Article:

Airbnb and Taxation: Developing A Seasonal Tax System

Abstract

This study applies tax planning theory to develop a seasonal tax strategy as an alternative to a fixed tax rate for shared lodging platforms such as Airbnb, to increase hosts' revenue and address seasonality in tourism. The annual revenue of the various types of accommodation is used to calculate a seasonality index by the moving average method, which is incorporated as a corrected coefficient in a seasonal tax formula. The sample includes data from 1,258 active Airbnb listings in Boston, Massachusetts. Using a mean comparison test, this study reveals that the application of a seasonal tax strategy significantly increases the revenue of Airbnb hosts compared to a fixed tax rate system. Drawing on the flexibility tenet of tax planning theory, policy makers can use the proposed seasonal tax strategy as an instrument to revisit the taxation system for sharing economy businesses based on changes to the socioeconomic, environmental, and political conditions. Implications for all stakeholders are discussed.

Keywords: Airbnb, seasonality, tax, revenue management, peer-to-peer accommodation

Introduction

An emerging economy of new Internet-based marketplaces where people can share their goods and services has been flourishing around the world in recent years. Airbnb, Uber, and Lyft are examples of these kinds of collaborative consumption systems. Airbnb is one of the most prominent members of the shared accommodation business and operates more than six million listings worldwide (Airbnb press room, 2019). It has been estimated that Airbnb's annual revenue will exceed $10 billion by 2020 (Heo et al., 2019).

Like other businesses in the travel and tourism industry, Airbnb's operation is subject to seasonality, which can cause overtourism and fluctuation in revenue (Costa et al., 2018; Goodwin, 2017). Seasonality derives not only from the natural seasons (e.g., summer and winter) but also from commercial and religious seasons (e.g. Christmas and Easter holidays) that affect tourists' decision making and thus the revenue of tourism and hospitality services (Rosselló and Sansó, 2017). The efficiency of tourism services can be decreased when large masses of tourists are concentrated at a destination during a brief 'peak' season and little tourist activity occurs during the rest of the year (Lim and McAleer, 2001). Overtourism and revenue instability influence local communities' perceptions and attitudes toward the tourism industry (Matev and Assenova, 2012; Weber et al., 2017).

Tourism research typically focuses on analysis of the distribution of imbalances of a specific feature (e.g., number of Airbnb guests) during a span of time to predict the future patterns of the given feature. For instance, Merkert and Webber (2018) report a remarkable seasonal fluctuation in both the seat factor of the average flight and the price of tickets, which demonstrates the impact of seasonality on commercial airlines. Different time-series methods have been used to measure the impacts of seasonality. For example, in several studies (e.g.,

Ferrante et al., 2018; Koenig-Lewis and Bischoff, 2005; Lim and McAleer, 2001; Yang and Zhang, 2019) seasonal changes in the number of tourist arrivals and aggregate demand for tourism are measured through moving average techniques. Although some research (e.g., Cetin et al., 2017; Gudkov et al., 2017; Mills et al.,2019; Sheng, 2017) evaluated the effectiveness of different types of tax system in the development of the tourism industry, no studies appear to have applied a moving average method to modelling seasonal tax in peer-to-peer accommodations (i.e., Airbnb).

To address this research gap, the present study uses a moving average technique to examine the seasonal revenue pattern of Airbnb hosts in Boston, Massachusetts. We develop a seasonal index that is incorporated into the common tax formula. By correcting the tax coefficient based on seasonal revenue patterns, both hosts and guests will pay less tax in low seasons, which results in lower prices and redistribution of tourist flows throughout the year, as well as more sustainable revenue for hosts. Hence, this study can be used as a guideline by both Airbnb hosts and policy makers worldwide to employ a seasonal tax, as an adaptive strategy to seasonality and overtourism.

Theoretical background

Airbnb benefits and challenges

Airbnb is a privately owned rental website that provides a peer-to-peer platform for individuals to rent rooms, flats, apartments, villas, and other temporary accommodations at a wide range of prices. However, there is criticism of the commercial use of Airbnb by property owners and landlords, which may affect local housing markets unfavorably through increasing rental fees (Schäfer and Braun, 2016; Wachsmuth and Weiser, 2018). Therefore, commercial practices (i.e.,

permanently rented entire units) should be considered in addition to home sharing to fully understand the platform's role in the accommodation sector (Kadi et al., 2019).

