.029*	-0.342***	-0.293***	0.025***
	(1.92)	(-6.43)	(-6.95)	(3.10)
Inst	0.032	-0.143	-0.108	0.004
	(1.45)	(-1.11)	(-1.62)	(0.31)
Constant	3.231***	1.060	8.215***	-0.470**
	(25.00)	(1.15)	(7.36)	(-2.29)
Observations	194	194	194	194
R-squared	0.966	0.885	0.949	0.957
id FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

4.3.2 Capital Effect

From table 18 below, column (1) shows that the explanatory variable, the tourism development index (Td), has a significantly positive regression result on the mediating variable, capital effect (Cap). This indicates that as the tourism development index continues to rise, the mediating variable, capital effect (Cap), will also be positively influenced.

From columns (2) to (4) of the table below, it can be seen that after including the mediating variable, capital effect (Cap), the explanatory variable, tourism development index (Td), shows a positive and significant regression result at the 5% level for the explained variables: rationalization of industrial structure (Sh), upgrading of industrial structure (Se), and ecologicalization of industrial structure (Sr). This result indicates that even after including the mediating variable, capital effect (Cap), tourism development will still positively influence the upgrading of the industrial structure in the ASEAN region. This demonstrates that the mediating variable, capital effect (Cap), plays a mediating role in the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region.

Table 18 Capital Effect

	(1)	(2)	(3)	(4)
VARIABLES	Cap	Sh	Se	Sr
Td	0.789***	2.577**	5.183**	0.945**
	(4.32)	(2.31)	(2.16)	(2.38)
Cap		1.430**	1.495***	0.239**
		(2.26)	(2.94)	(2.32)
gov	0.280***	1.726**	-1.326***	-0.244**
	(2.79)	(2.27)	(-2.72)	(-2.11)
FDI	-0.283***	-0.313	1.708**	-0.104
	(-3.40)	(-0.45)	(2.18)	(-0.55)

	(1)	(2)	(3)	(4)
VARIABLES	Cap	Sh	Se	Sr
Infra	-0.026*	0.283***	0.292***	0.056***
	(-1.87)	(3.51)	(3.49)	(4.00)
Tech	-0.013*	-0.301***	-0.248***	0.033***
	(-1.73)	(-5.21)	(-5.00)	(3.49)
Inst	-0.005	-0.110	-0.072	0.010
	(-0.53)	(-0.75)	(-0.95)	(1.04)
Constant	0.350***	3.098***	10.589***	-0.020
	(4.79)	(3.75)	(23.80)	(-0.24)
Observations	194	194	194	194
R-squared	0.797	0.882	0.946	0.955
id FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

The above regression results validate the second research objective 2: the mediating effects of employment and capital effects brought about by the development of the tourism industry on the upgrading of the industrial structure in the China-ASEAN region.

4.4 Moderating Effect Test

This past demonstrates the moderating effect test response all objective 3, by this following:

4.4.1 Environmental Effect

To explore whether environmental factors play a moderating role in the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN

region, this study incorporates the moderating effect of environmental factors (Env) and the interaction term between the moderating effect of environmental factors (Env) and the explanatory variable tourism development index (Q) and conducts regression analysis again. The regression results are shown in the table below. After adding the moderating variable of environmental factors (Env), the interaction term (Q) shows a negative effect on the explained variables of Industrial structure advancements, Industrial structure ecologicalization(se)and Industrial structure rationalization(sr), all of which are significant at different levels. This indicates that environmental factors exert a negative moderating effect. The reason may be that the moderating effect of environmental factors could trigger competitive effects. The interaction between tourism development and environmental factors may lead to a reallocation of resources among different industries. If the rapid development of the tourism industry consumes a large amount of environmental and social resources, it may suppress the development of other industries, thereby affect the rationalization and upgrade of the industrial structure. The rapid growth of the tourism market may lead to an imbalance in resource allocation. For example, a significant amount of resources may be invested in tourism infrastructure construction, neglecting the development needs of other industries, which in turn affects the optimization of the industrial structure.

