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COVID-19: Short-Run Impacts of the Pandemic on the Integrated Resorts Oligopoly of Macao

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Abstract

Objective: As a world tourist destination, Macao is inevitably under the impact of the COVID-19 pandemic. However, the market of integrated resorts in Macao are shared by only a few casino concessionaries, together forming an oligopoly. While the firms attempted to adjust price, quantity and quality of their hotel services in response to the pandemic, they could not overlook the strategic interactions with other players in the market. Hence, this paper aims to investigate the possible impact of the pandemic on the oligopolistic strategies in the integrated resort market in Macao.

Methodology: Application of a theoretical model of differentiated oligopoly to this six-firm case shows that price differences across firms depend on their quality differentiation. In order to analyze these price differences empirically, this paper collects data of hotel room rates of the integrated resorts from November, 2019 to mid-August, 2020, covering the periods before and after the outbreak of COVID-19.

Originality: In the existing literature, there is a lack of studies of the oligopoly in the hospitality industry of Macao. Furthermore, the effect of COVID-19 is still ongoing, so this present paper is one of the first to perform such analysis.

Results: The regression of each of the hotel price differentials on the COVID-19 dummy variable shows that COVID-19 has statistically significant impacts on almost all the price differentials. Intuitively, MGM and Wynn were in the high-price segment before and after the outbreak, while other firms switched positions in the low-price segment during the pandemic. One obvious downstream movement was by Conrad. According to the proposition derived from the theory, these imply that COVID-19 should have significant impact on the quality differentiation of the firms.

Practical implications: The results are in line with the observations that the integrated resorts have rolled out staycation packages according to preferences of local residents. These quality adjustments observed in Macao's hospitality industry currently only involved variable inputs rather than fixed inputs of production; therefore, the impact of COVID-19 should be seen as short-term effects.

Keywords: Covid-19; Differentiated oligopoly; Hospitality industry; Hotel room rate; Oligopolistic market structure; Pricing strategy.

1. Introduction

The hospitality industry in all major world tourist destinations suffered a strong hit by the COVID-19 pandemic. In Macao, overnight visitor arrivals fell by over 94% from January to February, 2020 (Statistics and Census Service, 2021). The Macao government has taken various measures including entry restrictions. The strictest restriction on visitors was effective on Feb. 20th, 2020, which required mainland Chinese visitors to be quarantined for 14 days at designated locations. Unlike small and medium-sized enterprises, the large-scale integrated resorts would rather incur short-term economic losses than shutting down. These integrated resorts, operated by the six casino concessionaries, saw the need to re-strategize their businesses, including offering staycation packages and local tours (Valles, 2021). As a result, the 5-star hotel occupancy rate has slowly risen since July, 2020. Even though Macao is

one of the regions with the fewest infected cases, the situation in the neighboring regions were much more pessimistic. Individual tourist visas for Chinese residents had not completely resumed until September, 2020. Since then, occupancy rate of 5-star hotels has gradually risen, but local resident staycations remained a large proportion of hotel occupancy in the Golden Week in October, 2020 (Moura, 2020). The latest data show that the occupancy rate was only 39.2% in January, 2021, compared to 83.2% a year ago. The government of Macao found it necessary to "re-program" toward the "new normal," and included in its third stimulus package a MOP200 subsidy to each resident on their staycation (Matias, 2020).

These recent observations in the hospitality industry of Macao motivate the objectives of the paper: i) to assess the short-term impacts of the pandemic on the oligopolistic strategies of the six casino concessionaries in the integrated resort market in Macao and ii) to provide a theoretical explanation of these impacts and of the conditions for these impacts to become long-term.

2. Literature Review

The present paper is related to three strands of literature. First, the theoretical model is based on the seminal model of differentiated oligopoly of Singh and Vives (1984). Singh and Vives (1984) included a quality variable in the utility function, such that a consumer's demand for a firm's product is positively related the quality of the product. Häckner (2000) extended the model to include n firms that compete in a Cournot fashion, in a Bertrand fashion, or both. This paper focuses on Bertrand (price) competition and largely simplifies the model by setting number of firms $n = 6$.