Airbnb lists more than six million places for people to stay in more than 100,000 cities and 191 countries around the world (Airbnb, 2019a). Airbnb is valued at US$38 billion as of 2018, a significant increase relative to 2017 (US$31 billion) (Lock, 2019). Airbnb hosts share unoccupied rooms and properties with travellers to generate income. In return, guests benefit from cheaper accommodations, a greater degree of choice, lower commission fees (20 percent to 30 percent), and greater flexibility with regards to reservation scheduling (Zekanovic-Korona and Grzunov, 2014).

In comparing Airbnb to hotels, the average nightly rate for Airbnb lodging in Boston was 24.5 percent less than the average nightly rate for a hotel room in 2015. Moreover, tourists who stay in Airbnb accommodations appreciate the opportunity to experience the local culture by staying in a place like home, living like a local, and participating in local events and activities (Malazizi et al., 2018). Social integration, economic gains, and enjoyment of the local activities are among the individuals' motivation to use digital sharing economy platforms (Hamari et al., 2016).

Airbnb's benefits are not limited to the hosts and guests; local communities and governmental bodies can appreciate different functions of this sharing platform (Hong and Lee, 2018; Zervas et al., 2017). For example, the South Korean government implemented a tax-free policy for peer-to-peer accommodation platforms (including Airbnb) during the 2018 Winter Olympics to furnish accommodations for 1.57 million visitors. Airbnb has a considerable economic impact on local communities; research suggests local economic booms caused by guests' daytime spending at local businesses (Kaplan and Nadler, 2015). In addition to the social

and economic impacts of Airbnb, home sharing has environmental benefits as well. Comparing the environmental impacts of Airbnb lodgings and hotels in North America and Europe, Airbnb claims it provides more environmentally sustainable accommodations (Airbnb, 2014). Airbnb properties tend to be associated with less waste and energy and water usage per guest than hotels, which corresponds to lower greenhouse gas emissions (Airbnb, 2014; Midgett et al., 2018).

The degree to which Airbnb potentially threatens the hotel industry is the subject of scholarly debate. Zervas et al. (2017) articulated that as hotels must comply with various regulations and obligations, such as obtaining permissions for zoning codes and fire codes, insurance requirements, safety inspections, and city and state occupancy taxes, Airbnb has comparative advantages. They argued that the fast-growing number of Airbnb listings and guests negatively affected hotel revenues in Texas. Another study found that Airbnb mitigates premium prices at hotels and decreases in hotels' average daily room rates during peak seasons (Lane and Woodworth, 2016). Dogru et al. (2019) also showed that growth in Airbnb supply negatively influenced performance metrics (i.e., room revenues, average daily rates, and occupancy rates) of ten major U.S. hotel markets. In contrast, Choi et al. (2015) and Haywood et al. (2017) contended that Airbnb growth does not affect the hotel industry. Having said that, current and future impacts of Airbnb as an extremely flexible and dynamic accommodation provider cannot be neglected (Dogru et al., 2017; Haywood et al., 2017).

Airbnb hosts can make thousands of beds available throughout the world without extensive planning, permits, and, in some cases, taxes (García-Hernández et al., 2017; Goodwin, 2017). Hence, the flexibility of Airbnb's peer-to-peer structure allows users of the platform to respond well to the seasonal changes of demand pattern (e.g., raising rates during popular events and summer and winter holidays). Unlike Airbnb hosts, who normally do not have to deal with

the complicated process and legal costs of running a business, hoteliers must pay higher capital and fixed costs, such as wages to employees, employees' health premiums, marketing communications, and yearly maintenance fees that are not related to the number of guests or sales revenue (Zervas et al., 2017).

As discussed earlier, hotels have more limited power to quickly change prices and reallocate resources during periods of peak demand (Zervas et al., 2017). However, the potential impacts of Airbnb lodgings on local hotels' revenue differ based on their geographical proximity, relative service quality, and price (Zervas et al., 2017). Nonetheless, a precise comparison is difficult, as hotels' revenue can be affected by numerous factors. For example, the number of guests in certain hotels depends heavily on the season as well as the factors noted above. In addition to seasonal changes in the weather, various social and cultural holidays can affect the number of visitors to a given destination. These imbalances, called seasonality by Butler (1994), can influence the number of tourists, the types of tourists, and the money spent by tourists at that destination.

