Tourism Resilience Process During Pandemic with Big Data Insight

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Abstract

Tourism, which is one of the pillars of the Indonesian economy, has experienced a shock due to the COVID-19 pandemic. This study aims to identify tourism resilience and its relation to the Indonesian economy during the pandemic. Subsequent to this, this study also investigates the competitiveness of tourism in responding to government policies regarding the five national tourism priorities. Descriptive analysis of data sourced from big data is used to support the analysis of tourism resilience in terms of accommodation and accessibility. In addition, Principal Component Analysis is used to build the tourism competitiveness measure of the five priority tourism destinations. The results showed that big data proxy indicators related to tourism generally show recovery signals in the new normal period, even though it hasn't returned to its pre-pandemic condition and slightly decreased in early 2021. The improvement in this sector was mostly driven by domestic tourist. In terms of the economy, the added value of tourism has decreased considerably during 2020. In addition, based on the measure of tourism competitiveness, Central Java and North Sumatra are provinces that have good support systems for priority tourist destinations in their respective regions.

Keywords: big data; COVID-19 pandemic; economic impact; tourism
JEL Classification: C38; C55; L83

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1. Introduction

Indonesia has great potential in the tourism sector. Its natural beauty and cultural diversity are the main attraction for domestic and foreign tourists. Therefore, the tourism sector has an important role in the Indonesian economy. As expressed by the Minister of Tourism and Creative Economy - Sandiaga Uno - in December 2020 that this sector is a strategic sector that contribute to foreign exchange and create the fastest and largest job opportunities. This sector is very important in the efforts of Indonesia's economic recovery.

Based on Analysis on COVID-19 Impact on Businesses Owners (BPS, 2020), the sector most affected is the Accommodation and Food Service Activities. Around 92.47 percent of companies in this sector experienced a decline in revenue. In addition, the survey also found that 50.52 percent of companies in this sector reduced employees in the midst of the pandemic. It seems that the COVID-19 pandemic has not only had an impact on business actors, but also on the workforce.

The spread of the COVID-19 pandemic since the end of 2019 has become a nightmare for people around the world. Every government around the world is implementing various rules in an effort to deal with this pandemic. One of the rules applied is the limitation of population mobility. The public is advised to carry out activities from home and not to travel if not necessary. This mobility restriction directly affects tourism activities, one of which is the decline in the number of tourists.

Mobility restriction have resulted in a decline in tourism activities. This can be seen in the google mobility index data, where the mobility of people in retail and recreational areas during the pandemic has decreased significantly compared to normal conditions before the pandemic. Restrictions on mobility also have a direct impact on the decline in the number of foreign tourists in Indonesia. Based on data released by BPS, the number of foreign tourists throughout 2020 decreased by around 75 percent compared to 2019.

The reduced mobility in tourist attractions and the reduced number of foreign tourists not only have an impact on the sustainability of tourism activities, but also have an impact on the Indonesian economy. WTTC (2020) states that international tourist arrivals have a significant direct and indirect economic impact on the economy.

With a statement from Minister Sandiaga Uno, at the end of 2020 to early 2021, Indonesian tourism began to have a positive trend. This recovery phase was marked by the start of an increase in hotel room occupancy rates in several tourist areas such as the provinces of Bali, North Sumatra, and also West Nusa Tenggara. This can also be seen in the graph in Figure 1. In Figure 1, there is a positive trend in the occupancy rate of five-star hotel rooms from April to December 2020. Conditions in January 2021 experienced a decline due to the tightening of policies carried out by the government. However, even so, in later times, this occupancy rate is stable in the range of 30 to 40 percent. This condition indicates that the

resilience of the tourism sector has begun, with new tourism habits that apply the Health protocol. This condition is the initial phase until finally tourism fully recovers.

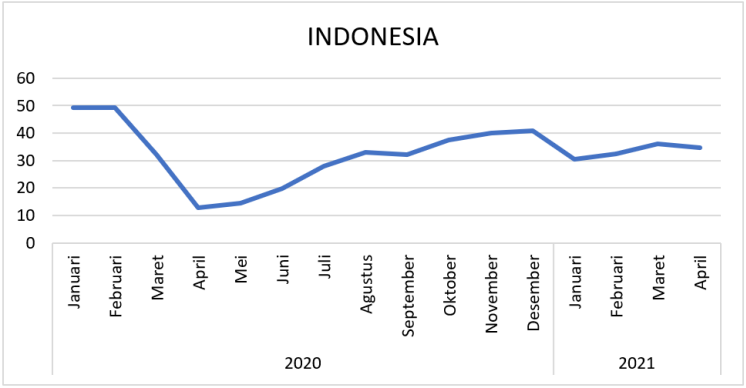

Figure 1: Hotel Room Occupancy Rate
Source: BPS Dynamic Table (2021), processed

This condition of resilience is a good starting point for tourism. This condition certainly needs support from the government in terms of accommodating tourist attractions. The tightening conditions for health procedures will indeed have an effect on decreasing the level of tourism at the beginning, but even so, other sectors such as health and the need for health consumption will also be lifted as a result of this. In addition, the intensification of vaccines is also a good result that is felt by the requirements of tourists who should have vaccinated at least once.