Table 19 Environmental Effect

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
Td	2.742**	4.646**	0.872***
	(2.16)	(2.18)	(4.49)
Env	-0.134***	0.160**	0.050***
	(-3.49)	(2.45)	(6.99)
Q	-0.888**	-1.456**	-0.214***
	(-2.27)	(-2.24)	(-3.33)

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
gov	1.240*	0.043	0.133
	(1.96)	(0.06)	(1.31)
FDI	-0.151	0.733	-0.358**
	(-0.28)	(1.36)	(-2.55)
Infra	0.026	0.202**	0.064***
	(0.36)	(2.28)	(4.36)
Tech	-0.124**	-0.297***	0.001
	(-2.47)	(-6.56)	(0.09)
Inst	-0.060	-0.054	0.008
	(-0.47)	(-0.86)	(1.02)
Constant	2.224***	11.153***	0.232***
	(3.53)	(27.75)	(3.83)
Observations	194	194	194
R-squared	0.916	0.952	0.968
ID FE	YES	YES	YES
YEAR FE	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

4.4.2 Urbanization Effects

To explore whether the level of urbanization plays a moderating role in the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region, this paper incorporates the moderating effect of urbanization level (Urban) and the interaction term between the moderating effect of urbanization level (Urban) and the explanatory variable tourism development index (Q2) into the regression analysis. The

regression results are shown in the table below. After adding the moderating variable of urbanization level (Urban), the interaction term (Q2) shows a positive effect on the explained variables of industrial structure advancement (Sh), industrial structure ecologicalization (Se), and industrial structure rationalization(Sr), all of which are significant at the 5% level. This indicates that the level of urbanization exerts a positive moderating effect. The reason may lie in the fact that the urbanization process facilitates the aggregation of resources such as population, capital, and technology, providing more comprehensive infrastructure and public services for tourism development. This agglomeration effect enhances the efficiency of resource utilization, promoting the rationalization and advancement of the industrial structure. Furthermore, as the level of urbanization increases, consumption levels and consumer attitudes also improve, which helps to expand the demand for the tourism market, thereby promoting prosperity and upgrading of the tourism industry. Additionally, the urbanization process attracts a large number of rural residents to migrate to urban areas, including many skilled and educated individuals. The influx of human resources provides strong support for the development of the tourism industry and also drives the upgrading of the industrial structure.

Table 20 Urbanization Effect

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
Td	-2.238	-1.053	0.057
	(-0.74)	(-0.31)	(0.08)
Urban	-1.984**	-1.833**	0.366*
	(-2.12)	(-2.07)	(1.75)
Q2	13.546**	17.221**	2.817**
	(2.27)	(2.55)	(2.50)
gov	2.654***	-0.382	-0.232**
	(3.90)	(-0.69)	(-2.00)

	(1)	(2)	(3)
VARIABLES	Sh	Se	Sr
FDI	-1.042	1.141*	0.064
	(-1.58)	(1.79)	(0.34)
Infra	0.198**	0.175*	0.019
	(2.23)	(1.87)	(1.30)
Tech	-0.273***	-0.216***	0.030***
	(-4.70)	(-4.44)	(3.17)
Inst	-0.075	-0.028	0.014
	(-0.74)	(-0.84)	(1.57)
Constant	3.937***	11.311***	-0.128
	(5.97)	(27.81)	(-1.14)
Observations	194	194	194
R-squared	0.889	0.953	0.961
ID FE	YES	YES	YES
YEAR FE	YES	YES	YES

Source: Author's analysis

Note: ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.t-statistics in parentheses.

The above regression results validate the third research objective 3: the moderating effects of urbanization and environmental factors on the promotion of industrial structure upgrading in the tourism development of the China-ASEAN region.

This study investigates the impact of tourism development on the upgrading of the industrial structure in the China-ASEAN region, verifying the three research objectives proposed in Chapter One:

①the positive contribution of tourism development to industrial structure upgrading (corresponding to Objective 1): The research results indicate that tourism development has a significant positive effect on industrial structure upgrading,

specifically manifested in the increased proportion of the service industry and the promotion of technological innovation. Data analysis shows that the increase in tourism revenue directly facilitates the expansion of the service sector, thereby promoting the optimization of the industrial structure. For instance, the ratio of tourism revenue to GDP is significantly positively correlated with the upgrading of the industrial structure (Sh), indicating that the growth of the tourism industry brings a positive impetus to the entire economy.

