
THE IMPACT OF THE COVID-19 PANDEMIC ON TOURISM SECTOR IN INDONESIA USING A STRUCTURAL PATH ANALYSIS BASED ON INTER- REGIONAL INPUT-OUTPUT MATRIX

Habi Cahya Kumara^{1*}, Dedy Prastyo², Santi Rahayu²

¹Badan Pusat Statistik Kota Subulussalam, Aceh, 24781, Indonesia

²Departement of Statistics, Faculty of Science and Data Analytics, Institut Teknologi Sepuluh Nopember, Surabaya, 60111, Indonesia.

* Correspondence, email: habicahya@gmail.com

Abstrak: Penelitian ini bertujuan untuk menggambarkan keterampilan pemecahan masalah program linear ditinjau dari gaya berpikir dan jenis kelamin yang berurutan ketika sekolah menerapkan pembelajaran online karena pandemi covid-19. Penelitian ini adalah studi kualitatif yang menghasilkan data deskriptif. Subjek penelitian ini terdiri dari dua siswa putra dan dua siswi putri kelas XI MIPA SMA MTA Surakarta. Penelitian ini dimulai dengan menentukan subjek penelitian dengan menggunakan kuesioner gaya berpikir, diikuti dengan tes pemecahan masalah program linear dan wawancara. Memeriksa validitas data menggunakan triangulasi metode. Hasilnya menunjukkan keterampilan pemecahan masalah program linear; 1) Siswa sekuensial beton laki-laki dan perempuan melakukan secara sistematis dan kurang hati-hati; 2) Siswa pria dan wanita sekuensial abstrak mengumpulkan data secara lengkap dan menganalisis informasi yang diperoleh secara teratur serta siswa sekuensial abstrak perempuan kuat dalam decoding tertulis dan simbol; 3) keterampilan pemecahan masalah siswa dengan abstrak berurutan lebih tinggi daripada siswa berurutan konkret; 4) siswa laki-laki dengan gaya berpikir berurutan berkinerja lebih baik dalam memecahkan masalah matematika daripada siswa perempuan dengan gaya berpikir berurutan.

Kata kunci : *Pemecahan masalah, Gaya berpikir Sekuensial, Jenis kelamin*

Abstract: At the end of 2019 the world was shocked by the new emerging infectious disease in China; the Coronavirus disease (Covid-19). This outbreak is spreading fast and has infected almost all countries including Indonesia, the WHO has designated Covid-19 as a pandemic. The Indonesian government issued a policy of limiting community activities in an effort to break the spread of the virus. This restriction resulted in a significant reduction in economic demand. Based on the release of economic growth data by BPS, Indonesia experienced a recession in the third quarter of 2020 with the transportation and tourism sectors being the sectors most affected by this pandemic. This study will analyze the impact of the Covid-19 pandemic in Indonesia on the tourism sector and its relationship with other sectors using Backward Linkage, Forward Linkage, Multiplier Effects, and Structural Path Analysis (SPA) methods on Indonesia's Inter-Regional Input Output (IRIO) data. According to the results of the analysis up to October 2020, Indonesia lost potential income in the tourism sector by 165.97 trillion rupiah. The hotel and restaurant sector has the largest impact on the formation of output by -99.09 trillion rupiah. The decline in output of hotel and restaurant sector gave a high multiplier impact on the food and beverage sector by -17.9 trillion rupiah and trade sector by -10.7 trillion rupiah. Regionally, the province of Bali

and DI Yogyakarta became the provinces with the biggest impact from the decline in tourism due to the composition of the tourism sector in it's regional economy is equal to 34,8% and 26,5%.

Keywords: *Covid-19, Tourism Sector, Structural Path Analysis, Inter-Regional Input-Output*

INTRODUCTION

Covid-19 is a global outbreak that has had a devastating impact on both the human and social dimensions. After appearing in China, the pandemic spread rapidly to 210 countries including Indonesia. The covid-19 pandemic was a big shock to the global economy, including Indonesia. The economy was in decline for at least the first half of 2020 and the decline may take longer if containment measures for the covid-19 outbreak are not effective.

The number of positive cases of Covid-19 in Indonesia, based on the announcement of a government spokesperson for Covid-19 management on November 15, 2020, reached 467,113 people. Meanwhile, the spread of Covid-19 around the world reached 54.63 million, of which 1.32 million people died. This shows that Covid-19 has become a global problem and has caused disruption to global, domestic supply chains, financial market volatility, consumer demand shocks and negative impacts in key sectors such as travel and tourism.

The impact of the pandemic on the tourism industry was very pronounced; there was a significant decrease in the number of foreign tourists visiting Indonesia. Based on data from the Central Statistics Agency (BPS), until September 2020 the number of foreign tourists to Indonesia had decreased by 88.95% compared to the same month in 2019. Cumulatively (January-September 2020), the number of foreign tourist visits to Indonesia reached 3.56 million, or decreased 70.57% compared to the same period in 2019 which amounted to 12.10 million.

