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Article

Smart Tourism Spillover Effects: Analysis Using an Inter-Regional Input-Output Model

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Abstract

The pandemic crisis in 2020 has significantly impacted the tourism sector. Besides, the tourism sector is a sector that has great potential in the economy and is an alternative to replacing the extractive sector, such as coal mining. Furthermore, new concepts related to smart tourism are also starting to emerge, which is expected to help accelerate economic recovery. Based on this, this study aims to evaluate the economic effects of smart tourism, both intra- and inter-regional effects, using inter-regional input-output. This is the first study to discuss the regional linkages to smart tourism. The result shows that smart tourism in Indonesia has a spillover effect to other regions, which can help regional integration. The smart tourism industry has a larger total effect on value-added than other industries. In intraregional, the multiplier effect on output, income, and value-added is greater than other industries. The biggest spillover effect of smart tourism is Java and Nusa Tenggara. Based on forward and backward linkage analysis, smart tourism in Bali is classified as "dependent on inter-industrial demand as an intermediate primary production." In addition, smart tourism can be categorized as a key sector in intra regional Bali. With the investment simulation in the smart tourism industry, it can be forecasted that Indonesia's economic growth in 2022 will increase by 0.035 percent; Bali by 2.2 percent; and other provinces by 0.006 percent, given the improvement of other industries.

Keywords: smart tourism; spillover effect; regional integration

[1] BPS-Statistics of Kalimantan Selatan Province

I. Introduction

1.1. Motivation and Research Problems

Nowadays, many countries are more concerned about the development of the tourism sector. Tourism has great potential to contribute to economic development, such as quality economic growth, new employment opportunities, and socio-economic improvement of a country (Dinu, 2000). Increased tourist arrivals will result in increased tourist expenditure, which will boost the global economy's growth rate. Empirical research related to the impact of tourism on economic growth can also be found in the study by Ma et al. (2015). Furthermore, the study highlighted the role of the tourism sector in the development of positive spatial correlation that led to spatial spill-overs. Its potential for sustainable development is also very important, especially as an alternative sector to replace the large role of extractive sectors such as coal mining.

Before the pandemic, the role of tourism in the economy had an increasing trend. It can be seen from the increase in the number of foreign tourist arrivals to Indonesia, from 14.04 million people in 2017 to 16.11 million people in 2019 (BPS-Statistics Indonesia, 2022). However, various restrictions on economic activity have made tourism the sector most affected by the pandemic. In 2020, the number of foreign tourist arrivals fell to 4.05 million people, which grew negatively by 74.84 percent. Moreover, the room occupancy rate of classified hotels fell by 60.70 percent (BPS-Statistics Indonesia, 2022). From the gross domestic product, it can also be seen that several tourism-related sectors grew negatively, d accommodation and food service activities, and other services activities. Even in Bali, the contraction growth is more profound than Indonesia's economy in aggregate.

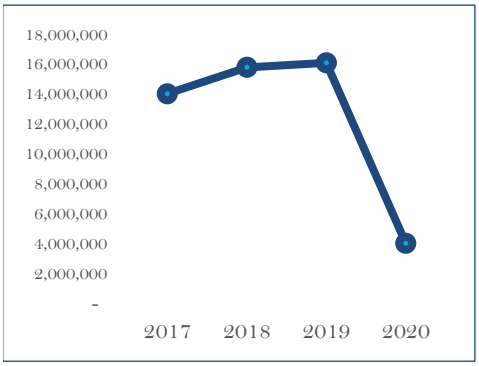

Figure 1. Number of Foreign Tourist Arrivals to Indonesia by Entrance (People)

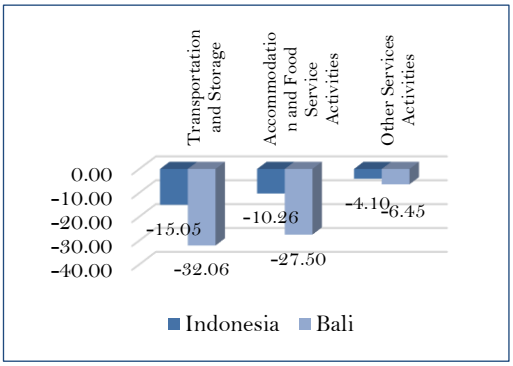

Figure 2. Growth of Tourism-related Sector, 2020 (Percent)

In the current period of economic recovery, a revival of the tourism sector is urgently needed, which can boost regional integration. Regional integration is one solution to solve common political, economic, and sociocultural issues faced by countries in a particular geographical area (Wijesinghe, 2020). The tourism sector's enormous potential and role in regional integration are expected to help accelerate economic recovery and make economic recovery programs run on the track.

In recent years, a new concept of traditional tourism has emerged, namely smart tourism. Smart tourism is an industry that can be a solution amid crisis conditions, both

current and future crises. According to Zamyatina et al. (2021), combining information and communication technology (ICT) and the tourism sector can shorten the operational processes and information flow management. It is useful during the recovery of the tourism sector.

However, research on smart tourism concerning regional integration is still limited, especially empirical research. Even in Indonesia, to the best of the author's knowledge, this is the first study to discuss the regional linkages (intra- and inter-) to smart tourism. Therefore, this study uses inter-regional input-output to evaluate the economic effects of smart tourism, both intra- and inter-regional effects. Thus, this study raises the following research questions:

1. How much does a smart tourism industry contribute to the economies of the intraregional and other regions?
2. How does the smart tourism industry interact with other industries?
3. What is the economic effect of an investment in smart tourism industries?

This study focuses on Bali's province. It is because Bali has been the main destination of foreign tourists in Indonesia and the most significant contributor to Indonesia's foreign exchange income (Ollivaud & Haxton, 2019).

1.2. Concept of Smart Tourism

Many academics consider the terms "smart" and "intelligent" to be interchangeable (Li & Hu, 2016). Li et al. (2016) define intelligence as the ability to change one's state or activity in response to various situations, requirements, and previous experiences, implying that intelligence may produce acceptable results based on multiple demands, conditions, and historical experiences. However, "smart" means to do the right thing in various challenging situations.