The second strand of related literature concerns the oligopolistic market structure in the hospitality industry. Among the few studies in the literature, Friesz, Mookherjee and Rigdon (2005) provided a theoretical model of Cournot-Nash (quantity) competition of a hotel oligopoly. With a simple numerical example, Arenoe, van der Rest and Kattuman (2015) demonstrated a game theoretical approach to room rate determination in an oligopolistic hotel market. Baum and Mudambi (1995) is an earlier empirical study that tested the Ricardian model on data of Bermuda resort hotels and found that hotel prices were high and stable when there was excess demand, but the opposite was true when there was excess supply. Chung (2000) examined the

oligopolistic competition among deluxe hotels in Seoul from 1989 to 1996 and provided explanations based on game theory. Vargas-Hernández, Quijano and Benítez (2020) used the VRIO framework, and based on the number of hotels, determined that the Grupo Posadas shared the market with IHG Hotels, constituting an oligopoly in the lodging sector in Mexico. Most of these studies focused on the pricing strategies and the market structure itself. Few studies performed cause-and-effect analysis, except for Pan (2006), which applied a Nash bargaining model and examined the determinants of average daily hotel room rates in Taipei and the effect of group bargaining. There is not only a lack of studies of the oligopoly in the hospitality industry of Macao, the effect of COVID-19 is still ongoing, so this present paper is one of the first to perform such analysis.

Outside of the tourism field, on the other hand, many empirical studies have evaluated the impacts of the pandemic. When constructing the regression model and incorporating COVID-19 as a dummy variable, this paper references the most recent studies of the impacts on prices. Just to name a few, there are Boshoff (2020), Kim, Kim and Wang (2021) and Škare, Soriano and Porada-Rochoń (2021). The regression models worth highlighting here are Narayan (2020a) and Narayan (2020b). Narayan (2020a) assessed how COVID-19 changed the volatility of the USD-YEN exchange rate. As in their paper, the regression model of this paper identifies an "early stage" and a post-COVID-19 period. It is reasonable to assume that in the early stage, there was insufficient information about the potential effects of COVID-19 (Narayan, 2020a). Different from Narayan (2020a), however, this study does not attempt to identify structural breaks (Narayan & Popp, 2013). As will be explained in section 4, the exact timing of the measures that the Macao government has taken against the pandemic makes the structural breaks apparent. It serves as a strong argument for the timing of the structural breaks in all 15 price differentials analyzed in this paper, and is more suitable for the analysis than methods of structural break identification, which are data-driven and specific to one time series alone.

3. Methodology

The aim of this study is to investigate the oligopolistic strategies of the six casino concessionaries, which operate integrated resorts in Macao. A regression model is necessary to evaluate the impact of the COVID-19 pandemic on their strategies. In

order to construct the regression model, this paper first provides a theoretical explanation to the pricing strategies taken by the oligopolists. Hence, this paper applies a model of differentiated oligopoly on a 6-firm case and simplifies the model further by adjusting the assumptions according to the observations in the hospitality industry of Macao. Afterwards, this paper runs a regression analysis over the hotel room rate data and the COVID-19 dummy variables, controlling for serial correlation and seasonality. The regression results help determine the statistical and economic significance of COVID-19 on the pricing strategy of each of the six firms.

3.1 Theory

The model of differentiated oligopoly due to Singh and Vives (1984) and generalized to n firms by Häckner (2000) has a utility function that is quadratic in the consumption of the products, each produced by one of the n firms and is linear in the consumption of other goods, I. Applying the model to a 6-firm oligopoly, $n = 6$. For simplicity, further assume that the products of the six firms are perfect substitutes, so that the utility function becomes

$$U = \sum_{i=1}^{6} q_i \alpha_i - \frac{1}{2}\left(\sum_{i=1}^{6} q_i^2 + 2\sum_{i \neq j}^{6} q_i q_j\right) + I \quad . \tag{1}$$

where q_i is the quantity of product produced by firm i and α_i measures quality in the sense that other things equal, the greater the α_i, the higher is the utility of consuming q_i. Consumers chooses the optimal consumption of each product by maximizing utility subject to budget constraint $\sum p_i q_i + I \leq m$, in which p_i denotes the price of product i and m denotes income, and the price of I is normalized to 1. The first-order condition is therefore

$$\frac{\partial U}{\partial q_i} = \alpha_i - Q - p_i = 0 \quad , \tag{2}$$

where $Q = \sum q_i$. (2) yields the inverse demand function of firm i: $p_i(q_i) = \alpha_i - Q$. Firm i maximizes profit $\pi_i = p_i q_i - C(q_i)$, taking the quantities produced by the other 5 firms as given. As in Häckner (2000), this application normalizes cost to be zero, so that the first-order condition can be solved as reaction function:

$$q_i(q_{-i}) = \frac{\alpha_i - \sum_{j \neq i} q_j}{2} \quad . \tag{3}$$

Summing (2) and (3) over all firms and back-substitute the expression into (3) implies the following reaction function when firms engage in Bertrand (price) competition:

$$p_i(p_{-i}) = \frac{\alpha_i}{2} - \frac{\sum_{j \neq i}(\alpha_j - p_j)}{10} \quad , \tag{4}$$