Tourism supporting sectors such as hotels, restaurants, and retail entrepreneurs have also felt the impact of Covid-19; based on BPS data, the Room Occupancy Rate (TPK) of star-classified hotels in Indonesia in September 2020 reached an average of 32.12 percent, or decreased by 21.40 points compared to the TPK in the same month in 2019, which recorded 53.52 percent.

The decline that occurs in the tourism business will have an impact on MSME businesses and the availability of jobs, whereas all this time tourism has been a labor-intensive sector that absorbs more than 15 million workers. This figure does not include the derivative effects or the multiplier effect that follows, including the derivative industries that form under it.

The World Bank noted that the impact of Covid-19 on the world economy caused 92.9 percent of countries in the world to experience a recession, including Indonesia. The Central Statistics Agency announced that in the second and third quarters of 2020, Indonesia's economic growth was negative,

namely -5.32 in the second quarter and -3.49 in the third quarter. In the economic growth report, it is stated that the Transportation and Warehousing sector experienced the most significant decline in growth compared to other sectors, which was -30.8 in the second quarter and -16.70 in the third quarter, followed by the Accommodation, Food and Drinking sector, which was -22, 02 in the second quarter and -11.86 in the third quarter. This provided an initial picture that the tourism sector in Indonesia is most affected by the covid-19 pandemic.

Judging the condition of the national economy that is experiencing a recession due to the covid-19 pandemic, in this paper the author will examine the impact of the Covid-19 pandemic on the tourism sector in Indonesia as the most affected sector using the Interregional Input Output (IRIO) approach.

LITERATURE

1. Input-Output (I-O) Table Structure

Input-Output analysis as a theoretical framework and an applied economic tool in a market economy was developed by Wassily Leontief with the construction of the first input-output tables for the United States for the years 1919 and 1929 which were published in 1936 [United Nations, 1999]. The Input Output table shows output structure, value added, intermediate consumption, supply and demand between sectors. Input-Output analysis can predict the impact of economic change between final demand and output total, value added, import, tax, and labor force. It can also explain the leading sector and the impact between other sectors. [BPS-Statistics, 2015], the use of I-O tables are: a) Knowing the composition between supply and use of goods and services, especially in the analysis of import requirements and possible substitutions b) To find out which sectors have the most dominant influence on economic growth and sectors that are sensitive to national/regional economic growth c) Estimating the impact of final demand on output, value added, imports, tax revenues and employment in various production sectors d) Arranging the projections and evaluations of macroeconomic variables.

2. Forward and Backward Linkage

Forward Linkage describes how an increase in output of certain sectors will encourage an increase in the output of other sectors. This linkage analysis indicates how to use the input as intermediate consumption and focused on input structure. Backward Linkage describes an increase in the output of a certain sector will increase the input demands of other sectors and focused on demand structure.

$$BL_j = \frac{n \sum_{i=1}^n b_{ij}}{\sum_{i=1}^n \sum_{j=1}^n a_{ij}} \quad FL_i = \frac{n \sum_{i=1}^n \frac{v_i}{X_i} a_i}{\sum_{i=1}^n \sum_{j=1}^n a_{ij}}$$

where :

BL_j : Index of Backward Linkage of j sector FL_i : Index of Forward Linkage of j sector

a_{ij} : element of invers Leontief Matrix for row I and column j

Multiplier Analysis

Multipliers measure the total effects on either output, income, employment or value added, given an increase in one unit of output of a particularly industry (UN, 1999). Measuring the multiplier, we have an equation to calculate the output value:

$$X = (I - A)^{-1}Y$$

Where, $(I - A)^{-1}$ is inverse of Leontief Matrix, and X, Y denoted as output and final demand. The formula of several multiplier are below:

$$O_j = \sum_{i=1}^n a_{ij}$$

where :

O_j : Output Multiplier of sector j

a_{ij} : element of invers Leontief Matrix for row I and column

Output Multiplier describes output change in the certain sector because of the output change of other sectors. Income Multiplier describes output change in the certain sector because of the income change of other sectors. Labor multiplier shows the relationship between labor output is the amount of labor required to produce one unit of output. Meanwhile, the value added multiplier reflects the influence of each component of the final demand for creating value added in each sector.

3. Structural Path Analysis

The use of input–output tables in such applications as Life-Cycle Assessment (LCA) has greatly benefited from the technique of Structural Path Analysis (SPA), introduced in the early 1980s [3]. Recently, this has seen increasingly widespread use, both in an LCA context [4],[5],[6],[11] and in more general areas such as trade modelling [7],[8] and in trophic systems [9]. The basic idea behind a SPA is the unravelling of the Leontief inverse by means of a series expansion of the direct requirements matrix [11]. This allows the analyst to investigate impacts that are caused directly by final consumption to those caused in the first order away from the to those in higher orders. The use of SPA has only been applied statically—often for extracting the main upstream impacts of products

or organisations. In this paper, by applying SDA techniques, we seek to investigate the effects of changes within the decrease of foreign tourist in Indonesia to Tourism sector.