Due to the importance of the tourism sector to the Indonesian economy, a recovery in this sector could have a positive impact on Indonesia's economic recovery. With the resilience process that occurs, optimism will grow from the recovery which of course will soon follow. Not only that, the existence of a new habit regarding the need for health will also have a spread effect on other sectors, in addition to the already categorized high spread effect from the tourism sector. For this reason, an analysis of the development of the Indonesian tourism sector during the pandemic is needed to see the potential for recovery in this sector. Not only analysing the development of Indonesian tourism in general, it is also necessary to describe the development of tourism in various provinces or popular destinations, so that the policies implemented are more appropriate. For this reason, this study will discuss the development of the tourism sector in general and its relation to the Indonesian economy, as well as various new phenomena of Indonesian tourism in several provinces during the year of the COVID-19 pandemic.

Nowadays the data sources are not only from census and surveys. Various information scattered on the internet can be used as a new data source that we

can analyze. Because of its size and characteristics, this information is known as big data. In this digital era, especially in the midst of a pandemic when it is difficult to carry out face-to-face censuses and surveys, big data can be used as a new data source to support official statistics published by the government.

Big data can be used as a proxy or a complement in analysis. Adhinugroho et al. (2020) conducted a study by building online travel web scraping to support tourism statistics in Indonesia. The study found that it is feasible to use big data as a proxy or as a complement of official statistics. By using the Web scraping technique, the indicator that usually requires more time and cost can be done in real-time and less cost (Adhinugroho et al., 2020). In this study, then further developed on how big data can provide analysis and other perspectives so as to produce diverse analyzes and insights. Some data sourced from big data in this research such as google mobility index, flight tracking, Indonesian stock exchange, and job vacancies advertisements are used as supporting data for analysis.

2. Methodology

2.1. Analysis Overview

In responding to the recovery from Indonesian tourism, a descriptive analysis and preparation of a tourism competitiveness index were carried out. Descriptive analysis uses data sourced from big data in presenting real-time data. Descriptive analysis is used to see the progress of tourism in terms of accommodation and accessibility. Meanwhile, the preparation of the competitiveness index is carried out for the five main priorities of Indonesian tourism. The purpose of compiling this index is to respond to government policies related to five super priority destinations. The dimensions used are sourced from the literature "Tourism accessibility competitiveness: A regional approach for Latin American countries" (Porto et al., 2018). The dimensions adopted are as follows in Table 1.

Table 1: Dimensions and Variables for Compiling Tourism Competitiveness Measures

Dimension	Variable from Big Data
Endurance	Facebook Mobility
Region Mobility	Google Mobility
Region Accessibility	Flight
Regional Economic	Online Booking Price
Accommodation Accessibility	Online Booking occupancy
Region Popularity	Google Trend

The selection of these dimensions has been adjusted between the literature and the available big data. In addition, there needs to be a match between the literature and the characteristics of the big data used so that the resulting dimensions are representative. The new thing added to this research is in terms of regional

economic dimensions, due to the research objectives that focus on the resilience of the tourism sector.

2.2. Data

The data used in this analysis comes from official data from the Central Statistics Agency and also other sources providing big data. Big data used is taken from several sites. The time reference used in this analysis is from January 2020 to March 2021. The big data used in this analysis uses the web scraping method on several sites providing hotel accommodation bookings (Adhinugroho et al., 2020), flight records (Panuntun & Pramana, 2020), and also mobility reports by Google.

Big Data collection using Python programming language. The package used is the Scrapy package. The use of scrappy packages based on requests to the website API that can be run in parallel.

2.3. Web Scraping

In this study to capture tourism activities, different big data sources are used. The main approach to obtain the data is by implementing a web-scraping method. Web scraping is a method or technique of data extraction by a computer software program to obtain information from a website. The scraping usually simulates data request from users by inserting a program on a web browser (Mahto & Singh, 2016). Web scraping is usually done when the data needed is not available in the Application Programming Interface (API). The unstructured data on the web need to be transformed into structured data before analysis.

In this study, the programming language used is python. Packages used are selenium and scrapy. The use of packages is specifically based on the type of website that will be crawled. The use of both packages and the programming language used is due to the ease of use and also the speed of data collection.

2.4. Data Cleaning

After web scraping is done, the collected data needs to be prepared before processing (pre-processing). Preprocessing is done by doing data cleaning of the entire dataset. The data obtained from the Web scraper are needed to be cleaned before being analysed. The cleaning process included the removal of data duplication. In addition, cleaning is also carried out on unreasonable values in the data.

2.5. PCA

The use of Big Data as an analytical tool will cause problems in terms of data diversity, both in type and distribution. Thus, in reducing big data indicators to make them a composite index, an analytical tool is needed that is able to limit

this diversity (Delchambre, 2015). With the diversity of dimensions of big data, the use of the PCA method is very efficient. This is due to the high volatility of big data. In addition, PCA is a dimension reduction method that is commonly used in big data processing.

Principal Component Analysis (PCA) is a mathematical procedure that uses orthogonal transformations to convert a series of observed correlated attributes into a series of uncorrelated attribute values called principal components. The number of principal components is less than or equal to the number of original attributes. This transformation is defined in such a way that the variance of the first principal component is as high as possible (accounts for as much variability in the data as possible), and each subsequent component in turn has the highest possible variance under the constraint that it must be orthogonal to (not correlated with) the preceding component.