Solving the 6 reaction functions simultaneously yields the equilibrium price of firm i:

$$p_i = \frac{5\alpha_i - \sum_{j \neq i} \alpha_j}{11} \quad , \tag{5}$$

From (5), it can be derived that the price differential between firm i and firm j is

$$p_i - p_j = \frac{6}{11}(\alpha_i - \alpha_j) \quad , \tag{6}$$

(6) implies that price differences across two firms, if any, is positively related to quality differentiation across firms. This proposition provides theoretical ground for an explanation of any price difference observed across firms. This simplified model assumes the 6 products to be perfect substitutes. Hence, consumers are willing to pay a higher price for a product only because of the satisfaction they gain from consuming a particular product with higher quality.

It is not an unreasonable proposition. In fact, before the pandemic, the occupancy rate of the integrated resorts was well over 80%. Consumers who needed to stay overnight would willingly substitute one integrated resort over another as long as they were available. The years of rating on Trip Advisor (2020), Booking.com, (2020) and Agoda, (2020) provided some evidence of the consumers' perception. The ratings of six integrated resorts representing the six casino concessionaries (listed in Table 1) ranged from 8 to 10 out of 10. The small gap between the ratings showed that even though the six integrated resorts are close substitutes in the eyes of the consumers, they differ slightly in quality.

3.2 Regression Model

It is difficult to measure and quantify the quality differences across firms. However, according to the theoretical derivation in (6), the quality differences should be reflected in the price differences across firms. The hotel room rates, on the other hand, can be collected relatively easily. Hence, the impact of COVID-19 can be estimated over the hotel price differentials. The regression model is as follows:

$$DIFF_{ij,t} = c + \lambda DIFF_{ij,t-1} + \beta t + \delta_1 EARLY_{t-1} + \delta_2 COVID_{t-1} + \sum_{p=1}^{k} \beta_p \Delta DIFF_{t-p} + \sum_{w=1}^{m} \gamma_w s_{w,t} + \epsilon_t \quad , \tag{7}$$

where $DIFF_{ij} = p_i - p_j$ is the hotel price differential of firm i and firm j, regressed on constant c, trend t and the dummy variables for the EARLY stage and the post-COVID-19 period. β_p controls for any serial correlation with the optimal lag length k chosen using Schwarz Information criterion. γ_w controls for seasonality captured by m seasonal dummies, including day of the week (MON, TUE, WED, THUR, FRI, SAT, SUN) and public holidays of mainland China (CHI_HOLIDAY) and those of Macao (MAC_HOLIDAY) (Office Holidays, 2021). ϵ_t is the model's residuals.

4. Results and Discussion

4.1 Data

Each of the six casino concessionaries operate more than one integrated resort in Macao. Typically, each of the six brands locate one integrated resort in the waterfront area of Macao peninsula and one in the Cotai strip. For example, MGM Macau and MGM Cotai offer hotel rooms of similar quality and amenities and are widely regarded as close substitutes by consumers. Hence, it is reasonable to choose one integrated resort to represent one casino concessionary. The representative integrated resorts chosen in this study include Altira Macau of Melco, Broadway Macau of Galaxy Entertainment Group, Conrad Macao of Las Vegas Sands Corporation, Grand Lisboa of Sociedade de Jogos de Macau (SJM), MGM Macau of MGM Mirage and Wynn Macau of Wynn Resorts. This study tracks daily hotel room rates of similar room types in the six integrated resorts on the websites of Agoda (2020) and Booking.com (2020) from November, 2019 to mid-August, 2020, covering the period before and after the outbreak of COVID-19. Note that even though the sample covers 289 days, not all time series have the sample size. In particular, Altira, Conrad and MGM were closed during the period when the government demanded for casino closure in February, 2020 (Centre for Disease Control and Prevention, 2021). While Altira and MGM resumed on Feb. 20th, Conrad continued to suspend its businesses till Jun. 12th. Hence

the price differentials between Conrad and other integrated resorts, later described in Table 2, are also shorter time series. The hotel rooms are suites with sizes ranging from 46 to 56 square meters. For comparison, this analysis calculates per-square-meter hotel room rates. Table 1 presents the descriptive statistics of the data.