RESEARCH METHODOLOGY

The data used in this study are secondary data, namely the inter-regional input-output data of Indonesia in 2015 obtained from Bank Indonesia, data on the number of foreign tourist visits in 2010-2020 from BPS, and data on average foreign tourist expenditure per visit in 2019 from BPS. The inter-regional input-output data provided interaction data between 34 provinces in Indonesia and 37 sectors.

In this study, the stages of analysis used the IRIO table, which are as follows:

1. Explored the research variables used;
2. Calculated the value of direct forward linkage and direct backward linkage for all sectors and regions in Indonesia;
3. Calculated the distribution power index and sensitivity degree index for all sectors and regions in Indonesia.
4. Determined the Key Sector from the results of the previous index calculation;
5. Calculated the output multiplier, household income multiplier, and labor multiplier;
6. Performed a structural path analysis by determining that the maximum stage was 8 with a threshold range of 2%;
 - a. Extracted the relationships between sectors and provinces in the input-output table;
 - b. Calculated the value of direct intensity and total intensity;
 - c. Calculated direct intensity input;
 - d. If the value of direct intensity between sectors and provinces was still greater than the threshold, then calculation a. was carried out and stage 2 was entered;
 - e. Repeated step a. and b. until the direct intensity value was less than or equal to the threshold or entering the maximum predetermined stage.
7. Decomposed the results of direct intensity calculations to make flow table;
8. Whereas for the simulation analysis, the data was divided into sections based on the timing of the intervention.
 - a. Data before intervention at time ($T = 1$ to $T = 120$) or the period January 2010 to December 2019.
 - b. Data from the time of intervention until the last data at time ($T = 120$ to $T = 130$) or in the period January 2020 to October 2020.
9. ARIMA modeling with pre-intervention data ($n = 120$).

10. ARIMA Model evaluation before intervention based on the smallest MSE value.
11. Forecast for data after the intervention (as much as $n = 10$) using the ARIMA model before intervention.
12. Calculated potential loss using forecasted data and analyzed the path of loss using SPA results.

RESULTS AND DISCUSSION

1. Analysis of the Linkage of the Tourism Sector Using the Interregional I-O Model

One of the advantages of the I-O model analysis is that it can be used to determine the extent of the relationship between production sectors. The linkages between sectors show that there is a level of technical linkage between the active elements, which is the generator to initiate a technical polarization process. This technical relationship can be in the form of (1) forward linkage, which is a relationship with finished materials; (2) backward linkage, which is almost always a relationship with raw materials; (3) multiplier relationship in the form of output, income, and labor; (4) sector linkages using Structural Path Analysis.

However, before analyzing the economic impact on the tourism sector, the economic value of the tourism sector must be found and converted into the economic value of the sectors in the 2015 IRIO table. In this study the conversion was carried out based on the matching table of the Tourism sector into the Input-Output table by the Ministry of Tourism and Creative Economy. The tourism sector was formed through sector aggregation from the Input-Output table so as to produce 4 main forming sectors of the tourism sector, namely the Hotel and Restaurant sector, the Water Transportation sector, the Air Transport sector, and the other services sector.

In calculating the magnitude of the influence of the tourism sector in an area, the calculation of the proportion of the output value in the tourism sector was carried out on the overall output in that region. By calculating the value of the proportion of output in the tourism sector, it will be known how big the role of the tourism sector is in the region's economy.

Five provinces with the highest contribution from the tourism sector to the regional economy were Bali at 34.82%, Special Region of Yogyakarta at 26.5%, East Nusa Tenggara at 23.77%, Special Capital Region of Jakarta at 18.81%, and Banten at 17.98%.

Meanwhile, the five provinces with the lowest contribution from the tourism sector to the regional economy were South Sumatra at 6.22%, East Kalimantan at 6.15%, North Sumatra at 6.13%, West Papua at 4.74%, and Riau at 2.55%.

2. Analysis of Backward Linkage and Forward Linkage in the Tourism Sector by Provinces in Indonesia

Analysis of the relationship between the IRIO table for sectors related to the tourism sector by provinces in Indonesia is shown in Table 1. From this table it is known that there are 10 provinces with a key sector for the Hotel and Restaurant sector, 11 provinces with a key sector for the Water Transportation sector, 17 provinces with a key sector for the Air Transport sector, and 6 provinces with a key sector for the Other Services sector. This shows that the demand for the tourism sector has a strong influence in several regions in Indonesia in creating output for all economic sectors in the region.

There are 10 provinces in Indonesia whose economic structures are based on the 2015 IRIO table and hotel and restaurant sectors are leading. This is indicated by the IBL and IFL values for the hotel and restaurant sector, which are above 1. These areas are the provinces of West Sumatra, Jambi, Bengkulu, Lampung, East Kalimantan, Central Kalimantan, North Kalimantan, Central Sulawesi, North Maluku and West Papua.

