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Hosting Annual International Sporting Events and Tourism:
Formula 1, Golf or Tennis?

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Abstract

Hosting sports events to attract international tourists is a common policy practised by many host governments. Hosting mega-sports events like the Olympics are said to leave a legacy that could impact the attractiveness of a country/city in the long term. However, the opportunity to host these mega-events are limited and expensive. This study considers the economic impact of hosting annual international sporting events, specifically the extent to which Formula-1, ATP Tennis, and PGA Golf can attract international tourists. Using monthly data from 1985 – 2018 and we show that the effect differs from one sport to another within a country, and the same sport across countries. Hosting the Formula-1 is most effective for Canada but has no significant impact in the UK. ATP tennis has a significant impact on all three countries but may not be the star event. Policy-makers must consider carefully the sport that gives the best bang-for-the-buck.

Keywords: sports tourism, F1, Tennis, Golf, international tourists

Introduction

Hosting sporting events to attract more inbound international tourists has become a popular strategy among many local and national governments. The Brazilian Ministry of Sports estimated that the hosting of the 2014 FIFA World Cup would attract 600,000 international tourists while the previous tournament in South Africa attracted more than 300,000 foreign visitors (Baumann and Matheson, 2018). Hosting large scale, high profile sports events has been on the increase in recent years as there is a strong belief that there is net positive economic impact from hosting such events (Huang et al., 2014). The city of Shanghai for example, is reported to host about 160 sports events a year including the Formula-1, men's and women's golf and the Shanghai Masters Tennis in its effort to become a sports metropolis by 2025, emulating other well-known sports destinations like London and Paris (*South China Morning Post*, 29 August 2018).

The rationale for hosting large scale sporting events is that the event will leave a legacy such that the impact of the event will “remain longer than the event itself” (Preuss, 2007:211). However, Thomson et al. (2019) state that a legacy is created only if the scale of the event involves “significant investment in infrastructure and urban development, have international media exposure and attract large number of tourists” (p.295). Clearly, these conditions refer to mega events like the Olympic Games and the FIFA World Cup. However, opportunities to host these mega events are limited to a handful of cities/countries within a decade that are capable of meeting a long list of criteria. In recent years, the net benefits of hosting such events have been questioned (Zimbalist, 2016) as to whether it's a fool's gold (Baade and Matheson, 2002) or a lottery jackpot (Preuss, 2006: 183).

In this paper, we turn away from mega sporting events which dominate the current literature and focus our attention on popular annual international sporting events. We focus on Formula-1 Grand Prix, ATP Tennis tournaments and PGA Golf played in Australia, Canada and the UK. These sports are among the top 10 biggest global sports¹ based on coverage of major online sports websites and that follow an annual international schedule/circuit. They are hosted by a city/country annually in a particular month and so, allows a city/country to make the event a permanent feature in its calendar and over the long term, link the image of the sport with the destination (for instance, Brazil and football or Wimbledon and tennis). We evaluate the economic impact of hosting these annual events, specifically the increase in international tourist inflow. We compare among the three sports within the country as well as each sports across the three countries.

Literature Review

Previous literature that evaluates the economic impact of hosting sporting events have focused predominantly on mega-sporting-events as stated earlier (see for example, Baumann and Matheson, 2018; Mitchell and Stewart, 2015; Rojas-Mendez et al., 2019, among others). Ritchie (1984) revealed various ways in which these events can make an impact, potentially resulting in the so-called hallmark events. Using a gravity model involving 200 countries over the period 1995 to 2006, Fourie and Santana-Gallego (2011) showed that hosting these mega events can increase tourist arrivals by about 8 percent a year. However, Mitchell and Stewart (2015) found that the Beijing Olympics did not have any significant effect on Chinese tourism, perhaps due to the crowding out effect (Baumann and Matheson, 2018). More recently, cities like Budapest, Rome and Hamburg had to withdraw their bidding for the 2024 Olympic Games due to a backlash from their residents (Thomson et al., 2019). In

¹ www.biggestglobalsports.com

general, the results are mixed depending on whether the studies are prospective or retrospective (Humphreys, 2006). These mega-events are however, a once-in-a-life-time event, and the pre-requisites and competition to host them are challenging. FIFA for example, requires host countries to have between 8 to 12 large stadiums while the Olympic International Committee (OIC) require facilities that can house 15,000 athletes and sufficient hotel rooms for spectators (Baade and Matheson, 2016).