Airbnb and taxation

Airbnb has grown rapidly in recent years. However, the platform currently faces headwinds from some landlords' coalitions and hotel industry insiders, who criticise Airbnb for its ability to circumvent the established rules and regulations (Zervas et al., 2017). Uzunca and Borlenghi (2019) indicate that more rules and a legitimate legal framework would increase the short-term accommodation supply by decreasing the uncertainties surrounding the legal issues in digital sharing economy platforms. With this realisation, Airbnb has begun to notify all its users about relevant regulations and legislations in the area they operate. Airbnb services are available in

hundreds of countries and cities and Airbnb should work collaboratively with local authorities and hosts to provide detailed legal guidance to hosts using its platform (Kaplan, 2014).

Taxation is one of the regulatory approaches that policy makers apply to digital platform businesses (Davidson and Infranca, 2016; Ranchordás, 2015). In light of the lower costs associated with the emergent peer-to-peer lodging sector, two general taxation schemes are proposed for platforms like Airbnb (Airbnb, 2019b). The first is levying a service fee on both guests and hosts. Airbnb earns 9 percent to 12 percent from guests for each reservation—the precise rate varies based on the length of stay—and 3 percent from hosts. Alternatively, governments can also impose a local tax on the service. For example, Airbnb hosts' revenue in some U.S. localities can be subject to income taxes. Airbnb reports information on U.S. hosts whose gross income is more than $20,000 and whose transactions per year total more than 200 to the Internal Revenue Service (Airbnb, 2019b). Airbnb currently collects taxes from hosts in certain cities. For instance, hosts collectively pay more than $20 million in occupancy tax in New York City. Airbnb also has agreed to collect lodging taxes from users in Portland (Njus, 2014).

According to tax information provided by the Massachusetts Department of Revenue (DOR, 2017), Airbnb, hotels, lodging houses, and motels must pay a room occupancy excise tax of 5.7 percent for any rented room with a rate of more than $15 per night. Cities and towns in Massachusetts impose additional local room occupancy excise taxes. For example, this excise tax is 6.5 percent in Boston. A tax rate of 2.75 percent is also levied to provide convention centre funding in the cities of Boston, Worcester, Cambridge, Springfield, West Springfield, and Chicopee. Thus, Airbnb hosts in these cities must pay a total of 14.95 percent tax for each room rented for more than $15 per night. In sum, Airbnb hosts can face significant liability when a

fixed-rate tax is levied on their income. Although authorities already monitor and track Airbnb members' financial activities by imposing a service fee or fixed-rate income tax in some localities, a more flexible taxation system can aid governments to regulate and exercise oversight over Airbnb hosts. Hosts also stand to benefit if the taxation system ensures sustainability of their revenues.

Seasonality in tourism

Tackling the challenges of seasonality is an important and under-researched topic in tourism scholarship (Baron, 1975; Commons and Page, 2001). Seasonality is defined in relation to tourism as "the tendency of tourist flows to become concentrated into relatively short periods of the year" (Allcock, 1989, 387). Bowie et al. (2016: 6) noted that "irregular demand can be described in hospitality markets as the seasonality of demand". The literature provides evidence that the behaviour of tourists is affected significantly by climate and weather (Li et al., 2017a, 2017b; Olya and Alipour, 2015; Olya et al., 2019; Ridderstaat et al., 2014).

Overtourism caused by seasonality has negative impacts on the experiences of tourists (Ashworth and Thomas, 1999; Lundmark, 2006; Yacoumis, 1980). Butler (1994: 332) stated that seasonality is "a temporal imbalance in the phenomenon of tourism, which may be expressed in terms of the number of visitors, traffic on the highways, employment and admission to attractions". Because tourism and hospitality fields are significantly affected by seasonality, seasonality is often considered in economic and financial assessments of these fields. Scott and McBoyle (2007) argue that seasonality can hamper the overall ability of the tourism industry to generate sustainable revenue. The overuse and underuse of facilities occurring in peak and off seasons, respectively, may also result in inefficiencies in service operations (Getz and Nilsson, 2004; Pegg et al., 2012) and economic development (Williams and Shaw, 1991).