These values show that the hotel and restaurant sector, which is one of the sectors related to the tourism sector in the regions, is a sector that is sensitive in responding to changes in demand (including final demand), but also strong in driving the growth of other economic sectors.

Jambi Province had the largest IBL value, i.e. 1.296. This mean that the Hotel and Restaurant sector can absorb the output of other sectors as raw material / input for the sector well. Whereas the province with the largest IFL value for the Hotel and Restaurant sector was West Sumatra Province, i.e. 1.358. This shows that the output of the Hotel and Restaurant sector is able to encourage growth in other sectors in this region.

Table 1. Backward dan Forward Linkage Index for Tourism Sectors by Province in Indonesia

Province	Sectors							
	Hotel and Restaurant		Water Transportation		Air Transportation		Other Service	
	IBL	IFL	IBL	IFL	IBL	IFL	IBL	IFL
Sumatera Barat	1.27	1.36	1.02	1.48	1.45	1.32	0.98	1.09
Gorontalo	0.89	1.02	1.37	1.13	1.54	1.30	0.96	1.27
Kalimantan Timur	1.14	1.29	1.13	1.27	1.03	1.30	0.91	1.39
Jambi	1.30	1.33	0.98	1.20	1.03	1.15	0.93	1.30

Province	Sectors							
	Hotel and Restaurant		Water Transportation		Air Transportation		Other Service	
	IBL	IFL	IBL	IFL	IBL	IFL	IBL	IFL
Riau	1.42	0.59	1.37	0.87	1.66	0.76	1.23	1.10
Kalimantan Selatan	1.28	0.77	1.06	0.97	1.10	1.35	1.04	1.40
Maluku Utara	1.06	1.07	1.13	1.43	1.16	1.41	1.10	0.56
Kalimantan Tengah	1.27	1.10	1.05	1.20	1.23	1.22	0.87	0.99
Aceh	1.02	0.89	1.12	0.86	1.26	0.98	1.15	1.55
Kep Bangka Belitung	1.16	0.98	1.19	1.16	1.35	1.21	0.92	0.84
Kalimantan Utara	1.09	1.08	1.09	1.02	1.05	1.13	0.93	1.32
Papua Barat	1.18	1.07	0.85	1.16	1.11	1.19	0.96	1.20
Banten	1.21	0.64	1.36	1.05	1.28	1.10	1.14	0.89
Jawa Timur	1.14	0.72	1.47	1.19	1.39	1.01	1.08	0.62
Jawa Barat	1.01	0.87	1.49	0.63	1.42	1.06	1.17	0.88
Jawa Tengah	1.25	0.66	1.34	0.88	1.40	1.33	0.97	0.69

In general, the results of backward linkage and forward linkage analysis in the tourism sector in provinces place West Sumatra, East Kalimantan, North Maluku, Central Kalimantan and North Kalimantan as provinces with the highest backward linkage and forward linkage indexes in Indonesia. This is counterproductive to the results of the analysis of the proportion of the tourism sector to the previous regional economy where the provinces with the highest contribution of the tourism sector to the regional economy were Bali, Special Region of Yogyakarta, East Nusa Tenggara, Special Capital Region of Jakarta and Banten. To be able to explain further the results of the backward linkage and forward linkage indexes, the sectorial linkages in a region need to be broken down to be compared with the tourism sector linkages in provinces whose tourism sector has a large contribution value. In this study, the breakdown process of sector linkages was carried out using multiplier analysis and Structural Path Analysis (SPA).

3. Multiplier Analysis of the Tourism Sector by Sectors in Indonesia

Table 2 shows that the output multiplier related to the tourism sector with the largest value is the Hotel and Restaurant sector, i.e. 1.7664, which means that for each one-unit increase in output (million rupiah) in the Hotel and Restaurant sector, the sector is able to create additional output of 1.756 in the national economy, which means that each additional of IDR 1 million in the Hotel and Restaurant sector is able to create additional output of IDR 1.76 million in the national economy. As for other sectors, such as water transportation, air transportation, and other services, the multiplier output values are 1.6778, 1.7561, and 1.5447, respectively.

Table 2. Multiplier Index of Tourism Sector in Indonesia

Sectors	Multiplier		
	Output	Income	Labour
Hotel and Restaurant	1.7664	0.3010	0.0175
Water Transportation	1.6778	0.2956	0.0063
Air Transportation	1.7561	0.3163	0.0034
Other Services	1.5447	0.4313	0.0167

Furthermore, the income multiplier figure was also calculated, which was a measure that shows that every one-unit increase in income / wages of a sector will increase the national economy's income by its multiplier value and vice versa. The largest revenue multiplier in the tourism sector is the Other Services sector with a value of 0.4313. This means that an increase in revenue in the Other Services sector by one unit (in million rupiah) will increase income in all sectors of the national economy by IDR 0.43 million or IDR 431,300. Meanwhile, other sectors, namely the hotel and restaurant, water transportation and air transportation, had income multiplier values of 0.301, 0.295, and 0.316, respectively.