Pai et al. (2020) mentioned that the ultimate goal of smart tourism is to make tourists' travel experiences more convenient and enjoyable. Smart tourism is traditional tourism combined with technology that allows tourism and the services to be managed to provide more profitable significance (Aramendia-Muneta, 2020). Based on Phillip (2000), two types of techniques shape smart tourism: 1) smart demand and the application of management strategies capable of managing demand and access; 2) smart marketing techniques capable of targeting the right client segments and delivering appropriate messages. Molz (2012) identified smart tourism aims to use mobile digital connectivity to create more innovative, meaningful, and sustainable relationships between tourists and destinations. Furthermore, smart tourism is part of a more considerable effort to see tourism as meaningful civic participation rather than merely a form of consumption.

Smart tourism refers to the tourism sector where integrated, real-time data and physical infrastructure have been combined into one complex environment, such as a city, thus making outstanding achievements (Pai et al., 2020). More specifically, Lee & Hlee (2021) define smart tourism in a city as an innovative and sustainable city that achieves economic and social values. The smart tourism city also increases competitiveness by collecting, examining, visualizing, and modeling large amounts of real-time data generated across the city and sharing it with all participants in the smart tourist ecosystem. Through connectedness via information communication technology, smart tourism contributes to

increased efficiency, sustainability, eco-friendliness, and improved resident/tourist quality of life/visit (ICTs) (Lee & Hlee, 2021).

European Capital of Smart Tourism (2020) measures smart tourism based on smart solutions for the tourism industry. In practice, the European Capital of Smart Tourism (2020) measures the achievements of smart tourism into four categories: sustainability, digitalization, cultural heritage & creativity, and accessibility. Sustainability means having measures that are eco-friendly and sustainable at the same time. Digitalization refers to the use of ICT to improve tourism. The new development of this tourism is accessibility, which shows how physically accessible a city is to tourists, regardless of their disability.

Zamyatina et al. (2021) conducted a study to see the prospects of the business strategy formation of smart tourism. His research shows that information and communication technologies in smart tourism can support tourism development. The existence of the smart tourism concept opens up opportunities for improvement of quality, the attractiveness of services and productivity, and the efficiency of operating processes and information flow management. However, on the other hand, this new tourism concept has several threats, especially related to the increasing dependence on technology. Dependence on communication quality is also a challenge in this industry.

1.3. Related Research

Lee & Hlee (2021) conducted research that analyzed the intra- and interregional economic effects of smart tourism, focusing on Seoul. This research also clarifies the scope of smart tourism by using the Delphi survey. The inter-regional input-output model is used to support the research results. The results show that smart tourism has low production effects in all regions and industries compared to other industries. Still, it is a high-income, high-value-added industry that considerably contributes to tax revenue security. Except for the indirect tax enticement effect, smart tourism city Seoul contributes to the economy of Seoul. However, it has a minor economic impact on other regions than other industries. From the standpoint of Seoul, the smart tourist industry is an intermediate production business, which indicates that the smart tourism industry in Seoul has service industry characteristics.

Savić & Pavlović (2018) analyze the factors supporting smart tourism in Serbia. The three factors focused on research are technology, human capital, and innovation. According to the findings, Serbia has an excellent foundation for smart tourism development in terms of technology and human capital but limited innovative potential. Understanding these factors in terms of their past and current development and their level of growth compared to other countries with smart cities can aid in determining how and to what extent these factors can be improved to create the necessary conditions for smart tourism development in Serbia.

Research by Kim & Choi (2016) uses input-output tables to analyze the characteristics of the smart city industry and its influence on Korea's national economy. The results showed that the smart city industry has intermediate characteristics between ICT and urban construction industries. Based on the forward and backward linkage effects, the results obtained are the importance of the relevant service industries to the smart city industry.

The spatial spillover effects of tourism development on urban economic performance are also investigated by Jiao et al. (2019). Methods used are the moran Index and the general

nesting spatial model (GNS). According to their findings, tourism has a positive impact on economic performance. They also recommend that policymakers emphasize the differentiation and specialization of tourism resources among nearby cities and avoid beggar-thy-neighbor policies.

II. Data and Methodology

2.1. Data

In answering the research questions, the inter-regional input-output (IRIO) table was used in this study. The recent IRIO table released by BPS-Statistics Indonesia was in 2016, with 52 industries in 34 provinces in Indonesia. The analysis focuses on the Province of Bali as the most significant contributor to Indonesia's foreign exchange income. In classifying the business activities of the smart tourism industry, researchers used references from the research of Lee & Hlee (2021), who conducted a Delphi survey. In the first stage, 12 experts were asked to choose which of the overall sectors included in the smart tourism-related industries. The second stage rated the degree of relationship of the smart tourism industry, which was selected in the first stage. The survey results show the percentage of smart tourism coverage in the selected industry, which is presented in Table 1.

Table 1. Classification of the smart tourism industry and contribution to general industry

Industry	Percentage
Computers and Peripherals	75.0
Communication, Broadcasting, Video, and Sound Equipment	83.3
Telecommunications Services	100.0
Broadcasting Service	91.7
Information Service	100.0
Supply for Software Development and Other IT Services	91.7
Motion Picture and Video Production and Distribution	66.7
Research and Development	50.0
Wholesale and Retail Service	91.7
Road Transport Services	91.7
Water Transport Services	83.3
Air Freight Service	91.7
Restaurant and Accommodation Services	100.0
Cultural Services	100.0
Sports and Entertainment Services	100.0

Source*:* Lee &Hlee (2021)

2.2. Data on Income Inequality

The IRIO table is an extension of the Single Input-Output Table, which analyzes two or more regions. IRIO analysis is based on a sectoral and regional disaggregation of the well-known macroeconomic equation for the gross regional or gross national product (Oosterhaven & Hewings, 2013). The IRIO table shows transactions between economic activities and between regions (BPS-Statistics Indonesia, 2021). The IRIO model is a useful tool for analyzing regional and industry interdependencies. The IRIO model necessitates a substantial amount of primary data, which can only be compiled when the interindustry flows' spatial and sectional origin and destination are perfectly and directly understood (Zhang & Zhao, 2007). The indicators obtained from this IRIO table are the level of

interdependence and linkages between regions, cross-regional trade relations (exports-imports), and industrial concentration by region.