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Airbnb is regarded as one of the stimulators of overtourism at a given destination. The affordability and availability of Airbnb attract more people to a destination who are interested in renting accommodation using Airbnb (García-Hernández et al., 2017; Goodwin, 2017). Seasonality causes various complications in tourism planning and management, especially in fragile natural environments exposed to high tourist traffic in peak seasons (Li and Srinivasan, 2019; Weaver and Oppermann, 2000). Water and air pollution, traffic congestion, safety and security issues, and negative effects on residents' well-being are a few burdens that large numbers of tourists can place on local communities during relatively short periods of peak traffic like holidays (Cuccia and Rizzo, 2011; Martín-Martín et al., 2014; Sastre et al., 2015). In sum, problems stemming from seasonality affect both the local environment and residents' daily lives (Deery et al., 2012).

Seasonality is such an important yet under-researched issue in tourism and hospitality management that both the private and public sectors are seeking adaptive strategies to tackle the problems it can cause (Vergori, 2017). In this vein, Li and Srinivasan (2019) proposed supply- and demand-side strategies such as distribution of the demand between off seasons and peak seasons and redistribution of the supply from a peak season to a low season. Marketing and promotional practices such as pricing and tax inducement, service personalisation, and diversification of products and services have been suggested to encourage tourists to travel during off seasons (Connell et al., 2015; Rotaris and Carrozzo, 2019).

In line with ecological modernisation theory, Olya (2015) proposed a nature-based solution to develop a recreation management calendar that helps decentralisation of tourism activities on a Mediterranean island and redistributions of tourism flows throughout the year. A seasonal tax system may offer positive economic, environmental, and social benefits to a

destination by taking seasonality into account to create a tax plan. A seasonal tax system as a sustainable policy could result in redistributing tourism flows throughout the year, which is particularly important in fragile destinations.

Theory of tax planning

There are several theories such as the theory of tax planning (Hoffman, 1961) and the theory of tax reform (Feldstein, 1976) that explain why tax reform is imperative. The theory of tax planning postulates that improper management of a tax system may have a negative impact on individual taxpayers (Hoffman, 1961). This study uses the theory of tax planning as a core theory to support the development of a seasonal tax system. According to the first tenet of the theory of tax planning, the concept of flexibility should also be embodied in the original tax plan. It states that a tax plan should be able to "be modified in accordance with changes in the tax laws, business conditions, or the motivations of the taxpayer" (Hoffman, 1961, 280). Not only the basic plan may need modification, but also possible alternatives should be incorporated. Although a service fee or fixed-rate income tax is applied to Airbnb in many places, a more flexible taxation system considering the seasonal pattern of the hosts' revenue would aid governments to regulate Airbnb properly.

Policy makers normally consider the utility of consumers (e.g., hosts and tourists) and negative externalities of seasonality (i.e., social and environmental costs) in planning to mitigate seasonality (Cellini and Rizzo, 2012). Distributing tourists throughout a year and tackling seasonality can favourably affect congestion and underutilisation of capacity, which lead to enhancement of the quality of tourist experiences as well as the well-being of citizens (Connell et al., 2015). The actions also provide peace of mind to all stakeholders that the tax system is flexible enough to incorporate social, political, economic, and environmental conditions in

sharing economy businesses and services. From the host perspective, because the number of idle rooms in off seasons will be decreased the alternative tax plan provides an incentive for sustainable revenue over a year.

Methodology

This study examines 1,258 active Airbnb listings in Boston, Massachusetts, between April 2015 and March 2016. We used listing data from AirDNA that provides short-term vacation rental data and analytics related to more than 10 million listings in 80,000 markets globally. The classification includes shared room, private room, studio, one room, two rooms, three rooms, and 4 or more rooms. The monthly revenue of each lodging is used to calculate a seasonal index through the moving average approach (Formulas 1 and 2). The seasonal index is then applied to modify the common fixed tax rate (Formula 3). Afterwards, a seasonal tax rate is computed for Airbnb hosts by multiplying the modified fixed tax rate by the seasonal tax coefficient (Formula 4). Next, two sets of revenue are calculated by deducting the fixed tax rate and the modified tax rate from the total revenue. A means comparison test (i.e., *t*-test) is used to compare host revenues with and without the seasonal tax strategy. These procedures are explained in detail below.

The moving average technique shows the trend and recurrent components of series (Barrow, 2016). One assumption is that the seasonal patterns remain constant year to year. Following Lim and McAleer (2001), the first step is to calculate the four centred moving averages using Formula 1.

$$MA_t = \frac{1}{8} \times [Y_{t+2} + 2 \times \sum_{k=1}^{3} Y_{t+2-k} + Y_{t-2}] \qquad \text{(Formula 1)}$$

where MA_t is the centred moving average of the hosts' revenue for season t;

Y_t is the revenue in season t;

k is the number of lags.