In order to analyze the price strategies of the six firms, this analysis focuses on the price differentials of the hotel rooms. Pairwise comparison of the six integrated resorts generates 15 price differentials. In Figure 1, $DIFF\_ij$ refers to the difference in per-square-meter hotel room rates of integrated resort i and integrated resort j. For example, $DIFF\_AB$ stands the hotel price differential, $p_{Altira} - p_{Broadway}$. Visual inspection of the graphs finds that most of the 15 price differentials exhibit changes in the level and in the volatility before and after the COVID-19 outbreak.

The Macao government has taken various measures against the pandemic since the notification by China's National Health Commission on the last day of 2019 (Centre for Disease Control and Prevention, 2021). The measure that restricted the entry of mainland Chinese visitors, who make up a majority of Macao's visitors, was effective on Feb. 20th, 2020 (Centre for Disease Control and Prevention, 2021). As shown in Figure 1, the period between Dec. 31st, 2019 and Feb. 19th, 2020 involves some drastic drop or rise. After Feb. 19th, there are some visible changes in the time series. As in previous studies of the impact of COVID-19 on prices, there is an "early stage," in which the market needed to find out about new announcements of Macao's Health Bureau and to adapt to new measures (Narayan, 2020a). Hence, this study considers the period of Dec. 31st, 2019 to Feb. 19th, 2020, to be the "early stage" in which the impact of the pandemic was not fully realized. This period is marked as the shaded area in Fig. 1. Note that as explained in the literature review, there are different unit root tests used by previous studies to identify one or more structural breaks in a time series. In fact, when running a breakpoint Dickey-Fuller unit root test on each of the 15 price differentials identifies a structural break date. Even though each structural break date is slightly different, they all fall into the "early stage" defined in this study. The focus of this study, however, is not to identify a precise structural break date in one particular time series; rather, its interest lies in how COVID-19 impacted the pricing competition between the firms when the pandemic was in full force. In other words, the focus of this study is the post-COVID-19 period after Feb. 19th.

Table 1. Descriptive Statistics

	Full Sample 11/1/2019 – 8/15/2020	Pre-COVID-19 11/1/2019 – 12/30/2019	Early Stage 12/31/2019 – 2/19/2020	Post-COVID-19 2/20/2020 – 8/15/2020
Altira (Suite size: 54 m^2)				
N	279	60	41	178
Mean	29.33948	35.25667	36.72000	25.64491
SD	12.09237	12.92505	17.72478	8.047797
Minimum	17.80000	23.59000	20.72000	17.80000
Maximum	105.5200	68.48000	105.5200	45.14815
Broadway (Suite size: 46 m^2)				
N	289	60	51	179
Mean	32.36639	37.98300	37.69431	28.93428
SD	9.658625	11.69981	12.49449	5.592952
Minimum	23.41000	25.00000	26.04000	23.41000
Maximum	86.96000	67.30000	86.96000	45.22000
Conrad (Suite size: 52 m^2)				
N	162	60	38	64
Mean	39.50652	45.08050	52.09342	26.80745
SD	20.18557	17.59262	27.20912	5.258587
Minimum	21.35000	29.38000	29.37000	21.35000
Maximum	162.2700	115.3500	162.2700	43.04000
Grand Lisboa (Suite size: 50 m^2)				
N	289	60	51	179
Mean	32.01287	34.61867	37.31373	29.59899
SD	9.384564	10.34779	16.16749	4.188582
Minimum	22.60000	22.60000	26.58000	26.62000
Maximum	90.18000	65.60000	90.18000	39.68000
MGM (Suite size: 48 m^2)				
N	283	60	45	178
Mean	43.29463	55.05783	53.18267	36.82971
SD	18.66757	18.72158	28.77683	10.89579
Minimum	27.75000	32.35000	30.10000	27.75000
Maximum	128.9200	95.58000	128.9200	69.15000
Wynn (Suite size: 56 m^2)				
N	289	60	51	179
Mean	43.95025	66.12133	46.54765	35.70482
SD	23.40060	33.78114	21.97680	11.70679
Minimum	19.29000	28.39000	30.68000	19.29000
Maximum	154.3900	154.3900	130.8400	62.29000