The difference between a diagonal and an off-diagonal block of Z is essential. The diagonal blocks, Z_{ij}^{rr}, represent intra-regional intermediate goods and services. In contrast, the off-diagonal blocks, ZZ_{ij}^{rs}, represent interregional trade in intermediate goods from industry i in r to industry j to s (Hewings & Oosterhaven, 2015). The input coefficient in region 1 (A^{11}) can be calculated by dividing the intermediate input region 1 (Z^{11}) by the total input (X^1), as in the following equation.

$$A^{11} = \frac{Z^{11}}{X^1} \quad (1)$$

The input coefficient from region 1 to region r (A^{r1}) can be calculated as follows.

$$A^{r1} = \frac{Z^{r1}}{X^1} \quad (2)$$

The coefficient of added value in region 1 (V^1) can be calculated as follows.

$$A^{v1} = \frac{V^1}{X^1} \quad (3)$$

From the above calculation, then the input coefficient matrix (A), Leontief matrix, and multiplier effect are formed. The Leontief matrix is calculated from $(I - A)^{-1}$, where I is the identity matrix.

Table 2. Interregional input–output table

	Industry demand			**Final demad**				**Total**
	Region 1	**…**	**Region R**	**Region 1**	**…**	**Region R**	**Foreign exports**	
Region 1	Z^{11}	…	Z^{1R}	F^{11}	…	F^{1R}	e^1	x^1
…	…	Z^r_s	…	…	F^r_s	…	e^r	x^r
Region R	Z^{R1}	…	Z^{RR}	F^{R1}	…	F^{RR}	e^R	x^R
Foreign imports	Z^{m1}	…	Z^{mR}	F^{m1}	…	F^{mR}	Transit trade	M^{for}
Value-added	V^1	…	V^R	Y^1	…	Y^R	0	Y^{nat}
Total	$x^{1'}$	$x^{s'}$	$x^{R'}$	$C^1I^1G_1$	…	$C^RI^RG_R$	E^{for}	

Source: Hewings & Oosterhaven (2015)

The multiplier effect studied comprised output, income, value-added, and employment. Detailed definitions and formulas are shown in Table 3.

Table 3. Definitions and formula of each multiplier effect

Types of Multiplier Effect	Definition	Formula
Output	The ripple effect of one unit change in final demand on change in business turnover/output	The column sums of the Leontief matrix $(I - A)^{-1}$
Income	The ripple effect of one unit change in final demand on change in personal income for residents	$A_p(I - A)^{-1}$ A_p is an income multiplier matrix
Value-Added	The ripple effect of one unit change in final demand on change in value-added	$A_v(I - A)^{-1}$ A_v is a value-added multiplier matrix
Employment	The number of jobs created from one unit increases in final demand	$A_e(I - A)^{-1}$ A_e is an employment multiplier matrix

Source: *Lee* & Hlee (2021)

III. Results, Analysis, and Discussions

3.1. Classification of Smart Tourism Industries

There are several differences in industry classification from the results of the Delphi Survey conducted by Lee & Hlee (2021), so adjustments are needed to apply the amount of smart tourism coverage in the industrial classification of the Indonesian IRIO table. The adjustment was made by bridging the smart tourism industry conducted by Lee & Hlee (2021) with the 2016 IRIO Indonesia classification. Then, it is weighted using the National Input-Output table, which has a more detailed industry classification (185 products). The percentage of some industries is calculated using the average. The following are the results of the percentage coverage of the smart tourism industry used in this study.

Table 4. Percentage of selected smart tourism industry Indonesia

Industry	Percentage
Manufacture of Fabricated Metal Products, Computer and Optical Products, and Electrical Equipment	41.13
Wholesale Trade and Retail Trade Except of Motor Vehicles and Motorcycles	91.70
Land Transport	91.70
Sea Transport	83.30
River, Lake, and Ferry Transport	83.30
Air Transport	91.70
Accommodation Activities	100.00
Food Service Activities	100.00
Information & Communication	86.84
Business Activities	3.82
Other Service Activities	25.63

From the percentage results in Table 4, the smart tourism industry is separated from the general industry. Furthermore, several Indonesian IRIO table industries were aggregated, and the smart tourism industry emerged as a separate industry. The number of industries used in the research is 32 industries.

3.2. Intraregional and Spillover Effect of Smart Tourism

Tables 5 and 6 show the multiplier effect of the impact of output, income, value-added, and employment. These effects are divided into intra- and inter-region effects. Because the main focus of the smart tourism industry in this study is the Province of Bali, so the intra-regional effect is the effect that occurs within the domestic area of Bali. In contrast, the inter effect is the spillover effect that occurs outside Bali. Based on the table, in total, it can be seen that the multiplier effect of output and income of the smart tourism industry are lower than in other industries. The output multiplier for the smart tourism industry is 1.755, while for other industries, it is 1.815. The output effect of 1.755 means that an increase of one billion rupiahs in the final demand for smart tourism output in Bali will increase the total national output by 1.755 billion rupiahs.

The income multiplier is lower than the output multiplier. Then, if the income multiplier is compared between industries, it can be seen that the smart tourism industry effect is 0.359, which is lower than other industries, which is 0.370. Conversely, the multiplier effect of value-added in the smart tourism industry (0.927) is higher than in other industries (0.857). The value-added multiplier value of 0.927 means that an increase of one billion rupiahs in the final demand for the smart tourism industry will increase the value-added to the overall economy in Indonesia by 857 million rupiahs. On the other hand, the multiplier effect of total employment between the two industries is similar. These results imply that smart tourism has relatively low output and income effects in all regions and industries, but it is a higher value-added industry than others.