The centred moving average of Airbnb hosts' revenue in Boston is calculated for data obtained for the period 2015 (April)–2016 (March). According to Airbnb listings' categories, data include shared rooms, private rooms, and 'entire place' lodgings (studios and one- to four-bedroom apartments). Generally, the average revenue of the hosts displays seasonal patterns. Revenue rises slowly to its highest point in October ($6,193) but decreases dramatically to about $2,800 in February and begins to rise again in March. However, average revenue drops 19 percent in September, defying this broader trend (Figure 1).

Insert Figure 1 here

The next step is calculation of the ratio to the moving average (P_t), which is obtained by dividing revenue by the corresponding moving average for each season and expressing it in percentage form (Formula 2).

$$P_t = \frac{Y_t}{MA_t} \times 100\% \qquad \text{(Formula 2)}$$

The ratios eliminate the trend and cyclical components, which results in a series that contains seasonal and irregular movements. These percentages need to be arranged according to the seasons of the given years. Then, the averages over all seasons of the given years are computed and used as seasonal indices.

Results

The seasonal indices estimated for hosts' average revenue in various Airbnb listings are shown in Table 1. The seasonal indices for spring and summer are nearly identical, with values of 1.23 and 1.21, respectively.

Insert Table 1 here

Finally, an appropriate seasonal tax rate for an Airbnb establishment can be defined by finding the modified tax rate by applying the seasonality index.

$$CT = \frac{1}{P_t} - \frac{T_f}{100} \qquad \text{(Formula 3)}$$

where CT is the modified tax rate;

P_t is the ratio to the moving average for each season;

T_f is the fixed tax rate of 14.95 percent.

$$T_s = CT \times Y_t \qquad \text{(Formula 4)}$$

where T_s is the seasonal tax.

To calculate the revenue (Y_s) after seasonal tax, the seasonal tax (T_s) is deducted from the original revenue (Y_t). The amount of total taxes and host revenues with and without the seasonal tax are calculated and presented in Table 2. It is assumed that a moving average method satisfactorily expresses the trend and cyclical components of the series. The seasonal structure remains constant from year to year, which means the peaks and troughs generally occur in the same intra-year periods. The results show that hosts would pay less tax ($4,035) and earn higher revenue when paying the seasonal tax rate instead of the fixed tax rate during the year 2015–

2016. However, an inferential statistical analysis is needed to test whether there is a significant difference between the revenue before and after applying the seasonal tax rate.

Insert Table 2 here

Table 3 presents the results of a *t*-test to compare the mean of revenues with and without applying the seasonal tax rate. The results reveal that revenues with and without the seasonal tax are significantly different (mean difference: -48.046, $p < 0.001$) such that the mean of host revenue when incorporating the seasonal tax (Y_s: 4083.696) is more than the mean of host revenue with the fixed tax rate (Y_f: 4035.650). This significant difference indicates the functionality of a seasonal tax strategy as a policy that could potentially increase the revenue of Airbnb hosts.

Insert Table 3 here

Conclusion and implications

Tourism and hospitality services, including peer-to-peer platforms such as Airbnb, are affected by seasonality. The main economic impacts of seasonality on both supply and demand sides include higher rent prices, instability of job positions, and variation in service quality. Often, the overall effect is not favourable and one possible solution against this challenge is proposing sustainable revenue management strategies. Airbnb hosts' revenue management to address seasonality is important due to the size of Airbnb as a fast-growing business. In particular, research on seasonality in Airbnb is important as it is recognised as one of the contributors to overtourism because of its social and economic benefits (García-Hernández et al., 2017; Goodwin, 2017). As Zervas et al. (2017) discussed there are debates on the lack of an appropriate legal framework for peer-to-peer accommodations. Drawing on the theory of tax

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planning, this study contributed to the current knowledge of seasonality and the sharing economy by proposing an alternative strategy to reform the current tax system which improves sustainable revenue management of Airbnb hosts.

Although a fixed tax rate is currently applied to host revenue in some areas such as Boston, a seasonal tax as a flexible approach could be beneficial to governments, hosts, and even tourists. It acts as an instrument for managing host revenues sustainably as well as forecasting and expanding off-season tourism or tackling seasonality in a destination. The results from a *t*-test show that integration of seasonality in tax planning, compared to a fixed tax rate, helps hosts to pay less tax and earn a higher revenue in a one-year period. In accordance with Hamari et al. (2016), who believed that financial benefits make Airbnb a popular platform, improving host revenues through a seasonal tax system encourages Airbnb hosts to use and recommend this digital sharing economy platform as a serious source of income. On the other hand, less congestion at tourist attractions and higher service quality will also enhance tourist experiences.