Several studies have considered the impact of smaller, local but regular sporting events in the US (Daniels and Norman, 2003; Kaplanidou et al., 2012) and Japan (Nogawa et al., 1996) while several others have evaluated the economic impact of a single sport (for example, Kim et al., 2017 and Ramasamy and Yeung, 2020 for Formula-1; Papanikos, 2015 for the Athens Marathon). A majority of the literature examines the perception of the destination image (Hallmann et al., 2015; Kaplanidou and Gibson, 2010; Kaplanidou et al., 2012), visit motivation (Yusof et al., 2009), and focus on tourist profiling (Yusof et al., 2009; Ziakas and Boukas, 2016). With an abundance of research on mega events and to a certain degree, small-scale or individual events, we find limited research that takes a closer look at the impact of hosting annual international sporting events, let alone comparing which annual international sporting event might be more beneficial for the hosting city/country. Huang et al. (2014) is a rare paper that compares 3 major sports events in China to estimate the likely economic impact. However, they use survey data and include the spending of locals, which muddles the results. In this paper, our focus is on popular international sporting events that occur on an annual basis, namely the Formula-1 Grand Prix, PGA Golf and ATP Tennis. Our paper bridges this gap in the literature. We hope to contribute to the policy conversation and widen the possible events for countries that are less likely to host mega events, yet still wish to attract international tourists who are sports enthusiasts. In addition, unlike most papers in the

literature that use case studies and questionnaires, which leads to relatively limited data for more general implications, our paper instead focuses on the economic benefits of different annual international events, assessing the impact on the number of tourist arrivals.

There are two important reasons why hosting annual international sporting events may be preferable to a single mega-event. First, the financial burden of hosting the Olympics² or the FIFA World Cup may not be affordable by many countries/cities given the requirement mentioned earlier (Solberg and Preuss, 2007; Gibson et al., 2012; Konecke et al., 2015). The Australian government is reported to have committed USD 46 million just to bid for the 2022 World Cup and was prepared to spend a further USD 3 billion to build infrastructure and stadiums if successful (Mitchel and Stewart, 2015). Gruben et al. (2012) reported that London spent USD 25.5 million just to win the bid to host the 2012 Olympic Games and a further USD 4 billion to host the Games. In contrast, Sylt (2017) estimated the average cost of hosting the Formula-1 races to be under USD 60 million annually (in addition to a one-time cost of USD 270 million for building the race-track). Wan and Song (2019) find that developed and developing countries consider these expenditures differently. While the 2012 London Olympics is said to boost the British economy in general, Brazil's reason was to promote tourism but at the cost of local development. Schulz (2010) pointed out that mega events are usually limited to a three- to five- year build-up phase, a two- to six-week event, and then follow-up attempts to leverage legacies. Recurring sports events on the other hand are firstly repetitive, and often are based on existing local infrastructure, and has more potential to evolve with local opportunities and needs. Giampiccoli et al. (2015) assess the difference between the 2010 World Cup and recurring sporting events, and suggest that a

² Sports-related costs for the Summer Games since 1960 is on average US\$ 5.2 billion and for the Winter Games US \$393.1 million dollars: https://en.wikipedia.org/wiki/Cost_of_the_Olympic_Games

focus on the latter will yield more sustainable and predictable returns that benefits host communities.

Second, mega-events happen once in several decades. For example, the host of the 32nd Summer Olympics 2020 in 2021, Tokyo, also hosted the 18th Olympiad in 1964 – a gap of more than 50 years. Such long term economic impact of hosting these mega-events are doubtful. Since these events are flashpoints in history, the tendency to forget previous hosts are high (Solberg and Preuss, 2007). One year after the hosting of the European football tournament (EURO 2000), 55 percent of survey respondents forgot who the hosts were (Oldenboom, 2006). Annual sporting events, on the other hand, have the capability of converging the event and sports image to the destination image and create a sustainable pool of repeat visitors over a longer term (Kaplanidou et al., 2012; Taks et al., 2015). Daniels and Norman (2003) show that regular sporting events can provide significant economic potential for the host, especially when a combination of several events over the year are carried out.