Table 5. Multiplier Effect of the smart tourism industry and other industries

Industry Sector		Output			Income		
		Intra	Inter	Total	Intra	Inter	Total
1	Agriculture, Forestry & Fishing	1.179	0.258	1.437	0.331	0.043	0.374
2	Mining & Quarrying	1.189	0.303	1.493	0.342	0.045	0.387
3	Manufacture of Coal and Refined Petroleum Products	1.000	0.000	1.000	0.000	0.000	0.000
4	Manufacture of Food Products and Beverages	1.635	0.389	2.024	0.263	0.080	0.343
5	Manufacture of Tobacco Products	1.123	0.428	1.551	0.051	0.108	0.159
6	Manufacture of Textiles	1.395	0.682	2.077	0.262	0.123	0.385
7	Manufacture of Leather	1.378	0.686	2.065	0.415	0.135	0.550
8	Manufacture of Wood	1.463	0.612	2.075	0.272	0.112	0.384
9	Manufacture of Paper	1.286	0.860	2.146	0.343	0.189	0.532
10	Manufacture of Chemicals	1.355	0.667	2.022	0.171	0.116	0.287
11	Manufacture of Rubber	1.248	0.815	2.063	0.190	0.132	0.323

Industry Sector		Output			Income		
		Intra	Inter	Total	Intra	Inter	Total
12	Manufacture of Other Non-Metallic Mineral Products	1.479	0.553	2.032	0.416	0.104	0.520
13	Manufacture of Basic Metals	1.000	0.000	1.000	0.000	0.000	0.000
14	Manufacture of Fabricated Metal Products, Computer, and Optical Products, and Electrical Equipment *	1.209	0.538	1.748	0.296	0.102	0.398
15	Manufacture of Machinery and Equipment	1.241	0.582	1.823	0.291	0.110	0.401
16	Manufacture of Transport Equipment	1.354	0.644	1.998	0.266	0.119	0.386
17	Manufacture of Furniture	1.361	0.505	1.865	0.357	0.096	0.453
18	Other Manufacturing	1.312	0.428	1.739	0.318	0.074	0.392
19	Electricity & Gas	2.604	1.568	4.171	0.165	0.185	0.350
20	Water supply	1.341	0.388	1.729	0.284	0.060	0.344
21	Construction	1.418	0.618	2.037	0.308	0.125	0.433
22	Wholesale & Retail Trade *	1.239	0.158	1.397	0.398	0.030	0.428
23	Transportation & Storage *	1.432	0.426	1.858	0.305	0.069	0.374
24	Information & Communication *	1.460	0.231	1.692	0.224	0.042	0.266
25	Financial & Insurance Activities	1.199	0.106	1.306	0.399	0.023	0.422
26	Real Estate Activities	1.297	0.121	1.417	0.130	0.025	0.155
27	Business Activities *	1.472	0.258	1.730	0.453	0.048	0.501
28	Public Administration & Defence	1.445	0.305	1.749	0.480	0.056	0.536
29	Education	1.275	0.218	1.493	0.551	0.043	0.594
30	Human Health and Social Work Activities	1.296	0.511	1.807	0.324	0.081	0.405
31	Other Service Activities	1.390	0.316	1.706	0.337	0.055	0.392
Other Industries (Mean)		**1.357**	**0.457**	**1.815**	**0.288**	**0.082**	**0.370**
32	**Smart Tourism**	**1.366**	**0.389**	**1.755**	**0.293**	**0.066**	**0.359**

Notes: *excluding the smart tourism industry

Table 6. Estimation of the inducement coefficients of the smart tourism industry and other industries (continued)

Industry Sector		Value-Added			Employment		
		Intra	Inter	Total	Intra	Inter	Total
1	Agriculture, Forestry & Fishing	0.854	0.118	0.973	0.017	0.005	0.022
2	Mining & Quarrying	0.798	0.105	0.904	0.009	0.005	0.014
3	Manufacture of Coal and Refined Petroleum Products	0.000	0.000	0.000	0.021	0.000	0.021
4	Manufacture of Food Products and Beverages	0.748	0.209	0.957	0.031	0.007	0.038

Industry Sector		Value-Added			Employment		
		Intra	Inter	Total	Intra	Inter	Total
5	Manufacture of Tobacco Products	0.690	0.276	0.967	0.024	0.007	0.031
6	Manufacture of Textiles	0.599	0.296	0.896	0.029	0.013	0.042
7	Manufacture of Leather	0.600	0.308	0.908	0.029	0.013	0.042
8	Manufacture of Wood	0.644	0.284	0.928	0.030	0.012	0.042
9	Manufacture of Paper	0.532	0.387	0.920	0.027	0.017	0.044
10	Manufacture of Chemicals	0.609	0.317	0.926	0.027	0.013	0.040
11	Manufacture of Rubber	0.541	0.373	0.914	0.026	0.016	0.042
12	Manufacture of Other Non-Metallic Mineral Products	0.678	0.242	0.920	0.028	0.010	0.037
13	Manufacture of Basic Metals	0.000	0.000	0.000	0.021	0.000	0.021
14	Manufacture of Fabricated Metal Products, Computer, and Optical Products, and Electrical Equipment *	0.569	0.246	0.815	0.025	0.010	0.035
15	Manufacture of Machinery and Equipment	0.583	0.256	0.840	0.026	0.011	0.037
16	Manufacture of Transport Equipment	0.611	0.303	0.914	0.028	0.013	0.041
17	Manufacture of Furniture	0.700	0.241	0.941	0.028	0.010	0.038
18	Other Manufacturing	0.656	0.184	0.840	0.026	0.008	0.034
19	Electricity & Gas	0.313	0.409	0.722	0.037	0.023	0.061
20	Water supply	0.779	0.158	0.936	0.018	0.007	0.025
21	Construction	0.616	0.282	0.898	0.026	0.012	0.038
22	Wholesale & Retail Trade *	0.897	0.071	0.968	0.026	0.003	0.029
23	Transportation & Storage *	0.727	0.163	0.890	0.019	0.008	0.027
24	Information & Communication *	0.855	0.101	0.956	0.025	0.004	0.030
25	Financial & Insurance Activities	0.929	0.053	0.982	0.044	0.002	0.046
26	Real Estate Activities	0.922	0.056	0.978	0.015	0.002	0.017
27	Business Activities *	0.816	0.115	0.931	0.026	0.005	0.031
28	Public Administration & Defence	0.791	0.134	0.925	0.037	0.006	0.043
29	Education	0.854	0.098	0.952	0.022	0.004	0.026
30	Human Health and Social Work Activities	0.704	0.227	0.931	0.031	0.010	0.041
31	Other Service Activities	0.810	0.136	0.946	0.028	0.006	0.033
Other Industries (Mean)		**0.659**	**0.198**	**0.857**	**0.026**	**0.008**	**0.034**
32	**Smart Tourism**	**0.761**	**0.166**	**0.927**	**0.027**	**0.007**	**0.034**