②the mediating role of employment and capital (corresponding to Objective 2): The study further discovers that tourism development plays a mediating role in promoting industrial structure upgrading by fostering employment and capital accumulation. By establishing regression models, the results indicate a significant positive correlation between the tourism development index (Td) and the employment effect (Emp), suggesting that the increased job opportunities, in turn, enhance the adaptability and innovation of the industrial structure. Meanwhile, capital formation (Cap) also plays a crucial role in the process of tourism development driving industrial upgrading, further supporting the optimization of the industrial structure.

③the moderating effects of urbanization and environmental quality (corresponding to Objective 3): This paper also explores how urbanization and environmental factors moderate the impact of tourism development on industrial structure upgrading. The analysis reveals that as the level of urbanization increases, the positive relationship between tourism development and industrial structure optimization becomes stronger. This is particularly evident in regions with different levels of economic development, where urbanization in high-economic-development regions can more effectively promote the aggregation and optimization of resources, thereby accelerating the upgrading of the industrial structure. Conversely, environmental factors exhibit a negative moderating effect, indicating that excessive tourism development may lead to an imbalance in resource distribution among other industries, thereby affecting the rationalization of the industrial structure.

Overall, this study fully confirms the key role of tourism development in driving the upgrading of the industrial structure in the China-ASEAN region, revealing its complex relationship through the mediating mechanisms of employment and capital, as well as the moderating mechanisms of urbanization and environmental quality. These findings provide important theoretical foundations and practical guidance for further developing policies that optimize tourism and economic structure, emphasizing the need to balance tourism development with environmental protection and the rational use of resources to ensure sustainable economic growth and shared prosperity.

4.5 Further Analysis

This article applies the quantile regression method to deeply analyze the impact of tourism development on the upgrading of industrial structure based on the coefficients of tourism development quantiles, rationalization, ecological, and high-end industrial structures and their confidence interval upper and lower limits. The influence of tourism development on industrial structure upgrading exhibits significant heterogeneous characteristics at different stages of development. In the early stage of tourism development (low quantiles 10, 25), its role in promoting the rationalization and ecological aspects of industrial structure is particularly significant, with coefficients of 1.0447, 1.3463 and 9.4714, 8.2396, respectively, and confidence intervals that do not include zero, indicating that tourism development has a significant positive effect on optimizing industrial structure and improving the ecological environment during this stage. However, for high-end industrial structure, the driving effect of tourism development in the early stage is not significant, with coefficients of 0.2126 and 0.3773, and confidence intervals that include zero, indicating its limited role in promoting high value-added industries and technological innovation.