Figure 1 - Hotel Price Differentials of the Six Integrated Resorts

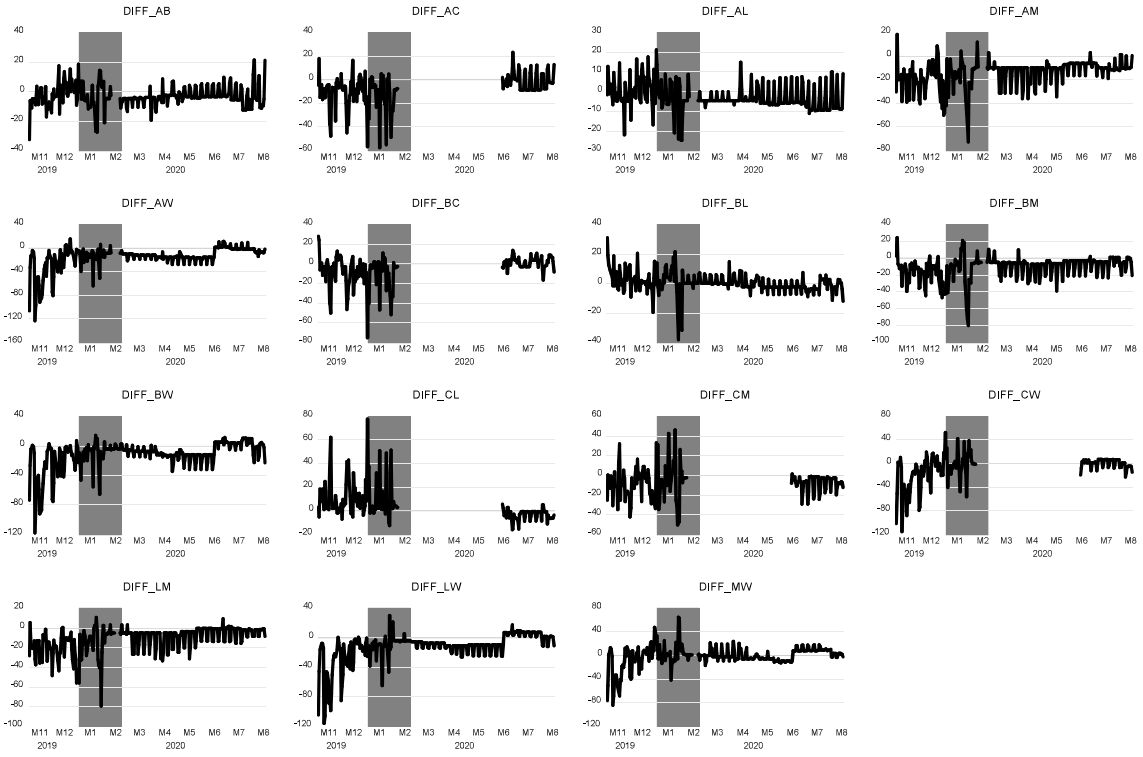

Table 2 summarizes the descriptive statistics of the 15 hotel price differentials and the Dickey-Fuller unit root test results. The standard deviations of all 15 price differentials drop in the post-COVID-19 period, implying less volatility in the post-COVID-19 period. This observation is consistent with the fluctuations visible in the graphs in Fig. 1.

Pre-COIVD, the null hypothesis that there is a unit root is rejected at 5% significance in 13 price differentials. The unit root hypothesis can also be weakly rejected in the Broadway-Wynn and the Conrad-MGM price differentials at 10% and 15% significance levels respectively. The results are much more mixed in the post-COVID-19 period. The null hypotheses can be rejected in only 8 of the 15 price differentials. This is evidence that the price differentials have become more persistent post-COVID-19. Any other shock on the price differentials would be non-transitory or have longer-term effect in the post-COVID-19 period. As of today, the local hospitality industry still considers the pandemic itself as the single most prominent shock (Valles, 2021). Shocks such as trade war and worldwide recession do not seem to be foreseeable. Furthermore, as of today, the impact of the pandemic on world tourism is still ongoing. Macao has not fully lifted its entry restrictions.