Notes: *excluding the smart tourism industry

By separating the Bali domestic multiplier effect (intra) and other provinces (inter), it can be seen that the effects of output, income, employment, and value-added are different in the two distributions. The smart tourism industry dominates the entire type of multiplier effect in the intra-region. On the other hand, if you focus on inter-regional effects, the sector other than the smart tourism industry is bigger. It also happened to the value-added multiplier of smart tourism, which was only 0.166 in the inter-regional effect, compared to other industries, which amounted to 0.198.

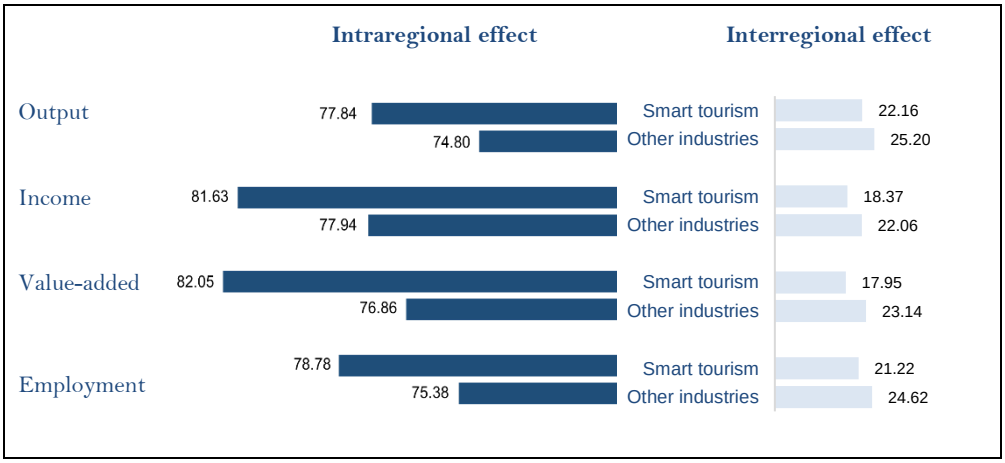

Figure 3. The ratio of intra- and inter-regional economic effects

Figure 3 shows the ratio of intra- and inter-regional economic effects of the smart tourism industry and other industries. Overall, the multiplier effect is greater intra-effect than the inter-effect, both in smart tourism and other industries. The contribution of the economic ripple effect is distributed to other regions by only around 20 percent. Therefore, the economic effects of smart tourism industries appear to have much influence in Bali.

If broken down by island, the interregional effect on output and value-added can be seen in Figures 4 and 5. For the output multiplier effect, the smart tourism industry had the largest impact on Java at 0.039, followed by Nusa Tenggara and Sumatra at 0.009 and 0.007, respectively. The position of the spillover effect magnitude from the smart tourism industry is almost similar to the value-added multiplier. Java Island occupies the first position with a value-added multiplier of 0.016, followed by Nusa Tenggara at 0.006. What is different is the third position of the value-added multiplier spread to Sulawesi Island by 0.006.

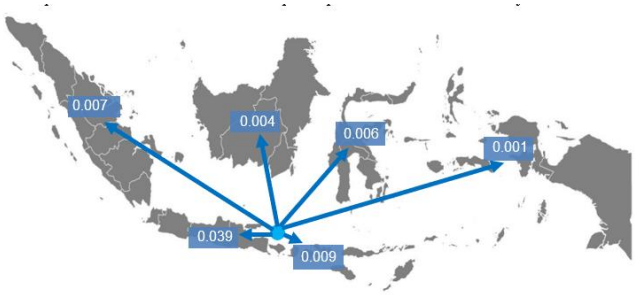

Figure 4. Inter-regional effect of smart tourism on output

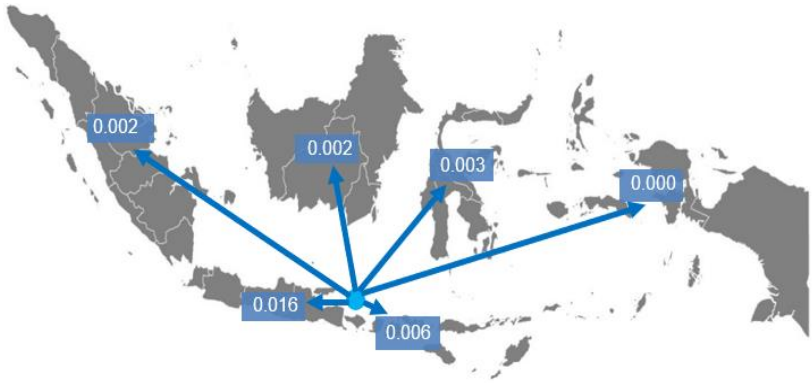

Figure 5. Inter-regional effect of smart tourism on value-added

3.3. Forward and Backward Linkage Effects

In the context of input-output analysis, it is necessary to have a linkage analysis to understand further the relationship between economic industries. An (intermediate) sector is linked to other sectors that supply (intermediate) inputs to it, as well as those whose output is used as their inputs (Zhang & Zhao, 2007). As a result, the expansion of a sector increases demand for inputs from its input-supplying sectors while also increasing input supply to sectors that use its output. The linkage analysis is divided into forward linkage effect and backward linkage effect. Forward linkage shows the linkage of the output of an industry to be used as input for other industries for its production. Thus, the output of a particular industry will increase if there is an increase in intermediate inputs from all other industries.