3. Result and Analysis

3.1. The Tourism Sector During the Pandemic

The COVID-19 pandemic has greatly impacted economic activity in Indonesia. In the second quarter of 2020, Indonesia's economic growth contracted minus 4.19 percent compared to the first quarter of 2020 (q-to-q). The business field related to the tourism sector experienced the deepest economic growth contraction. The transportation and warehousing business field contracted by 29.22 percent; and the accommodation and food & beverage business field contracted by 22.31 percent (BPS, 2021a,b,c,d,e). Based on Google's mobility index data, since the government started to advise for social distancing in mid-March 2020, there was a decline in community mobility in retail and recreation category which included places such as restaurants, cafes, shopping centers, theme parks, museums, libraries, and cinemas. The same decline of mobility trend also occurred in the category of transit stations which included public transportation centers such as train stations, bus terminals, ports, and vehicle rental places. Entering the new normal transition period since early June 2020, several economic sectors started to re-operate while still guided by health protocols. The government's policy of easing Large-Scale Social Restrictions (PSBB) effectively grew the mobility in retail and recreation places and also mobility in transit stations. In January 2021, the mobility declined again in line with the Implementation of Community Activity Restrictions (PPKM) as the government responded to suppress the transmission of COVID-19 which the number of active cases continued to increase since the end of 2020. Meanwhile, in February-March 2021 the mobility slowly started to increase again.

During the pandemic, the decline in transportation activities could also be seen from the reduced number of flights, both domestic flights or international flights at several major airports in Indonesia (Panuntun & Pramana, 2020). The results of big data sourced from the *FlightStatus* website showed that the number

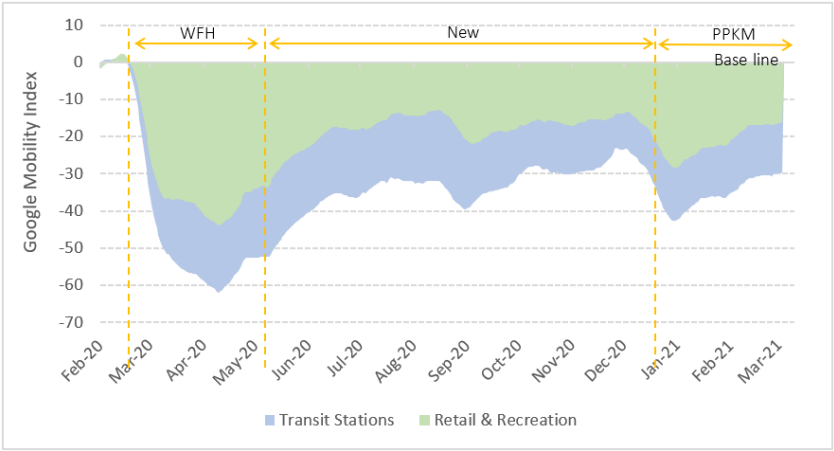

Figure 2: Google Mobility Index in the Category of Retail & Recreation and Transit Station
Source: Google Mobility Reports

of daily flights at the 5 busiest airports in Indonesia had decreased since COVID-19 began to spread in Indonesia in March 2020. The decrease continued to occur in April 2020 due to the government's policy disallowance of homecoming during the Eid holiday. Meanwhile, since the start of the new normal transition period in June 2020, the number of domestic flights had slowly started to recover. In January 2021, the number of domestic flights had declined again since PPKM was implemented in Java and Bali regions. While the number of international flights seemed, it did not much recover, it could be seen that only international flights at Soekarno-Hatta Airport started to increase slowly.

The decrease of the number of flights and limiting passenger capacity also affected a decline in the number of passengers. The decline in the number of domestic flight passengers peaked in May 2020 which coincided with restrictions of homecoming transportation during Eid Al-Fitr 1441H. The number of international flight passengers had also decreased drastically since the beginning of 2020, especially at Soekarno-Hatta Airport and Ngurah Rai Airport, which were the main entrances for international flight passengers. Until March 2021, the number of international flight passengers did not recover much, only Soekarno-Hatta Airport slowly begin to increase in the number of international flight passengers although it was still very low when compared to normal conditions before the pandemic.

Besides the air transportation, the decline of transportation activity during the pandemic also occurred in other modes of transportation. The downward trend in the number of passengers had occurred since the beginning of 2020 and peaked in May 2020. The most significant decline in the number of passengers occurred in

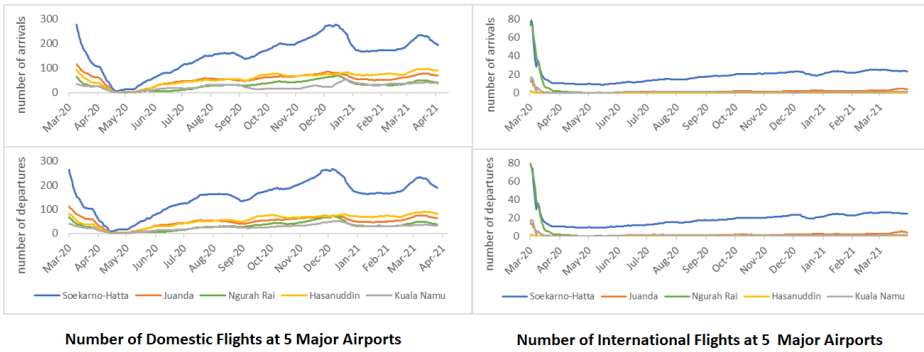

Figure 3: Number of Domestic and International Flights at 5 Major Airports
Source: *FlightStatus* website