Table 2. The 15 Hotel Price Differentials

	$DIFF_{AB}$	$DIFF_{AC}$	$DIFF_{AL}$	$DIFF_{AM}$	$DIFF_{AW}$	$DIFF_{BC}$	$DIFF_{BL}$	$DIFF_{BM}$	$DIFF_{BW}$	$DIFF_{CL}$	$DIFF_{CM}$	$DIFF_{CW}$	$DIFF_{LM}$	$DIFF_{LW}$	$DIFF_{MW}$
Full Sample															
Mean	-3.146283	-7.567109	-2.797872	-14.12210	-15.04842	-4.738398	0.353517	-10.89008	-11.58386	5.266154	-7.812792	-7.597841	-11.23526	-11.93738	-0.900260
SD	7.089333	13.15342	6.594443	11.02163	18.43045	14.05313	6.701877	12.96193	18.59814	14.56314	14.79159	24.24252	12.40374	19.52642	17.21227
Unit Root															
Test t-stat	-10.273***	-4.8032***	-2.5321***	-3.7793***	-3.2205***	-5.2885***	-11.939***	-5.3211***	-2.53361^	-7.8020***	-10.307***	-5.0762***	-8.7780***	-3.9024***	-5.4332***
Pre-COVID-19															
Mean	-2.726333	-9.823833	0.638000	-19.80117	-30.86467	-7.097500	3.364333	-17.07483	-28.13833	10.46183	-9.977333	-21.04083	-20.43917	-31.50267	-11.06350
SD	8.239714	12.23257	7.581991	13.19315	30.69095	14.44019	8.079604	13.61081	29.46316	13.34878	14.34461	30.83391	12.47825	30.16730	28.58338
Unit Root															
Test t-stat	-3.6508***	-5.9053***	-7.2988***	-5.2637***	-3.9207***	-4.8534***	-5.9007***	-4.7683***	-2.91159*	-4.8175***	-2.58607^	-4.3659***	-4.8436***	-3.8653***	-3.3069**
Early Stage															
Mean	-3.086098	-14.87026	-2.733659	-18.56341	-13.43927	-11.64947	0.380588	-14.53800	-8.853333	11.87868	-4.981579	0.698947	-14.86978	-9.233922	4.750222
SD	10.32336	16.71270	9.645082	16.21917	12.87965	18.69786	10.53580	21.48930	14.23157	19.53432	22.73456	22.08565	17.52775	14.36472	17.83942
Unit Root															
Test t-stat	-3.5351***	-2.13588**	-4.2878***	-2.15555**	-0.696702	-2.16570**	-4.6617***	-2.72726*	-5.6965***	-5.2388***	-5.5268***	-5.4415***	-3.6298***	-6.6934***	-4.7138***
Post-COVID-19															
Mean	-3.301701	-1.115183	-3.970822	-11.18481	-10.08775	1.576712	-0.664712	-7.883105	-6.770538	-3.530986	-7.464566	0.078747	-7.213984	-6.105826	1.097058
SD	5.668986	7.658790	4.767539	7.010436	8.479366	5.428482	3.969280	8.104958	9.875639	4.506550	7.311413	7.180983	8.277150	9.607671	8.568527
Unit Root															
Test t-stat	-1.942596*	-1.75046*	-0.747370	-0.496013	-0.977633	-4.0507***	-2.6097***	-2.84073*	-1.777384	-5.5570***	-1.696196	-8.0427***	-1.482069	-1.596198	-6.1863***

Note. ^ indicates $p < 0.15$. * indicates $p < 0.1$. ** indicates $p < 0.05$. *** indicates $p < 0.01$.