On the other hand, backward linkage refers to the linkage of another industry's overall output, which is the intermediate input required in an industry. If the demand for inputs in one industry increases, the output of all other industries will also increase. In other words, forward linkage is useful for detecting the output of the smart tourism industry as raw material for producing other industrial outputs. Meanwhile, backward linkage is to identify the output of smart tourism that is used as a final product that encourages an increase in the output of other industries that are used as intermediate inputs. Forward and backward linkage can be defined as follows (Lee & Hlee, 2021).

$$FL_i = \frac{\sum_{j=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} \quad \text{and} \quad BL_j = \frac{\sum_{i=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}}$$

where n is the number of industry sectors and b is $(I - A)^{-1}$.

Each industry can be grouped based on the forward and backward linkage values. By combining the categories from Miller (2009) and Lee & Hlee (2021), the classification of forward and backward linkage results is as follows.

Tabel 7. Industry classification based on linkage effects

		Forward Linkage	
		Low	**High**
Backward Linkage	**Low**	Generally independent as a final primary production	Dependent on interindustry demand as an intermediate primary production
	High	Dependent on interindustry supply as a final manufacture	Generally dependent as an intermediate manufacture

Source: Miller (2009) dan Lee & Hlee (2021)

In the context of inter-regional input and output analysis, forward and backward linkage can also be divided into intra-regional and inter-regional effects, as shown in Tables 8 and 9. The forward linkage effect of smart tourism in Bali is 3.333, where the value is more than one and is the highest position compared to other industries. The backward linkage effect of smart tourism also has a value of more than one but has a fairly low position compared to other industries, which are ranked 13. Due to the high value of forward and low backward linkage, the smart tourism industry in Bali can be categorized as "dependent on inter-industrial demand as an intermediate primary production." These results are the same as the research conducted by Lee & Hlee (2021) on smart tourism in Seoul. However, according to Lee & Hlee (2021), mentioning it as a primary production industry is inappropriate because the smart tourism industry consists of a combination of technology and service industries. Therefore, the smart tourism industry is more emphasized as "intermediate production," which is affected by increased demand in other industries.

If we look at the effect of interregional smart tourism in Bali, the forward linkage is also high at 5.173. This value is even higher than the forward linkage effect in the Bali region. However, smart tourism is low, below one for backwards linkage, which only reaches 0.855. With this linkage value, Bali's smart tourism industry in other regions is categorized as "dependent on interindustry demand as an intermediate primary production." So, both intra and interregional, smart tourism has the same role.

Table 8. Forward and backward linkage effects results (intra-regional effects)

	Industry Sector	Forward Linkage Effect	Ranking	Backward Linkage Effect	Ranking
1	Agriculture, Forestry & Fishing	1.577	3	0.869	29
2	Mining & Quarrying	0.952	9	0.876	28
3	Manufacture of Coal and Refined Petroleum Products	0.737	31	0.737	31
4	Manufacture of Food Products and Beverages	0.872	12	1.204	2
5	Manufacture of Tobacco Products	0.737	29	0.827	30
6	Manufacture of Textiles	0.751	23	1.027	10
7	Manufacture of Leather	0.766	21	1.015	12
8	Manufacture of Wood	1.170	6	1.078	5

Industry Sector		Forward Linkage Effect	Ranking	Backward Linkage Effect	Ranking
9	Manufacture of Paper	0.835	14	0.947	21
10	Manufacture of Chemicals	0.737	25	0.998	15
11	Manufacture of Rubber	0.737	28	0.919	23
12	Manufacture of Other Non-Metallic Mineral Products	0.787	17	1.089	3
13	Manufacture of Basic Metals	0.737	31	0.737	31
14	Manufacture of Fabricated Metal Products, Computer, and Optical Products, and Electrical Equipment *	0.737	27	0.891	26
15	Manufacture of Machinery and Equipment	0.737	30	0.914	24
16	Manufacture of Transport Equipment	0.737	26	0.997	16
17	Manufacture of Furniture	0.742	24	1.002	14
18	Other Manufacturing	0.828	15	0.966	18
19	Electricity & Gas	2.406	2	1.918	1
20	Water supply	0.771	20	0.988	17
21	Construction	0.886	11	1.045	9
22	Wholesale & Retail Trade *	0.988	8	0.913	25
23	Transportation & Storage *	0.890	10	1.055	8
24	Information & Communication *	0.818	16	1.076	6
25	Financial & Insurance Activities	1.321	4	0.883	27
26	Real Estate Activities	1.031	7	0.955	19
27	Business Activities *	1.244	5	1.084	4
28	Public Administration & Defence	0.773	18	1.064	7
29	Education	0.772	19	0.939	22
30	Human Health and Social Work Activities	0.751	22	0.955	20
31	Other Service Activities	0.844	13	1.024	11
32	**Smart Tourism**	**3.331**	**1**	**1.006**	**13**

Notes: *excluding the smart tourism industry

Table 9. Forward and backward linkage effects results (inter-regional effects)

Industry Sector		Forward Linkage Effect	Ranking	Backward Linkage Effect	Ranking
1	Agriculture, Forestry & Fishing	2.717	4	0.566	25
2	Mining & Quarrying	2.253	6	0.667	23
3	Manufacture of Coal and Refined Petroleum Products	2.443	5	0.000	31