The last multiplier is the labor multiplier, which is a measure that shows the creation of national employment opportunities due to the addition of labor in a particular sector. The largest labor multiplier figure in the tourism is the Hotel and Restaurant sector, i.e. 0.0175, which means that every time there is an additional workforce of 100 people in the sector, 2 people will create job opportunities in other sectors. In other sectors, namely water transportation, air transportation, and other services, the labor multiplier values are 0.0063, 0.0034, and 0.0167, respectively.

4. Multiplier Analysis of the Tourism Sector by Sectors in Indonesia

Structural path analysis (SPA) is used to analyze the transmission path from the injection (shock) that occurs in a balance sheet (in this study the tourism sector) to the destination balance within the IRIO (Inter Regional Input Output) framework. In this study, the analyzed transmission was limited to the transmission which provided a significant direct effect (structural path), which was above 2 percent (threshold).

Before conducting a structural path analysis in the regional (provincial) scope, the relationship of the tourism sector and other sectors in the national scope was explained in advance. The relationship between one sector and the other sectors can be seen in the global influence value of that sector. The Hotel and Restaurant sector has given a high global influence to the Food and Beverage Industry sector of 0.213, the Trade sector of 0.121, and the Fishery sector of 0.053. The

water transportation sector has a high global influence on the Food and Beverage Industry sector (0.130), the trade sector (0.077), and the communication sector (0.060). The Air Transport sector has a high global influence to the Communication sector (0.101, the Food and Beverage Industry sector (0.097), and the Trade sector (0.093). Meanwhile, the Other Services sector provides a high global influence on the building sector (0.062), the Food and Beverage Industry sector (0.062), and the trade sector (0.057).

By looking at the relationship between sectors in the IRIO table and tourism-related sectors, we can find out which sectors are related and have a major influence on the tourism sector in Indonesia, which in this case are the Food and Beverage sector and the Trade sector. This shows that the output of the tourism sector is largely absorbed by the Food and Beverage sector (18.11%) and the Trade sector (4.65%).

Table 3. Structural Path Analysis Output of Hotel and Restaurant Sector by Sector in Indonesia

Target Sectors	GI	Path	DI	TI	%
Beverage food industry	0.213	Hotel and Restaurant → Beverage food industry	0.1908	0.2104	18.11
Trade	0.121	Hotel and Restaurant → Trade	0.1145	0.1232	10.87
		Hotel and Restaurant → Beverage food industry → Trade	0.0230	0.0247	2.18
Fishing	0.053	Hotel and Restaurant → Fishing	0.0490	0.0527	4.65
		Hotel and Restaurant → Beverage food industry → Fishing	0.0227	0.0244	2.16
Plantation Plants	0.043	Hotel and Restaurant → Plantation Plants	0.0383	0.0414	3.63
		Hotel and Restaurant → Beverage food industry → Plantation Plants	0.0192	0.0207	1.82
		Hotel and Restaurant → Vegetable and animal oil industry → Plantation Plants	0.0197	0.0213	1.87
Vegetable and animal oil industry	0.039	Hotel and Restaurant → Vegetable and animal oil industry	0.0362	0.0410	3.43
		Hotel and Restaurant → Beverage food industry → Vegetable and animal oil industry	0.0184	0.0208	1.74
Corporate services	0.038	Hotel and Restaurant → Corporate services	0.0356	0.0380	3.38
		Hotel and Restaurant → Seafood processing industry	0.0309	0.0367	2.94
Seafood processing industry	0.034	Hotel and Restaurant → Beverage food industry → Seafood processing industry	0.0201	0.0239	1.91
Financial institutions	0.033	Hotel and Restaurant → Financial institutions	0.0305	0.0324	2.90
		Hotel and Restaurant → Beverage food industry → Financial institutions	0.0211	0.0224	2.00

From Table 4 it is known that the water transportation sector has an influence on other sectors in the national economy. The sector with the biggest influence was the Food and Beverage Industry (10.71%), followed by the Trade sector (6.79%) and the Vegetable Oil and Animal Oil Industry (4.99%).