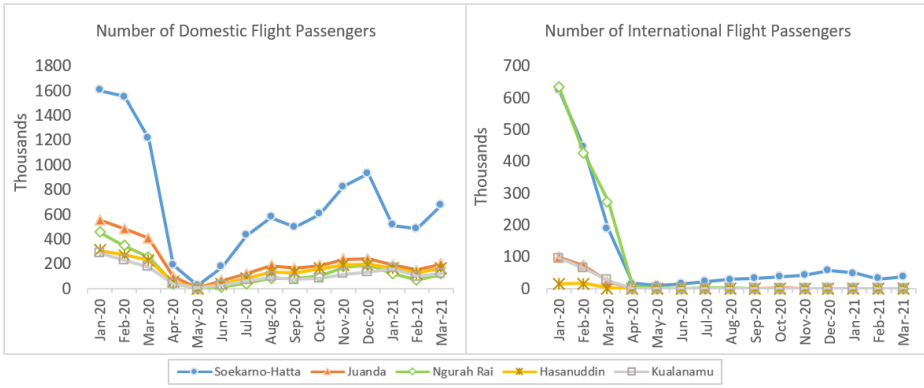

Figure 4: Number of Domestic and International Flight Passengers
Source: BPS Statistic (2021), processed

April 2020, where the number of domestic air transport passengers decreased by 81.70 percent; international air transport passengers decreased by 95.35 percent; sea freight passengers decreased by 70.82 percent and train passengers decreased by 74.86 percent compared to the previous month. Meanwhile, since entering the new normal transition period in June 2020 the number of passengers slowly began to increase, but until entering 2021, the number was generally still far from conditions at the beginning of 2020.

The number of foreign tourist arrivals had also decreased since the beginning of 2020. The most significant decrease occurred in April 2020, where the number of foreign tourist arrivals through air transport decreased by 99,69 percent and the foreign tourist arrivals which through by sea transport decreased by 59,52

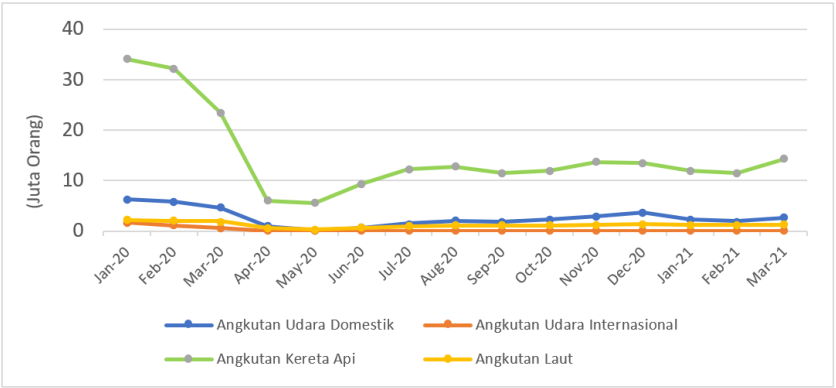

Figure 5: Number of Passengers by Type of Transportation
Source: BPS Statistic (2021), processed

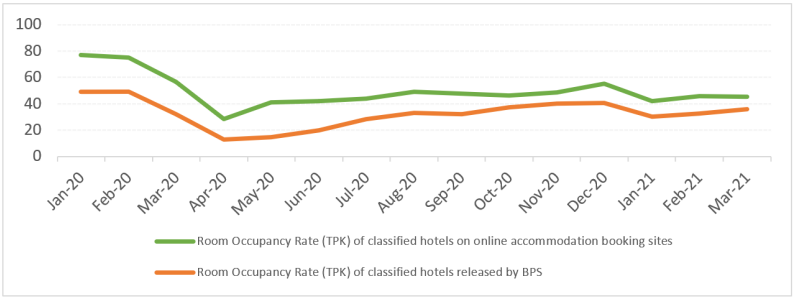

Figure 6: Room Occupancy Rate of Classified Hotel
Source: BPS Statistic (2021), processed

percent. Whereas the foreign tourist arrivals through land transport tended to be stable.

Then if we looked at the hotel activities, there was a decrease in the Room Occupancy Rate (TPK) of classified hotels on online accommodation booking sites, especially in the period of March - April 2020. The same pattern of decline was also shown by the TPK of classified hotels from the official statistics released by BPS. Although the number of TPK big data results from online accommodation booking sites was not same as the TPK released by BPS, in general it showed an almost similar pattern. Since May 2020, the TPK of classified hotels began to show a recovery, but it declined again in January 2021 in line with the enforcement of PPKM policy.

3.2. The Tourism Sector to the Indonesian Economy

The tourism sector has an important role in the Indonesian economy. Tourism activities have various activities that provide employment and can encourage other economic activities. The relationship of the tourism sector to the Indonesian economy can be seen in the contribution of tourism to GDP and employment in this sector.

In 2020, the accommodation and food service activities sector has a contribution of 2.55 percent to GDP, with a value of IDR 394.2 trillion. In Figure 6 it can be seen that in the second quarter of 2020 the contribution of this sector to GDP decreased from 2.80 percent to 2.28 percent, with a value that also experienced a significant decrease from Rp. 109.7 trillion to Rp. 84.2 trillion.