Industry Sector		Forward Linkage Effect	Ranking	Backward Linkage Effect	Ranking
4	Manufacture of Food Products and Beverages	1.910	7	0.855	18
5	Manufacture of Tobacco Products	0.009	32	0.941	15
6	Manufacture of Textiles	0.607	13	1.498	5
7	Manufacture of Leather	0.274	20	1.508	4
8	Manufacture of Wood	0.878	11	1.344	9
9	Manufacture of Paper	1.318	8	1.890	2
10	Manufacture of Chemicals	4.027	2	1.465	6
11	Manufacture of Rubber	1.128	9	1.791	3
12	Manufacture of Other Non-Metallic Mineral Products	0.508	16	1.215	11
13	Manufacture of Basic Metals	0.209	21	0.000	31
14	Manufacture of Fabricated Metal Products, Computer, and Optical Products, and Electrical Equipment *	0.593	15	1.183	12
15	Manufacture of Machinery and Equipment	0.450	17	1.278	10
16	Manufacture of Transport Equipment	0.303	19	1.415	7
17	Manufacture of Furniture	0.108	26	1.109	14
18	Other Manufacturing	0.124	25	0.940	16
19	Electricity & Gas	3.299	3	3.445	1
20	Water supply	0.017	31	0.852	20
21	Construction	0.166	24	1.359	8
22	Wholesale & Retail Trade *	0.997	10	0.346	28
23	Transportation & Storage *	0.431	18	0.936	17
24	Information & Communication *	0.090	28	0.509	26
25	Financial & Insurance Activities	0.805	12	0.234	30
26	Real Estate Activities	0.189	22	0.266	29
27	Business Activities *	0.597	14	0.567	24
28	Public Administration & Defence	0.078	29	0.670	22
29	Education	0.021	30	0.480	27
30	Human Health and Social Work Activities	0.172	23	1.123	13
31	Other Service Activities	0.105	27	0.695	21
32	**Smart Tourism**	**5.173**	**1**	**0.855**	**19**

Notes: *excluding the smart tourism industry

The combination of these two linkages analysis can also be identified whether the smart tourism industry plays a role as a key sector. This key sector can be described as a

sector that becomes the fundamental economic structure. According to Miller (2009), there are several ways to determine key sectors, one of which is sectors with both backward and forward linkages greater than one can be considered key sectors. In Figures 6 and 7, the industry considered a key sector is the one in the upper-right quadrant. The smart tourism industry plays a key sector in intra regional Bali. However, the industry cannot be categorized as a key sector in the interregional effect because the backward linkage value is less than 1.

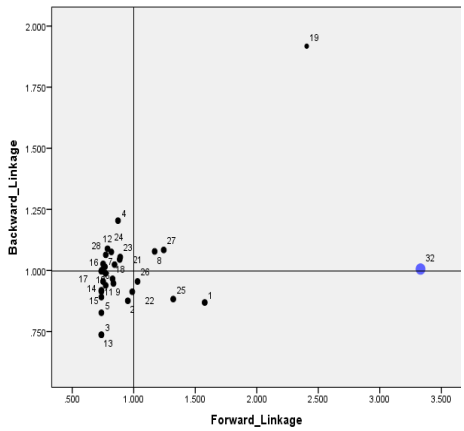

Figure 6. Forward and backward linkage effects results (intra-regional effects)

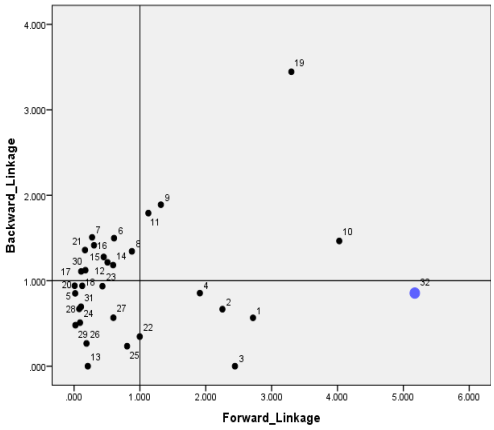

Figure 7. Forward and backward linkage effects results (inter-regional effects)

3.4. The effect of investment simulation on smart tourism

The multiplier effect that has been calculated previously can be used to see how big the impact is by using a monetary value. Smart tourism has the greatest impact on output and value-added multiplier in Bali, so this simulation focuses on these two effects. The simulation is carried out by inputting investments that may be given to the smart tourism industry in Bali. The Ministry of Tourism and Creative Economy targets the maximum total investment by 2022 in Indonesia to be US$ 1.5 billion (Arief, 2022). The contribution of Bali tourism to the total national foreign exchange was 28.9% in 2019 (Bappenas, 2021). With the estimation of the foreign exchange contribution of tourism, the investment simulation in the smart tourism industry in Bali is US$ 433.5 million, or equivalent to 6.36 trillion rupiahs. The simulation results on the output and value-added can be seen in Table 10.

A smart tourism investment of IDR 6.36 trillion will increase national output by 11.1 billion rupiahs and a national added value of 5.9 billion rupiahs. This investment had a major impact on intraregional Bali, where the increase in Bali's output reached 8.6 billion rupiahs and added value in Bali by 4.8 billion rupiahs. Meanwhile, the impact on other regions is an increase in interregional output by 2.5 billion rupiahs and an increase in value-added of 1.2 billion rupiahs.