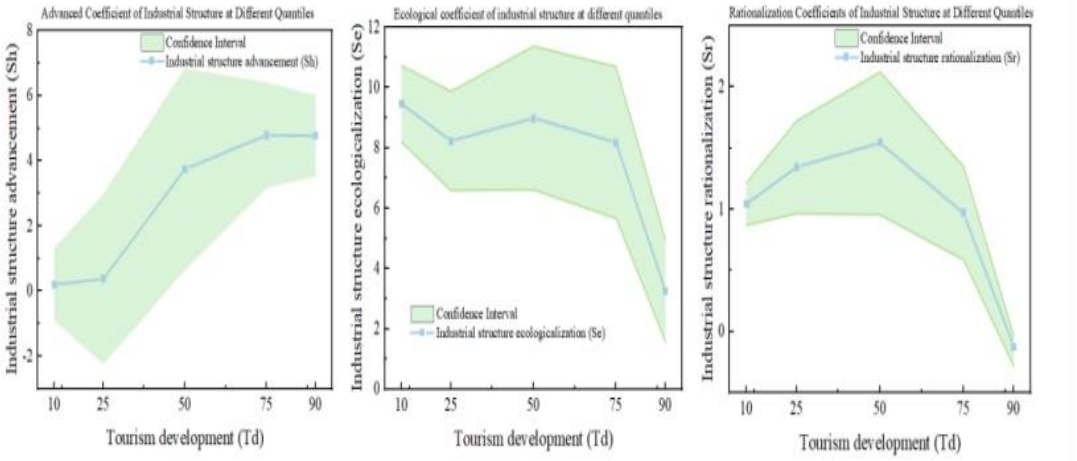

Figure 9 Further Analysis - Quantile Test

Source: Author's analysis

As tourism development progresses to a moderate level (quantiles 50, 75), its positive role in promoting the rationalization and ecological aspects of industrial structure remains, with coefficients of 1.5449, 0.9688 and 8.9981, 8.1903, although there is a decrease compared to the early stage. At the same time, the promotion of high-end industrial structure by tourism development begins to manifest, with coefficients rising to 3.751 and 4.7934, indicating a gradual strengthening of tourism development's role in driving the high-end transformation of industrial structure at this moderate level.

When tourism development reaches a mature stage (high quantiles 90), its promotion of the rationalization and ecological aspects of industrial structure is reversed, with coefficients of -0.1233 and 3.2697, suggesting that over-commercialization and excessive resource development in tourism may inhibit the optimization of industrial structure and ecological improvements. However, regarding high-end industrial structure, the promotion of tourism development at this stage peaks, with a coefficient of 4.774, indicating a significant positive effect of mature tourism development on the transformation to a high-end industrial structure, which may closely relate to the technological innovations and industrial integration driven by tourism development.

In summary, the impact of tourism development on industrial structure upgrading is not linear but significantly influenced by the stage of tourism development. In the early stage, its promotion of rationalization and ecological aspects of industrial structure is significant, but its driving effect on high-end industrial structure is limited; as the stage of tourism development advances, its role in promoting high-end industrial structure gradually strengthens, while the promotion of rationalization and ecological aspects may weaken or even turn into negative effects.

CHAPTER 5
CONCLUSION, DISCUSSION AND POLICY RECOMMENDATION

This study aims to analyze the impact of tourism development on the upgrading of industrial structure in the China-ASEAN region. The conclusion and policy recommendation by this following:

5.1 Conclusion

5.2 Discussion

5.3 Policy Recommendation

5.1 Conclusion

With the deepening of regional economic integration, the role of tourism in the economic development of the China-ASEAN region has become increasingly prominent. Based on panel data from China and ASEAN countries from 2000 to 2020, this study systematically analyzes the mechanism of tourism development's impact on industrial structure upgrading. Using a two-way fixed effects model, a mediation effect model, and a moderation effect model, it reveals the direct role, transmission pathways, and moderating effects of tourism development on industrial structure upgrading. The findings are as follows:

5.1.1 Significant promoting effect

Tourism development has significantly promoted the upgrading of the industrial structure in the China-ASEAN region, with the greatest impact on the ecological transformation of the industrial structure, followed by the advancement of the industrial structure to a higher level, and the weakest impact on the rationalization of the industrial structure.

5.1.2 Mediation effect

The results of the mediating effect test indicate that the "employment effect" and "capital effect" of tourism development significantly promote the upgrading of the industrial structure in the China-ASEAN region.

5.1.3 Moderation effect

The results of the moderating effect test show that the "urbanization effect" and "environmental effect" clearly moderate the role of tourism development in promoting industrial structure upgrading. Moreover, the "urbanization effect" mainly plays a positive moderating role, while the "environmental effect" shows a significant negative moderating role.

Heterogeneity analysis indicates that the role of tourism development in promoting industrial structure upgrading is more significant in regions with higher levels of economic development, highlighting the important moderating role of regional economic levels in policy effectiveness. Research evidence indicates that the tourism industry originated as an economic sector and continues to positively impact industrial structure upgrades as the functions of the industry evolve. However, the specific mechanisms by which tourism development drives upgrades in industrial structure still require further exploration.

5.2 Discussion

This study delves into the impact of tourism development on the upgrading of industrial structures in the China-ASEAN region, based on a systematic review of relevant literature. It both validates the main conclusions of existing research and demonstrates innovation and differentiation.

5.2.1 Research on Mechanism Innovation

This study provides a detailed analysis of the relevant mechanisms in terms of methodology and content. For the first time, it systematically introduces two mediating variables: employment effects and capital accumulation, revealing the internal pathways through which tourism development promotes the optimization of industrial structure by creating jobs and capital aggregation. In addition, it innovatively analyzes the moderating effects of urbanization level and environmental quality, clarifying the dual positive and negative impacts of external environmental factors on the industrial upgrading triggered by tourism, which is relatively rare in the existing literature on regional tourism research.