Table 4. Structural Path Analysis Output of Water Transportation Sector by Sectors in Indonesia

Target Sectors	GI	Path	DI	TI	%
Beverage food industry	0.130	Water Transportation → Beverage food industry	0.1184	0.1306	10.71
		Water Transportation → Vegetable and animal oil industry → Beverage food industry	0.0228	0.0251	2.06
Trade	0.077	Water Transportation → Trade	0.0751	0.0808	6.79
		Water Transportation → Beverage food industry → Trade	0.0231	0.0248	2.08
Vegetable and animal oil industry	0.059	Water Transportation → Vegetable and animal oil industry	0.0552	0.0626	4.99
		Water Transportation → Beverage food industry → Vegetable and animal oil industry	0.0185	0.0209	1.67
Communication	0.060	Water Transportation → Communication	0.0522	0.0575	4.72
Seafood processing industry	0.056	Water Transportation → Seafood processing industry	0.0514	0.0609	4.64
Other Services	0.047	Water Transportation → Other Services	0.0434	0.0479	3.93
Financial institutions	0.040	Water Transportation → Financial institutions	0.0376	0.0399	3.40
Electricity, gas and clean water	0.040	Water Transportation → Electricity, gas and clean water	0.0343	0.0408	3.10
Transportation and repair industry	0.036	Water Transportation → Transportation and repair industry	0.0336	0.0408	3.04

From Table 5 it is known that the Air Transport sector has the greatest influence on the Trading sector (7.27%), followed by the Food and Beverage Industry (7.13%) and the Communication sector (7.05%).

Table 5. Structural Path Analysis Output of Air Transportation Sector by Sectors in Indonesia

Target Sectors	GI	Path	DI	TI	%
Trade	0.093	Air Transportation → Trade	0.0798	0.0859	7.27
		Air Transportation → Beverage food industry → Trade	0.0194	0.0208	1.77
Communication	0.101	Air Transportation → Beverage food industry	0.0783	0.0863	7.13
		Air Transportation → Hotel and Restaurant → Beverage food industry	0.0185	0.0204	1.69
Communication	0.101	Air Transportation → Communication	0.0773	0.0851	7.05

Target Sectors	GI	Path	DI	TI	%
Corporate services	0.068	Air Transportation → Corporate services	0.0567	0.0604	5.17
Transportation and repair industry	0.076	Air Transportation → Transportation and repair industry	0.0530	0.0643	4.83
Hotel and Restaurant	0.062	Air Transportation → Hotel and Restaurant	0.0501	0.0567	4.56
Financial institutions	0.051	Air Transportation → Financial institutions	0.0425	0.0452	3.88
Building	0.045	Air Transportation → Building	0.0372	0.0422	3.39
Other Services	0.036	Air Transportation → Other Services	0.0292	0.0322	2.66

As for the results of structural path analysis in the Other Services sector, the sector that was most affected was the Building sector (5.37%), followed by the Food and Beverage Industry (5.25%) and the Trade sector (5.16%). From the results of the SPA in the four sectors related to the tourism sector, there are 2 sectors that have the highest influence on the tourism sector, namely the Food and Beverage Industry and the Trade sector. Based on these results, the current effect of the Covid-19 pandemic on the tourism sector will certainly hit the Food and Beverage Industry and the Trade sector.

Table 6. Structural Path Analysis Output of Other Services Sector by Sectors in Indonesia

Target Sectors	GI	Path	DI	TI	%
Building	0.062	Other Services → Building	0.0555	0.0630	5.37
Beverage food industry	0.062	Other Services → Beverage food industry	0.0543	0.0598	5.25
Trade	0.057	Other Services → Trade	0.0533	0.0573	5.16
		Other Services → Beverage food industry → Trade	0.0217	0.0234	2.10
Corporate services	0.033	Other Services → Corporate services	0.0303	0.0323	2.93
Communication	0.034	Other Services → Communication	0.0285	0.0314	2.76
Financial institutions	0.030	Other Services → Financial institutions	0.0273	0.0290	2.64

5. Analysis of the Impact of the Covid-19 Pandemic on the National Economy

The expenditure structure of foreign tourists visiting Indonesia in 2019 according to the Central Statistics Agency it is known that the expenditure of foreign tourists while living in Indonesia is mostly used for accommodation (38.55 percent) and food and beverages (21.15 percent). Meanwhile, the smallest expenditure allocation is used for local tour packages (1.55 percent). In 2019, the average expenditure of foreign tourists while living in Indonesia per visit was USD 1,145.64. With the current rupiah exchange rate of IDR 14,058.95 (www.bi.go.id dated February 10, 2021), the average foreign tourist expenditure is equivalent to IDR 16,106,495.48 per visit.

The economic value of the impact of the Covid-19 pandemic on the tourism sector is calculated based on the value of transactions in the key tourism sector, including tourist visits, tourist

spending, private sector investment and government investment, as well as government spending in the tourism sector (Kemenparekraf, 2019).

Furthermore, it is necessary to calculate the forecasting of tourist visits using time series analysis as a basis for calculating potential losses due to a decrease in foreign tourist visits. Based on the data pattern shown in Figure 1, it can be seen that the appropriate modeling of the data before the intervention occurs is the ARIMA procedure.