Table 3 - Regression Results

	$DIFF_{AB}$	$DIFF_{AC}$	$DIFF_{AL}$	$DIFF_{AM}$	$DIFF_{AW}$	$DIFF_{BC}$	$DIFF_{BL}$	$DIFF_{BM}$	$DIFF_{BW}$	$DIFF_{CL}$	$DIFF_{CM}$	$DIFF_{CW}$	$DIFF_{LM}$	$DIFF_{LW}$	$DIFF_{MW}$
c	-2.784***	-9.608***		-8.495***	-6.6188**	-6.244***	2.1249***	-8.270***	-5.501**	7.8092***	-5.139***	-6.1978**	-9.581***	-3.50397	-4.2259**
trend	0.02028**				0.03570**		-0.024***						0.02193*		
$DIFF_{ij,t-1}$	0.3301***	0.2976***	0.3322***	0.4833***	0.7414***	0.4146***	0.3235***	0.4876***	0.7632***	0.2878***	0.2225***	0.5202***	0.4480***	0.7767***	0.6142***
EARLY	-3.5464**	-0.98930	-3.672***	1.999204	0.643102	1.261485	0.477217	3.66896**	5.28265**	-2.00607	5.96959*	7.31195*	4.21208**	3.034005	4.20947*
COVID	-4.836***	7.4942***	-3.836***	4.7278***	-2.96197	7.2484***	1.950764	5.5637***	5.30600**	-11.32***	1.518574	8.64264**	4.28554*	3.49838*	3.63900*
SUN								5.1742***							
MON					3.26587*									4.50276**	4.95154**
FRI	4.0695***	5.45561**		-11.71***	-5.228***		-2.3560**	-12.42***	-10.28***		-12.29***	-16.16***	-13.25***	-5.506***	3.68387*
SAT	4.3421***	4.61148*	8.1352***				4.9682***			5.93067**			-5.814***	-8.241***	-3.62353*
CHI_HOLIDAY	3.02322**						-3.459***	-4.7421**			-13.66***		-5.0957**		
MAC_HOLIDAY				-9.435***				-4.18143*							8.5976***
$\Delta DIFF_{ij,t-1}$		-0.07903	-0.11044	-0.1060**	-0.300***	-0.08353		0.054402	-0.13943*			-0.02582		-0.347***	
$\Delta DIFF_{ij,t-2}$			-0.16277		-0.1632**			0.18667**	-0.209***			0.068111		-0.195***	
$\Delta DIFF_{ij,t-3}$			-0.14655		-0.13974*			0.13595**	-0.218***					-0.08225	
$\Delta DIFF_{ij,t-4}$			-0.13770		-0.03548			0.084421	-0.10134					-0.08523	
$\Delta DIFF_{ij,t-5}$			-0.09824		0.005312			-0.02022	-0.201***					-0.05051	
$\Delta DIFF_{ij,t-6}$			-0.06675		0.032618			0.008265	-0.1128**					0.081624	
$\Delta DIFF_{ij,t-7}$					0.13643**			0.14214**						0.10670*	
$\Delta DIFF_{ij,t-8}$					0.1754***									0.1575***	
Adjusted R-squared	0.229200	0.223836	0.323752	0.457939	0.626681	0.263035	0.285558	0.594927	0.579548	0.301935	0.161243	0.400653	0.530282	0.663963	0.473730

Note. * indicates $p < 0.1$. ** indicates $p < 0.05$. *** indicates $p < 0.01$.

After world tourism restores its normality, the six casino concessionaries may engage in fiercer price competition, bringing volatility back to the game again.

Note that for the full sample, the unit root tests reject the null hypotheses in all 15 price differentials; therefore, the time series are stationary, and the present analysis can proceed to derive regression results.

4.2 Results

Table 3 shows the regression results of the 15 hotel price differentials. The resulting models are chosen based on common criteria including adjusted R-squared as well as Akaike Information Criterion and Hannan-Quinn criteria. COVID, which is the dummy variable for the post-COVID-19 period has statistically significant impact on all 15 price differentials except for the ALTIRA-WYNN, BROADWAY-LISBOA and CONRAD-MGM price differentials. The influences have much more mixed results in the early stage. The impacts are significant in only 8 of the 15 price differentials. These are expected results as the pandemic had not yet exerted full impact on world tourism and the city had gradually strengthened entry restrictions during the early stage. Hence it is more meaningful to compare the pre- and post-COVID-19 periods, neglecting the early stage. The mean statistics in the pre- and post-COVID-19 periods presented in Table 1 can be used to form the following price ranking. The regression results in Table 2 confirm the switching of the positions when COVID has a statistically significant negative or positive effect on a price differential.

Pre-COVID-19:

$$p_{WYNN} > p_{MGM} > p_{CONRAD} > p_{BROADWAY} > p_{ALTIRA} > p_{LISBOA}$$

Post-COVID-19:

$$p_{MGM} > p_{WYNN} > p_{BROADWAY} = p_{LISBOA} > p_{CONRAD} > p_{ALTIRA}$$

The rankings show that Wynn and MGM are in a high-price segment, while others are in a low-price segment pre- and post-outbreak. However, in the low-price segment, there are some movements. As shown in Table 1, all six of the per-square-meter hotel room rates have dropped in the post-COVID-19 period. However, the drop of that of Conrad was much more drastic. As mentioned above, Conrad has suspended from businesses for as many as 127 days. This is possibly the reason for Conrad's

adjustment of pricing strategy. As a result, Conrad's position relative to the other five firms moves downstream in the price segment.