Table 10. Estimation of the output and value-added induced by the simulation of smart tourism investment (million Rp)

	Industry Sector	Output			Value-Added		
		Intra	Inter	Total	Intra	Inter	Total
1	Agriculture, Forestry & Fishing	349,173	320,303	669,476	262,369	240,676	503,046
2	Mining & Quarrying	2,301	158,078	160,379	1,580	108,544	110,124
3	Manufacture of Coal and Refined Petroleum Products	-	336,507	336,507	-	-	-
4	Manufacture of Food Products and Beverages	148,354	527,663	676,016	45,605	162,206	207,811
5	Manufacture of Tobacco Products	-	493	493	-	305	305
6	Manufacture of Textiles	207	6,639	6,845	80	2,560	2,639
7	Manufacture of Leather	255	2,311	2,565	106	958	1,063
8	Manufacture of Wood	6,088	7,044	13,132	2,509	2,904	5,413
9	Manufacture of Paper	12,329	59,701	72,030	4,845	23,458	28,303
10	Manufacture of Chemicals	135	95,442	95,578	54	37,895	37,949
11	Manufacture of Rubber	6	38,772	38,778	2	15,474	15,476
12	Manufacture of Other Non-Metallic Mineral Products	2,543	8,537	11,080	1,038	3,485	4,522
13	Manufacture of Basic Metals	-	5,002	5,002	-	-	-
14	Manufacture of Fabricated Metal Products, Computer, and Optical Products, ande Electrical Equipment *	10	17,487	17,497	5	8,039	8,043
15	Manufacture of Machinery and Equipment	-	11,537	11,537	-	5,378	5,378
16	Manufacture of Transport Equipment	6	60,582	60,588	2	26,072	26,075
17	Manufacture of Furniture	526	1,210	1,736	273	628	901
18	Other Manufacturing	6,568	4,441	11,010	3,204	2,166	5,370
19	Electricity & Gas	171,235	127,215	298,451	9,902	7,356	17,258
20	Water supply	8,919	1,332	10,251	5,629	841	6,470
21	Construction	21,024	12,658	33,682	8,148	4,906	13,054
22	Wholesale & Retail Trade *	59,318	74,482	133,800	44,538	55,923	100,461
23	Transportation & Storage *	82,407	51,847	134,254	41,668	26,216	67,884
24	Information & Communication *	39,976	9,006	48,982	24,348	5,485	29,833
25	Financial & Insurance Activities	213,320	70,169	283,489	171,934	56,555	228,490
26	Real Estate Activities	162,350	13,564	175,913	122,784	10,258	133,042

	Industry Sector	Output			Value-Added		
		Intra	Inter	Total	Intra	Inter	Total
27	Business Activities *	145,557	43,066	188,623	81,294	24,053	105,347
28	Public Administration & Defence	8,653	4,763	13,416	4,796	2,640	7,437
29	Education	9,351	1,472	10,822	6,593	1,038	7,631
30	Human Health and Social Work Activities	3,061	4,897	7,958	1,679	2,685	4,364
31	Other Service Activities	56,605	11,426	68,031	34,245	6,912	41,158
32	**Smart Tourism**	7,171,783	384,694	7,556,476	3,955,385	212,166	4,167,552
	Total	**8,682,058**	**2,472,341**	**11,154,399**	**4,834,614**	**1,057,784**	**5,892,398**

Notes: *excluding the smart tourism industry

The simulation results make it possible to project sources of growth of the smart tourism industry in Bali, both nationally and regionally. To calculate economic growth, the added value used is in constant form, which does not include inflation. Meanwhile, the results of the value-added impact in Table 10 still include inflation, so it needs to be published using a price index. In this study, the implicit index of the previous year was used to obtain a constant value sourced from BPS-Statistics Indonesia. The results of the projected source of growth of the smart tourism industry in 2022 can be seen in Figure 8. If there is an investment in smart tourism of 6.36 trillion rupiahs, assuming other industries do not experience changes in 2022, Indonesia's economic growth is estimated to increase by 0.035 percent. In Bali Province, smart tourism investment is estimated to increase its economic growth by 2.2 percent, assuming other industries remain.

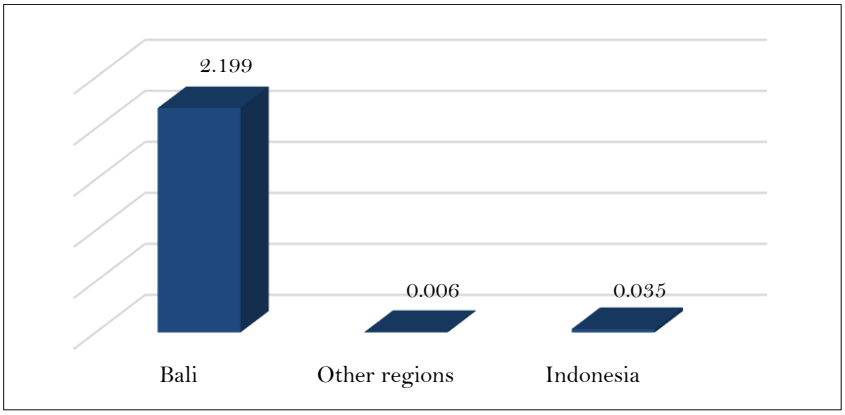

Figure 8. Source of growth of smart tourism industry, 2022 (percent)

IV. Conclusion and Recommendation

Smart tourism is a combination of the tourism sector and ICT use. The contribution from the industry is expected to play a role in regional integration, which will help post-crisis economic recovery. This study aims to analyze the spillover of the economic effects of

the smart tourism industry. An inter-regional input-output (IRIO) table was used to support the analysis. The results show that the value-added multiplier effect on the smart tourism industry is greater than that of other industries.

On the other hand, the smart tourism industry's multiplier effect of output and income is smaller. The Java and Nusa Tenggara islands are the areas that get the largest spillover effect of output and value-added from Bali's smart tourism. In addition, smart tourism in Bali can be categorized as "dependent on inter-industrial demand as an intermediate primary production" and is a key sector in intraregional. Suppose a simulation is carried out on increasing investment in the smart tourism industry. In that case, Indonesia's economic growth in 2022 is estimated to increase by 0.035 percent, assuming other industries do not change. This investment is projected to increase the economic growth of Bali and other regions by 2.2 percent and 0.006 percent, respectively.

It was found that about 20 percent of the output, income, value-added, and employment multiplier effect of the smart tourism industry in Bali spread to other regions. These effects are expected to contribute to balanced regional development. Moreover, to optimize the economic effects of a smart tourist industry, policymakers must take into account the growth of other businesses that are both directly and indirectly impacted by it. I suggest further research to be focused on other smart tourism regions, such as the tourism SEZ of Mandalika, Tanjung Kelayang, etc.

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