Lower tax payments and higher revenue of hosts mean that local government tax revenue decreases and calculation costs of the modified amount of taxes may be added to the tax equation. Nonetheless, in line with Connell et al. (2015), government can compromise on costs involved in the seasonal tax as it acts as an adaptive strategy against seasonality and helps fulfil their commitments and responsibilities concerning the climate change crisis. As Connell et al. (2015) argued, it can improve the social well-being of local communities. According to the flexibility tenet of the theory of tax planning (Hoffman, 1961), this policy provides an opportunity for local authorities to create an expectation for the hosts in terms of the possibility of modifying the taxation system according to environmental, economic, social, and political

conditions. Specifically, small changes in the taxation system in countries like the United States may have huge impacts.

Other applications of a seasonal tax as a helpful strategy for sustainable tourism management include the management of lodging for mega-events (e.g., the Olympics) and conservation of historical and ecological tourist attractions from damage caused by overtourism. As Olya (2015) discussed, by redistributing tourism flows throughout the year, a seasonal tax can serve as a nature-based solution that decreases the impact of tourism on fragile sites (such as historical landmarks and natural environments) that can be damaged by overuse during peak demand periods. Governmental bodies can support such adaptive strategies not only to raise public awareness about the impact of seasonality and climate change but also to demonstrate they are supporting businesses and services through applying such solutions to economic and ecological challenges.

This study is subject to some limitations that offer opportunities for future research. This study is a first attempt to propose an adaptive strategy against seasonality by developing a seasonal tax system. We used the available data on Airbnb listings in Boston during a specific period (2015–2016). We encourage future research to use multisource data from a wider time span. Moreover, in the present study, we discussed the revenue management of Airbnb hosts in addressing seasonality; further study can investigate revenue management of Airbnb and local authorities with integration of the proposed seasonal tax strategy. Another pathway for future research is designing the architecture of operationalisation of a seasonal tax system that demonstrates details of the calculation cost of the modified tax, required resources, and coordination and cooperation between stakeholders (e.g., local authorities, hosts, and Airbnb) to implement and evaluate this adaptive strategy.

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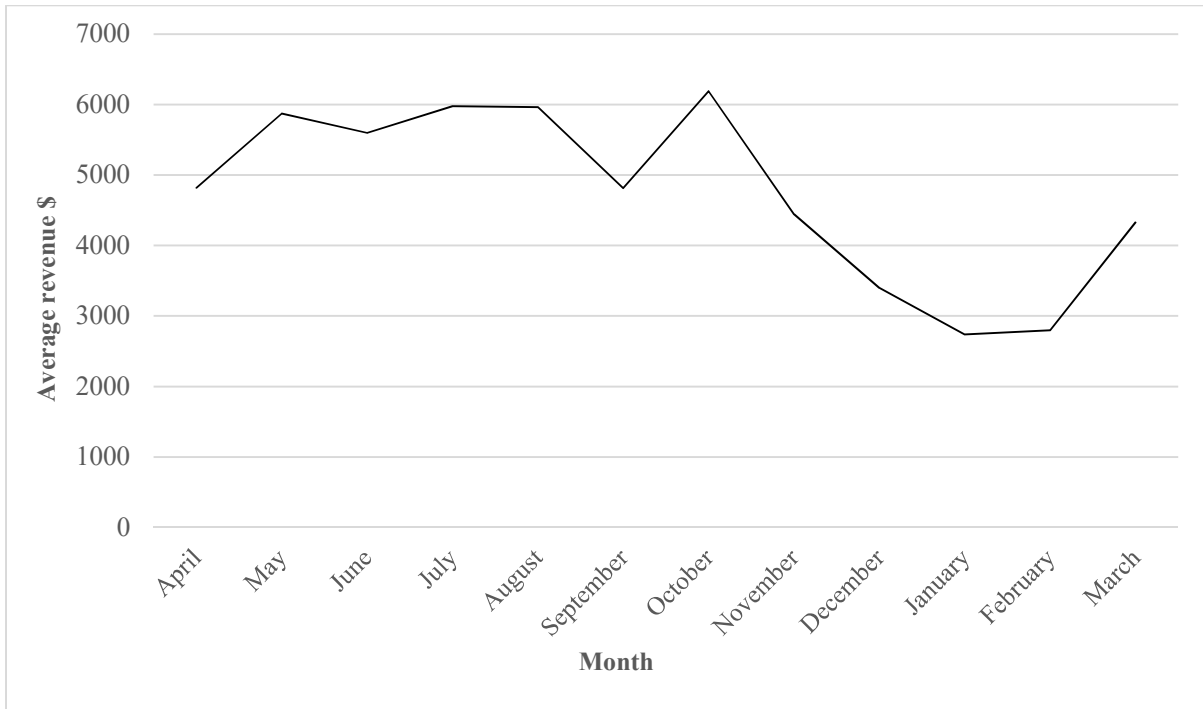
Figure 1. Seasonal revenue pattern of Airbnb hosts in 2015-16