The decline in the contribution to GDP was due to the implementation of large-scale social restrictions (PSBB) in Indonesia during that period, which began with the signing of government regulation No. 21 of 2020. This regulation states that PSBB is a response to the COVID-19 pandemic, which allows local governments to limit movement of people and goods into and out of their respective areas, with the approval of the Minister of Health. One of the activities limited by this regulation is activities in public places or facilities. This restriction is certainly very influential on tourism activities in Indonesia, so that the GDP obtained from this sector also decreases. Furthermore, in the third and fourth quarters, the contribution of the accommodation and food service activities to GDP increased to 2.49 percent and 2.63 percent with a value of Rp. 97.1 trillion and Rp. 103.2 trillion, respectively. During this period, a transitional PSBB was applied, where the restrictions were not as strict as the PSBB. Several sectors have also begun to open up so that it is possible for people to carry out tourism activities again, although with some restrictions.

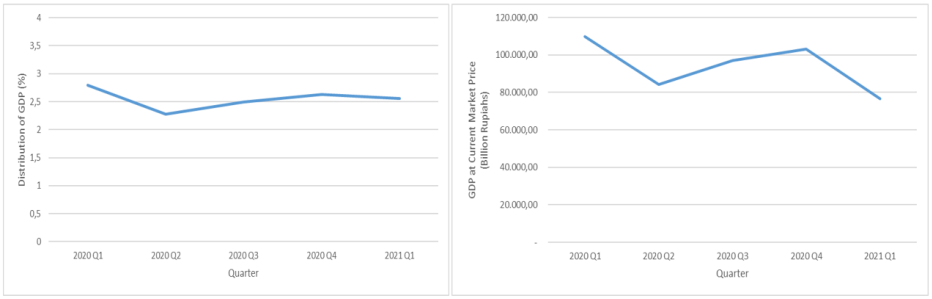

Figure 7: Distribution and Value of GDP from Accommodation and Food Service Activities Sector in 2020 at Current Market Prices
Source: BPS Statistic (2021), processed

detikFinance (2020) said that "Business actors in the hospitality sector in various regions apply massive discounts. Various online travel agencies continue

to provide massive promotional notifications. Several hotels in the DKI Jakarta area, Bandung City, and so on have also put up signs in front of their hotels containing interesting promotional information. All these methods are used to attract visitors, so hotel occupancy can climb up, after dropping below 5% due to the COVID-19 pandemic." *Katadata* (2020) also mentions that lodging and hotel booking companies offer discounts of up to 99% to restore occupancy. This condition can be seen in Figure 7, based on the results of big data, the average hotel price in Indonesia is in the range of Rp400,000 to Rp500,000 per day. The average hotel price increased slightly in the second quarter of 2020. This increase was due to a decrease in the number of visitors, while operating costs incurred by hotels remained. Then, in the third quarter of 2020 until the first quarter of 2021, the average trend of hotel prices tends to fall. The implementation of the transitional PSBB and the start of some activities in public places have begun to be allowed, causing many hotels to apply discounts to attract more visitors (Adhinugroho et al., 2020).

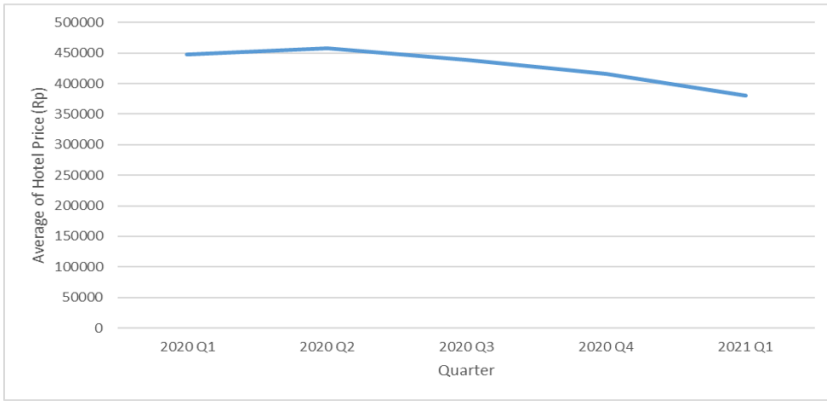

Figure 8: Average Hotel Price by Quarter
Source: Online Travel Agency (Processed)

If we look at the stock market, the average share price in the accommodation and food service activities decreased in February–April 2020. The spread of the COVID-19 pandemic in Indonesia and the implementation of PSBB seem to make investors less interested in this sector. The average share price tends to stagnate at Rp380–Rp450 in April 2020 to March 2021. The frequency of stock transactions in June 2020 increased significantly compared to the previous months. This shows that the implementation of the transitional PSBB which began in early June 2020 attracted investors to buy shares in the accommodation and food service activities.

The tourism sector has a contribution to employment. The accommodation and food service activities has the fourth largest number of workers in Indonesia

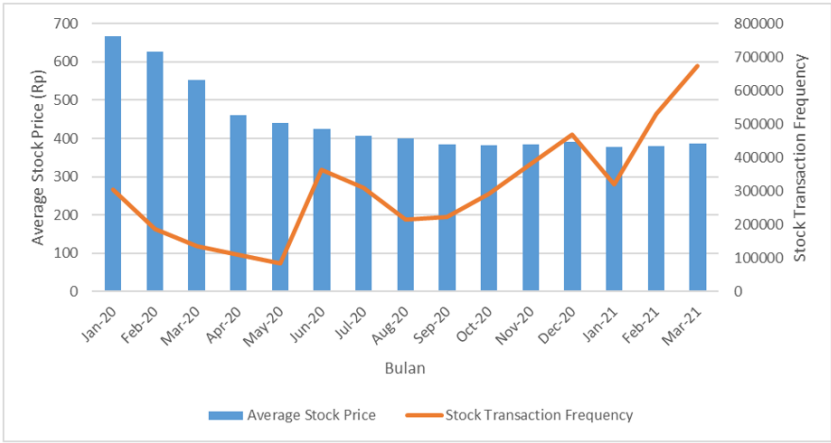

Figure 9: Frequency of Stock Transactions and Average Stock Price per Month
Source: Indonesia Stock Exchange (Processed)