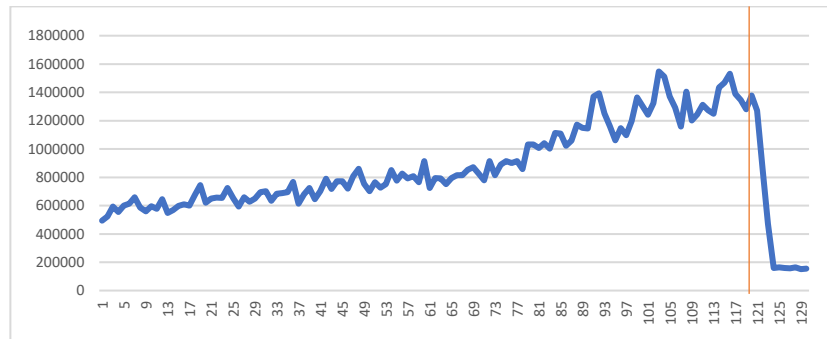


Figure 1. Time Series Plot of Foreign Tourist by Month in Indonesia

Based on Figure 1, the data before the intervention changed according to changes in time. The data pattern indicates that the data before the intervention has a trend, meaning that data before the intervention (Y_0t) can be categorized as not stationary and therefore a transformation must be carried out with the $\ln(Y_0t)$ formula.

The test results on the significance of the parameters and white noise show that of the 6 predictive models there were only 3 models that had significant parameters at $\alpha = 5\%$ and met the white noise assumptions, namely ARIMA (0,1,1) (1,0,2)₁₂, ARIMA (2,1,0) (0,0,2)₁₂, and ARIMA (0,1,1) models (0,0,2)₁₂. However, based on its MSE value, the ARIMA model (2,1,0) (0,0,2)₁₂ had the smallest MSE value, i.e. 0.003693 so that the ARIMA model (2,1,0) (0,0,2)₁₂ was selected as the best model for data before the intervention occurred. Table 7 shows the results of the parameter significance test of the selected model.

Table 7. Parameter Estimate of ARIMA(2,1,0)(0,0,2)₁₂

Type	Coef	SE Coef	T-Value	P-Value
AR 1	-0,5650	0,0899	-6,28	<0,0001*
AR 2	-0,2669	0,0894	-2,98	0,003*
SMA 12	-0,4994	0,0901	-5,54	<0,0001*
SMA 24	-0,5774	0,0959	-6,02	<0,0001*

From the selected model ARIMA (2,1,0) (0,0,2)₁₂, the prediction figure was then calculated if there was no Covid pandemic. The forecasting value was then used to calculate potential losses

due to a decrease in the number of foreign tourists. Forecasting results data with the selected model can be seen in Table 8.

Table 8. Forecast Result of Foreign Tourist Visit in Indonesia with ARIMA(2,1,0)(0,0,2)¹² Models

Year	Month	Tourist Visit (Y _t)	Forecast Result ARIMA(2,1,0)(0,0,2) ¹² (Y ₁ * _{t0})	(Y ₁ * _{t0})- (Y _t)
2019	Nov	1,280,781	1,280,781	0
2019	Des	1,377,067	1,377,067	0
2020	Jan	1,272,083	1,266,611	-5,472
2020	Feb	863,960	1,295,069	431,109
2020	Mar	470,970	1,368,905	897,935
2020	Apr	160,042	1,339,166	1,179,124
2020	Mei	163,646	1,344,554	1,180,908
2020	Jun	158,256	1,457,092	1,298,836
2020	Jul	157,939	1,526,231	1,368,292
2020	Aug	163,185	1,542,163	1,378,978
2020	Sept	151,275	1,456,837	1,305,562
2020	Okt	153,918	1,423,542	1,269,624
Total		6,373,122	16,678,019	10,304,897

With the average expenditure of foreign tourists of USD 1,145.64 per visit based on data from the Central Bureau of Statistics in 2019 and the current rupiah exchange rate of IDR 14,058.95 (www.bi.go.id February 10, 2021), the average foreign tourist expenditure is equivalent to IDR 16,106,495.48 per visit. Then the potential loss in the tourism sector in the period November 2019 to October 2020 was IDR 165.97 trillion.

The value was then converted into sectors in the IRIO table using the data base on the average expenditure of foreign tourists according to expenditures from the Central Bureau of Statistics and matching data on tourist expenditure against the IO table from the Ministry of Tourism and Creative Economy. The results of the matching calculations are as shown in table 9.