5.2.2 Further analysis of regional heterogeneity

Unlike most heterogeneity analyses based on countries, this study clearly distinguishes the role of the tourism industry under different economic and policy environments. Through subgroup comparisons, it points out that the positive impact of the tourism industry on industrial structure upgrading is more pronounced in economically developed areas, reflecting the significant moderating effect of regional economic foundations on policy outcomes. This fills a current research gap on regional heterogeneity.

5.2.3 Focus on the China- ASEAN Specialty Region

This study focusing on the unique regional context of China-ASEAN, the research offers not only theoretical innovation but also strong practical application value, addressing the current quantitative research gap regarding tourism economy and industrial structure upgrading mechanisms in this region and providing solid theoretical support and empirical evidence for coordinated regional development and policy formulation.

In summary, this study expands the theoretical framework and empirical perspectives while verifying the major conclusions of existing literature, especially in the in-depth analysis of mediating mechanisms, moderating effects, and regional differences, enriching the academic discussion on the relationship between tourism development and industrial structure upgrading, and offering more targeted and actionable policy recommendations for the economic policies of the China-ASEAN region.

5.3 Policy Recommendation

Currently, accelerating industrial structure upgrade is not only an important means to achieve high-quality economic development but also a key approach to promote coordinated and collaborative development among regions. Based on the findings of this study, the following policy recommendations are proposed:

5.3.1 Priority Promotion of Tourism Development Strategies

Adapt to local conditions and prioritize the promotion of tourism development strategies. Taking the expansion of the tourism industry and high-quality development as

an opportunity, we aim to optimize resource allocation, drive the growth of emerging industries, and facilitate the transformation and upgrading of traditional industries, thereby providing viable options for industrial structure upgrading in the China-ASEAN region.

5.3.2 Optimize the allocation of tourism resources

Strengthen the transfer and flow of factors such as labor and capital to create a favorable tourism market environment. It is essential to continuously deepen supply-side structural reforms and fully leverage the decisive role of the market in resource allocation. Relying on the new economic development pattern, we must eliminate "bottlenecks" that hinder the free flow of capital and labor. By standardizing the transaction system in the tourism industry, we can promote the healthy development of modern tourism and foster a positive market environment.

5.3.3 Promote industry integration

Strengthen the positive interaction and deep integration between urbanization, environmental protection, and the tourism industry. On one hand, urbanization provides the necessary spatial conditions for tourism development and industrial structure upgrading, and it is possible to adopt a tourism-oriented urbanization construction strategy, such as the establishment of tourism-themed towns. This is not only an effective exploration of new-type urbanization but also provides strong support for promoting the urbanization of tourism and the upgrading of industrial structure. On the other hand, it is essential to accelerate the coordination and coupling of tourism development with the ecological environment, making it a key link in industrial structure upgrading and regional economic development. By alleviating ecological pressure and enhancing the momentum for industrial upgrading, it promotes the optimization and upgrading of regional industrial structures, aligning with the characteristics of modern tourism development.

5.3.4 Establishing a Regional Coordination Mechanism

Establish a policy system for industrial restructuring and upgrading to promote coordinated regional development. On one hand, it is essential to encourage the transformation and upgrading of modern service industries, including tourism, gradually steering them towards higher-end and more refined directions to address the

shortcomings of certain sectors. For example, by developing high-end hotels and unique guesthouses, we can attract high-spending tourists, promote the integration of agricultural sightseeing with cultural tourism, and enhance the added value of tourism products, thereby facilitating overall economic growth. On the other hand, leveraging tourism development as an opportunity, we can establish a development model for industrial structures that complement regional advantages. This can be achieved through the sharing of tourism resources between China and ASEAN, forming regional tourism alliances to realize cooperation, such as jointly hosting tourism expos and cultural exchange activities. Furthermore, in the future, we can explore the establishment of cross-border e-commerce platforms to boost the transaction of tourism products and cultural exchanges, further enhancing the collaborative development of industries within the region and achieving mutually beneficial outcomes.

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