in 2020. In Figure 8 can be seen the results of the 2020 National Labor Force Survey (Sakernas). Based on the results of the February 2020 Sakernas, there are around 9 million people who work with the main occupation in this sector. Furthermore, in August 2020, there was a decline in the number of people working in this sector to 8.5 million people. Based on the Analysis on COVID-19 Impact on Businesses Owners (BPS, 2020), there are around 17.63 percent of companies in this sector that lay off workers for a short time, and 50.52 percent of companies in this sector that reduce the number of employees due to the COVID-19 pandemic. The number of businesses that are temporarily closed or permanently closed due to the pandemic, as well as the number of companies that have implemented reductions in the number of employees have caused a decline in the number of workers in this sector.

BPS collects big data on the number of job vacancies, which are sourced from job advertisement websites. Based on this data, it can be seen that the number of job vacancies in the accommodation and food service activities experienced a very significant decrease in April–May 2020. In March 2020 there were 548 advertisements, decreased to 138 in April and 33 in May. Then, in July–December 2020 the trend of the number of job vacancies tends to increase, with the highest number of advertisements in November with 255 advertisements.

The data is then compared with search trend data on Google Trends with the keywords "hotel job vacancies" and "restaurant job vacancies" in the Indonesia during the period January 2019–March 2021. Data sourced from google trends is a web search statistic that displays the popularity of the topic. at a certain time. The numbers shown represent search interest based on the highest points on the chart for a given region and time. A value of 100 indicates the term is at the peak

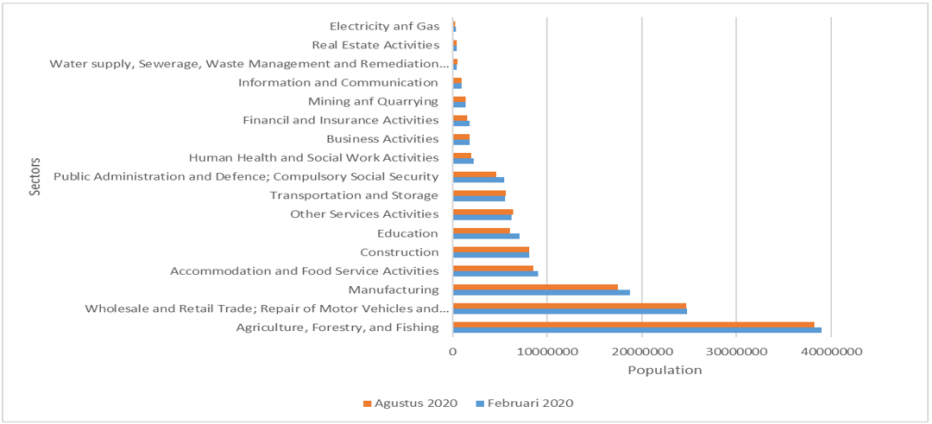

Figure 10: Number of Population Aged 15 Years Old and Over Working by Main Occupation
Source: BPS Statistic (2021), processed

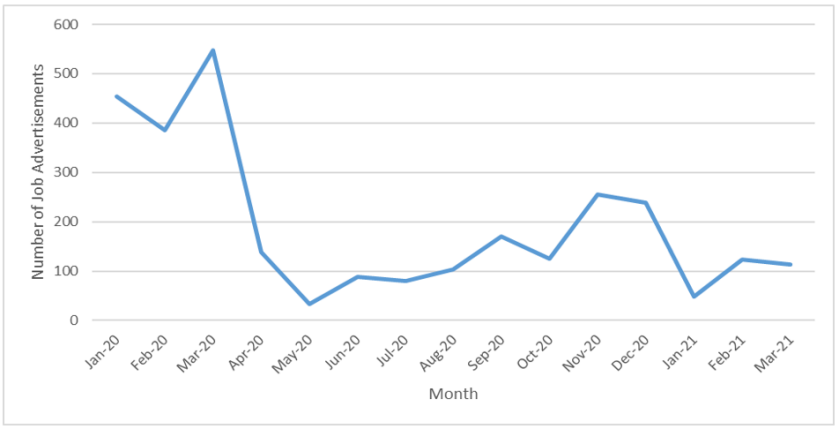

Figure 11: Number of Job Vacancy Advertisements in the Accommodation and Food Service Activities
Source: Job Advertisement Site (Processed)

of popularity, a value of 50 indicates a term with half popularity, and a value of 0 indicates that there is not enough data available for that term. This data is expected to provide an overview of the pattern of public interest in finding job vacancies in the accommodation and food service activities sector.