Table 9. Conversion Result of Tourist Expenditure in IRIO Sectors

No	Sectors	Triliun Rupiah	Percent
1	Hotel and Restaurant	99.09	76.42
2	Water Transportation	5.54	4.27
3	Air Transportation	8.08	6.23
4	Other Services	16.95	13.07
Total		129.65	

CONCLUSIONS AND SUGGESTIONS

Based on the results and discussion of this study, the following conclusions can be drawn:

1. Based on the backward and forward linkage index calculations, the provinces with the largest IBL and IFL values in the tourism sector are West Sumatra (1.17 and 1.31) and East Kalimantan (1.05 and 1.31). Meanwhile, Bali and Special Region of Yogyakarta which have the largest proportion of output in the tourism sector in Indonesia, have relatively low IBL and IFL values, i.e. 1.00 and 0.86 (Bali) and 0.99 and 0.96 (Yogyakarta). This shows that the output values of the tourism sector in those two provinces are more absorbed in other sectors. This means that the impact of the Covid-19 pandemic on the tourism sector will have a larger effect on the economy of the region than that of other regions.
2. Provinces with the largest output multiplier value in the tourism sector are Riau (2.22), West Java (1.99), and East Java (1.98). However, the high multiplier values in the provinces are not in line with the development of the proportion of the tourism sector output regionally. This indicates that the development of the tourism sector in the provinces has a very significant economic impact on the development of other sectors, but currently this potential has not been maximally developed as a support for the regional economy.
3. Structural Path Analysis in this study is a more in-depth analysis of the backward linkage results. Based on the IBL values, the paths associated with the target sectors were then searched. The SPA results in the tourism sector show that the main sectors related to tourism are the Food and Beverage Industry and the Trade sector. The Hotel and Restaurant sector affected the Food and Beverage Industry by 18.11% and the Trade sector by 10.87%. The Water Transportation sector affected the Food and Beverage Industry sector by 10.71% and the Trade sector by 6.79%. The Air Transport Sector affected the Trade sector by 7.27% and the Food and Beverage Industry sector by 7.13%. Meanwhile, the Other Services sector affected the Food and Beverage Industry by 5.25% and the Trade sector by 5.16%.
4. Based on the results of the simulation analysis, it is known that in the period November 2019 to October 2020, the potential losses received by the tourism sector in Indonesia due to the impact of the Covid-19 pandemic reached 165.97 trillion rupiah. In detail, the impact on the tourism-related sector was IDR 99.09 trillion in the Hotel and Restaurant sector, IDR 5.54 trillion in the Water Transportation sector, IDR 8.08 trillion in the Air Transport sector and IDR 26.85 trillion in the Other Services sector.

5. If the effects of the Covid-19 pandemic continue for the next one year (November 2020 to October 2021), the potential for additional losses to the tourism sector will reach IDR 274.87 trillion. In details, the impact on the tourism-related sector is IDR 164.1 trillion in the hotel and restaurant sector, IDR 9.17 trillion in the water transportation sector, IDR 13.38 trillion in the air transportation sector and IDR 28.06 trillion in the other services sector.

Based on the aforementioned conclusions, suggestions can be formulated as a consideration for further research as follows:

1. In the calculation of economic analysis, it is best to use the latest data and information sources so that the conclusion is more accurate and does not have too much bias with the real conditions.
2. To be able to analyze the impact and role of the tourism sector more fully, it is necessary to try other approaches such as the Computable General Equilibrium (CGE) model or econometric models.
3. It is necessary to add information on the path coefficient value of each national sector into the sectors in the regional area to increase the accuracy in the analysis of the results. In this study, the author used the information on the proportion of output in the tourism sector for each province to divide the impact value into each province.

REFERENCES

- United Nations (UN), Handbook of Input-Output Table Compilation and Analysis (Department of Economics and Social Affairs, Division of Statistics, New York), 1999.
- BPS-Statistics, Input-Output (I-O) Table of Indonesia in 2010 (BPS-Statistics, Indonesia), 2015.
- Defourney, J., Thorbecke, E., Structural path analysis and multiplier decomposition within a social accounting matrix framework (Economic Journal 94, 1984), pp.111–136.
- Treloar, G., Extracting embodied energy paths from input–output tables: towards an input–output-based hybrid energy analysis method (Economic Systems Research 9, 1997), pp.375–391.
- Lenzen, M., A guide for compiling inventories in hybrid life-cycle assessments: some Australian results (Journal of Cleaner Production 10 (6), 2002), pp.545–572.
- Lenzen, M., Environmentally important paths, linkages and key sectors in the Australian economy (Structural Change and Economic Dynamics 14 (1), 2003), pp.1–34.
- Lenzen, M., Wiedmann, T., Foran, B., Dey, C., Widmer-Cooper, A., Williams, M., Ohlemüller, R., Forecasting the ecological footprint of nations: a blueprint for a dynamic approach ISA (The University of Sydney, Sydney, Australia), 2007.
- Peters, G.P., Hertwich, E.G., The importance of imports for household environmental impacts (Journal of Industrial Ecology 10 (3), 2006a), pp.89–109.

- Suh, S., Theory of materials and energy flow analysis in ecology and economics, (*Ecological Modelling* 189 (3–4), 2005), pp.51–269.
- Wood, R., Lenzen, M., Dey, C., Lundie, S., A comparative study of some environmental impacts of conventional and organic farming in Australia (*Agricultural Systems* 89 (2–3), 2006), pp.324–348.
- Waugh, F.V., Inversion of the Leontief matrix by power series (*Econometrica* 18 (2), 1950), pp.142–154.