Table 1. Seasonal indices for revenue series 2015-2016

Season	Seasonal index
Spring	1.23
Summer	1.21
Autumn	0.9
Winter	0.66

Table 2. Total tax and host revenue with and without seasonal tax

Airbnb category	Season	Y_t	T	Y_f	T_s	Y_s
Shared Room	S1 (April-June)	4160.000	622.336	3537.664	588.099	3571.901
	S2 (July-September)	6427.000	961.479	5465.521	907.721	5519.279
	S3 (October- December)	4300.000	643.280	3656.720	595.072	3704.928
	S4 (January-Mach)	4237.000	633.855	3603.145	569.235	3667.765
Private Room	S1 (April-June)	7815.000	1168.343	6646.658	1104.806	6710.194
	S2 (July-September)	8812.000	1317.394	7494.606	1244.568	7567.432
	S3 (October- December)	7042.000	1052.779	5989.221	974.535	6067.465
	S4 (January-Mach)	5546.000	829.127	4716.873	745.097	4800.903
Studio	S1 (April-June)	11789.000	1762.456	10026.545	1666.610	10122.390
	S2 (July-September)	12925.000	1932.288	10992.713	1825.469	11099.531
	S3 (October- December)	10495.000	1569.003	8925.998	1452.391	9042.609
	S4 (January-Mach)	8319.000	1243.691	7075.310	1117.645	7201.355
B1	S1 (April-June)	14660.000	2191.670	12468.330	2072.483	12587.517
	S2 (July-September)	16067.000	2402.017	13664.984	2269.231	13797.769
	S3 (October- December)	12230.000	1828.385	10401.615	1692.496	10537.504
	S4 (January-Mach)	9184.000	1373.008	7810.992	1233.856	7950.144
B2	S1 (April-June)	20318.000	3037.541	17280.459	2872.354	17445.646
	S2 (July-September)	21519.000	3217.091	18301.910	3039.248	18479.752
	S3 (October- December)	14967.000	2237.567	12729.434	2071.267	12895.734
	S4 (January-Mach)	11204.000	1674.998	9529.002	1505.240	9698.760
B3	S1 (April-June)	22474.000	3359.863	19114.137	3177.148	19296.852
	S2 (July-September)	19949.000	2982.376	16966.625	2817.508	17131.492
	S3 (October- December)	19642.000	2936.479	16705.521	2718.235	16923.765
	S4 (January-Mach)	15656.000	2340.572	13315.428	2103.360	13552.640
B4	S1 (April-June)	32783.000	4901.059	27881.942	4634.530	28148.470
	S2 (July-September)	31595.000	4723.453	26871.548	4462.337	27132.663
	S3 (October- December)	29562.000	4419.519	25142.481	4091.052	25470.948
	S4 (January-Mach)	14908.000	2228.746	12679.254	2002.867	12905.133

Note: Y_t: original revenue, T: total tax with fixed rate, Y_f: after-fixed tax revenue, T_s: total tax with seasonal tax, Y_s: after-seasonal tax revenue.

Table 3. Results of *t*-test for comparing hosts' revenue with and without seasonal tax

Revenue Means		Paired differences			*t value*
Y_f	Y_s	Mean difference (Y_f-Y_s)	Std. Deviation	Std. Error Mean	
4035.650	4083.696	-48.046***	27.318	2.980	-16.119

Note: ***: p<0.001(2-tailed), Y_f: after-fixed tax revenue, Y_s: after-seasonal tax revenue.