In Figure 11 it can be seen that the trend of searching for restaurant and hotel job vacancies has a similar pattern. The search trend with these two keywords

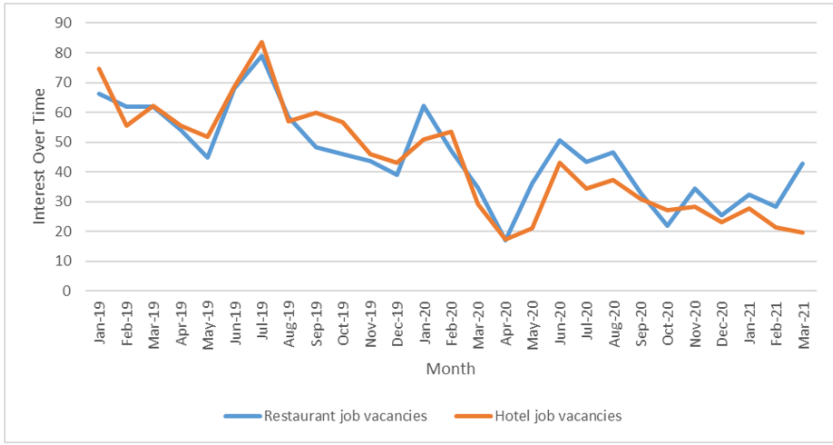

Figure 12: Google Trends Data with Keywords "restaurant job vacancies" and "hotel job vacancies"
Source: Google Trends (Processed)

was quite high during the period 2019 to early 2020, but experienced a significant decline in March–April 2020. Then, in June 2020 the trend of searching for vacancies in this field seemed to increase again, along with the enactment of PSBB transition. However, this increasing trend is not proportional to the number of job advertisements available.

3.3. Measures of Tourism Competitiveness in Five Tourism Super Priority Areas

Based on the results of the measures that have been formed, it can be seen that the measures made to accommodate the impact of COVID-19, where the size decreased in value in weeks 11 to 15 in 2020. During those weeks, there were social restrictions imposed by the government. After those weeks, the areas that experienced an increase above the baseline were Central Java and North Sumatra. This is due to the potential for domestic tourists that are still possible from these areas due to the population density of these areas.

If we look at the progress during week 11 in 2020 to week 14 in 2021, it can be seen that only three provinces of super priority areas are moving towards and reaching numbers above the baseline (100). The three provinces are Central Java, North Sumatra, and East Nusa Tenggara. However, if you look at the end of 2020, it appears that the five provinces of super priority areas already have a measure of tourism competitiveness that is above the baseline. This indicates that the impact of the year-end holidays has been felt by the five provinces of the tourism super priority areas.

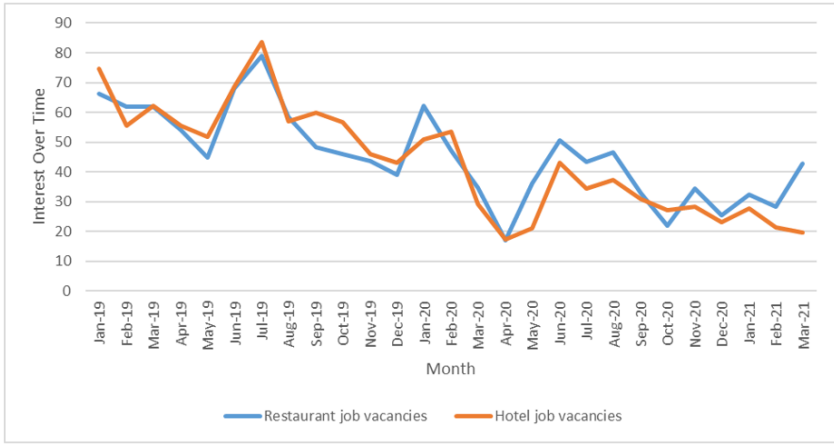

Figure 13: Movement of Tourism Competitiveness Measures from Five Provinces Locations of Five Super Priority Destinations During Week 11 2020 to Week 14 2021

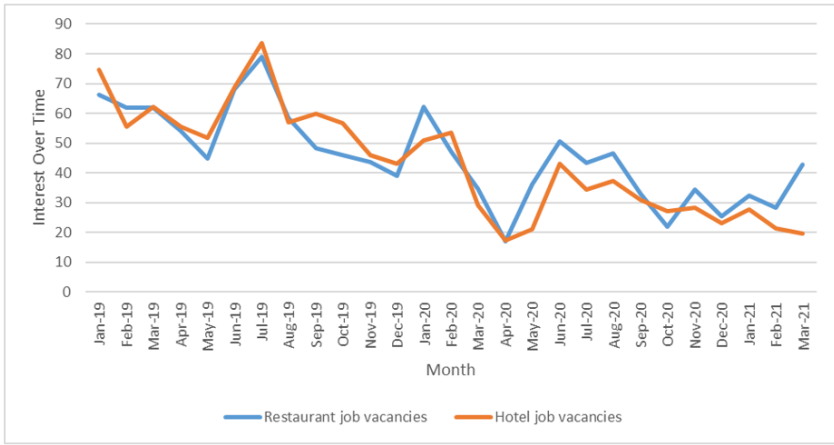

Figure 14: Average Size of Tourism Competitiveness from Five Provinces Location of Five Super Priority Destinations During Week 11 2020 to Week 14 2021

The picture shows that Central Java and North Sumatra are provinces which, during the 11th week of 2020 to the 14th week of 2021, have a measure of tourism competitiveness that is above the baseline. These two provinces are considered superior provinces, both in terms of coverage, facilities, access, and popularity. However, the thing that can be studied is the need for an increase in the other three tourist attractions to be able to become a driving force for the economy in terms of tourism.