The above is an important finding of the study. It shows how the COVID-19 pandemic indeed has significant impact on the pricing strategies in the oligopolistic market of integrated resorts in Macao. Together with the theoretical basis, this study can offer important insights. First of all, according to the differentiated oligopoly model, the price difference between two oligopolistic firms is due to their product quality differences. Hence, COVID-19 should lead to significant changes in the quality of the six integrated resorts. In fact, there have been quality changes in the integrated resorts during the pandemic. To restore businesses, many integrated resorts offer "staycation" packages to attract local residents (Valles, 2021). Staycation packages require quality adjustments in the hotel services, such as food and beverages (F&B) quantity and variety changes, additional spa services, extended length of stay (i.e., late checkouts), etc. (Altira, 2020; Broadway, 2020; Conrad, 2020; Grand Lisboa, 2020; MGM 2020; Wynn, 2020). For example, Altira and MGM Macau gave out free dining coupons in their staycation packages (Altira, 2020; MGM, 2020).

Second, it will be interesting to find out if such impact on the pricing strategies is short-term or it will last beyond the end of the pandemic. From a practical standpoint, not all possible quality adjustments are feasible in the short term. The mentioned quality adjustments that have taken place during the pandemic involved only changes in the variable inputs in production. There is not much evidence of quality adjustments that involve fixed inputs, such as re-branding and re-construction of facilities, which would take time to adjust and last longer. Even though the government of Macao saw the need to "re-program" toward the "new normal," it may take longer for the hospitality industry to adjust and determine whether to make long-term adjustments (Matias, 2020).

5. Concluding Remarks and Future Extensions

This paper examines the oligopolistic strategies of the six casino concessionaries in the integrated resort market of Macao. In the theoretical model of differentiated oligopoly, price differentials across firms are due to product quality differentiation. This provides a theoretical explanation to the price differences observed across firms in

Macao's integrated resort market. The empirical analysis collects secondary data of daily hotel room rates and room sizes from Agoda (2020) and Booking.com (2020) from Nov. 1st, 2019 to Aug. 15th, 2020. Based on the effective dates of major preventive measures and entry restrictions in Macao, the analysis identifies three periods – pre-COVID-19 period from Nov. 1st to Dec. 30th, 2019, the early stage of the outbreak from Dec. 31st, 2019 to Feb. 19th, 2020 and the post-COVID-19 period from Feb. 20th to Aug. 15th, 2020. The analysis focuses on the comparison between the pre-COVID and the post-COVID periods since the impact of the pandemic was not fully realized in the early stage. The regressions find that COVID-19 has significant impacts on 12 of the 15 price differentials. Together with the comparison of mean hotel prices pre- and post-COVID-19, rankings of the six prices can be derived. While MGM and Wynn remained in the high-price segment pre- and post-COVID-19, Conrad has taken a major hit on its businesses and has moved downstream the price segment. In line with the theoretical model, the empirical results are consistent with the recent observations that the integrated resorts have adjusted the quality of their hotel services when designing staycation packages for local residents. Unless the integrated resorts took on long-term quality adjustments such as re-branding and re-construction of hotel facilities, the impact of the pandemic on the pricing strategies should be considered as short-term.

Firm-level data of production costs and quality measures, especially in high frequencies are usually unavailable to researchers. If they become available, this paper suggests future research to conduct a more thorough regression analysis to test propositions derived in the theoretical model. Another interesting direction for future research is to investigate the possible collusive behavior before, during and after the pandemic. As there is currently no anti-trust law in Macau, collusive behavior in hotel pricing is plausible.

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Impact of Sport Events on Tourism Development in a Middle City

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Abstract

Objective: With this research, we intended to analyse the impact of sport events on the attraction of tourist at a middle city (Thomson et al., 2019). The purpose of this article is to understand the evolution of sport events and their influence on the tourist development of a medium-sized city, with the city of Vila Nova de Famalicão being studied (Kennelly, 2017; Kim & Jeong, 2019; Kirkup & Sutherland, 2017; Perić, Vitezić, & Badurina, 2019).

To carry out this article, a systematic review of the literature on the topic will be done in the Web of Science, using search terms such as "Sports Events" (SE) and "Tourism Development", as well as a bibliometric analysis that allows visualizing and mapping the most important areas and recent results from the SE research domain applied to