4. Conclusion

Based on a study conducted on tourism from a big data perspective, the following conclusions were drawn.

1. Based on the condition of Indonesian tourism, January to April 2020 is the worst condition with low economic value and low visits. This is a result of the pandemic that hit. Until March 2021, tourism conditions still have not shown a recovered condition (before the pandemic). However, there are already signs that tourism recovery has begun to be shown by starting to expand domestic tourism in December 2020 to January 2021.
2. Regarding the economy, the tourism sector in Indonesia has a large contribution and spread effect to added value. The value added of tourism experienced a very high decline during 2020. This decrease in added value can be proxied by the price level and also room occupancy obtained from Big Data analysis. The price level began to decline due to the lack of demand, and this was supported by the declining room occupancy rate.
3. Big data can be a proxy for the economic value of tourism. One indicator that can be used as a proxy is from the stock market in the food and beverage accommodation sector. Meanwhile, the hotel price indicator still needs another explanation because it will be tied to the price formation so that it can be linked to economic value. On the other hand, economic conditions from the aspect of labor can also be explained by big data during a pandemic. Indicators that can be used are the provision of advertisements on job vacancies and also the Google Employment Trends Index.
4. With the new phenomenon of five priority destinations in Indonesian tourism, Big Data can also be used as a supporting indicator that can monitor the condition of the province where the priority destinations are located. It can also be made a measure that is able to describe the competitiveness of tourism that can be monitored regularly. Central Java and North Sumatra are provinces that have good support systems for priority tourist destinations in their respective regions.
5. Big data by way of new data sources can be used to see tourism phenomena that are difficult to obtain with conventional data during a pandemic. This is due to the difficulty of monitoring in the field. With big data, new habits from Indonesian tourism can be captured as a result of the widespread use of technology in tourism as well as the development of existing information technology.

References

[1] Adhinugroho, Y., Putra, A. P., Luqman, M., Ermawan, G. Y., Mariyah, S., & Pramana, S. (2020). Development of online travel web scraping for tourism statistics in Indonesia. *Information Research, 25*(4), p. 885. doi: https://doi.org/10.47989/irpaper885.

[2] BPS. (2020). *Analisis hasil survei dampak COVID-19 terhadap pelaku usaha*. Badan Pusat Statistik (BPS - Statistics Indonesia).
[3] BPS. (2021a). *Distribusi PDB triwulanan atas dasar harga berlaku menurut lapangan usaha (persen)*. Badan Pusat Statistik (BPS - Statistics Indonesia). https://bps.go.id/indicator/11/106/1/-seri-2010-distribusi-pdb-triwulanan-seri-2010-atas-dasar-harga-berlaku.html.
[4] BPS. (2021b). *PDB seri 2010 (milyar rupiah)*. Badan Pusat Statistik (BPS - Statistics Indonesia). https://bps.go.id/indicator/11/65/1/-seri-2010-pdb-seri-2010.html.
[5] BPS. (2021c). *Penduduk 15 tahun ke atas yang bekerja menurut lapangan pekerjaan utama*. Badan Pusat Statistik (BPS - Statistics Indonesia). https://www.bps.go.id/statictable/2009/04/16/970/penduduk-15-tahun-ke-atas-yang-bekerja-menurut-lapangan-pekerjaan-utama-1986---2021.html.
[6] BPS. (2021d). Pertumbuhan Ekonomi Indonesia Triwulan IV-2020. *Berita Resmi Statistik No. 13/02/Th. XXIV*. Badan Pusat Statistik (BPS - Statistics Indonesia).
[7] BPS. (2021e). Perkembangan pariwisata dan transportasi nasional Maret 2021. *Berita Resmi Statistik No. 34/05/Th. XXIV*. Badan Pusat Statistik (BPS - Statistics Indonesia).
[8] Delchambre, L. (2015). Weighted principal component analysis: a weighted covariance eigendecomposition approach. *Monthly Notices of the Royal Astronomical Society, 446*(4), 3545-3555. doi: https://doi.org/10.1093/mnras/stu2219.
[9] detikFinance. (2020, September 18). *Hotel jor-joran kasih diskon buat tarik pengunjung*. Retrieved from https://finance.detik.com/berita-ekonomi-bisnis/d-5177977/hotel-jor-joran-kasih-diskon-buat-tarik-pengunjung.
[10] Katadata. (2020, September 8). *RedDoors & OYO gelar diskon, upaya dorong okupansi di masa pandemi*. https://katadata.co.id/ekarina/brand/5f577f2819633/reddoors-oyo-gelar-diskon-upaya-dorong-okupansi-di-masa-pandemi.
[11] Mahto, D. K., & Singh, L. (2016). A dive into Web Scraper world. In *2016 3rd International Conference on Computing for Sustainable Global Development (INDIACom)*, pp. 689-693. IEEE.
[12] Panuntun, S. B., & Pramana, S. (2021). Development of automated flight data collection system for air transportation statistics. *Journal of Physics: Conference Series, 1863*(1), p. 012020. doi: 10.1088/1742-6596/1863/1/012020.
[13] Porto, N., Rucci, A. C., & Ciaschi, M. (2018). Tourism accessibility competitiveness. A regional approach for Latin American countries. *Investigaciones Regionales - Journal of Regional Research*, (42), 75-91.
[14] WTTC. (2020). *Economic impact reports*. World Travel & Tourism Council. https://wttc.org/Research/Economic-Impact.

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