Governments and/or national sports associations have a choice as to which major sporting event that they can bid for. These sports differ in terms of their size and significance, thus the ability of the sport to attract tourists and media coverage would vary accordingly (Getz, 1997). It is important that stakeholders understand the economic impact of hosting various sporting events and choose those events that offer the highest returns (Huang et al., 2014). More specifically, in this paper, we compare the economic impact of hosting the selected sports, in particular the ability of these sports to attract international tourists. Expenditure by tourists makes up a significant portion of the new money that flows into a city/country which leads to the creation of new jobs and income (Mitchell and Stewart, 2015; Crompton et al., 2001). In the case of China for example, Huang et al. (2014) found that only 12 percent of the

new money from hosting the Formula-1 races came from local attendees. Thus, the ability of a particular sport to attract international tourists can represent a significant aspect of the economic impact of playing host for the event. Realizing this, China is planning the nation's first national sports tourism pilot zone in Hainan Island, aiming to host international sports events more frequently (*China Daily Global Edition*, 9 April 2020).

Five countries host the three sports selected for this study at a high level – Australia, Canada, the UK, France and Spain. Our choice of the former three is to ensure a geographical spread across various continents. All three selected host countries are, however, part of the British Commonwealth, but more importantly have a long history of hosting these sports. Some brief details of these sports tournaments at various locations are described in Table 1.

[Insert Table 1 here]

Data and Methodology

Previous studies have used two popular approaches to model tourism demand at the country level. The first approach, the Box-Jenkins uni-variate model, features the time-series of tourism demand itself as an exogenous variable. The rationale here is that without any other exogenous variables, the model is able to detect a great deal of underlying behavior within the tourism demand time-series (for example, the time trend, moving average structures, autoregressive parameters etc.). To determine if an event had a significant impact on tourism, dummy variables representing the timing of the event are appended to the time-series model (i.e. ARIMA). Mitchell and Stewart (2015) for example, fitted an autoregressive moving average model with a linear deterministic trend, monthly dummy variables to account for the time trend and other dummy variables to account for changes in tourism demand slumps due to catastrophes like SARS. A dummy 0 was included for the period before the event and a 1

after, to account for the change in the slope of the trend. The model is a pure univariate model without including any other exogenous variable.

The second approach models the variations in tourism demand by regressing it on a few selected exogenous variables. There have been many attempts to explain the variations in inbound arrivals of a particular country using a range of regressors. For instance, Witt and Witt (1995) suggested using the lagged dependent variable, which has been widely followed in the literature. Song et al. (2010: 73) stated that the “lagged dependent variable describes tourists’ expectations, habit persistence, the ‘word-of-mouth’ effect and supply constraints.” Time trend variables are included to represent tourists’ changing tastes and capture other time-dependent effects (Witt and Witt, 1995). Political stability has been shown to influence attendance at the Olympic Games (Gruben et al., 2012). Seetaram (2010) showed that the population of overseas Australians living in the source country was strongly related to inbound tourism to Australia. Kusni et al. (2013) highlighted the importance of relative price and substitute price (between the host and competing locations) as important determinants of tourist arrivals. These research show that the selection of regressors and the model specifications tend to be country-specific, hence there has been little consensus among researchers as to what constitute a standard reference model. In fact, more than 95% of studies used models with dyadic data which addressed issues for a single country (Song and Li, 2008). A few isolated efforts have been made to guide the identification of essential elements for modelling the variations in tourism demand. Pham et al. (2017) reviewed tourism demand studies over the past five decades and suggest four essential features for modelling the variations in tourism demand: (1) a variable that denotes the level of stability of the destination; (2) a variable representing the attractive feature of the destination (3) a variable representing the travelling cost to the destination; and (4) lagged variables

representing expectations, habit persistence, the ‘word-of-mouth’ effect and supply constraints. Ramasamy and Yeung (2020) applied the same framework and found the effects of hosting the Formula-1 Grand Prix on tourism demand to be significant but stressed that there is neither a best model nor a set of standard repressors one to model tourism demand.

As explained in the previous section, the objective of this paper is to compare the effect of hosting the Formula-1 races, PGA Golf and ATP Tennis on tourist arrivals in Australia, Canada and the UK. Since these events take place during a particular month during the year, we used monthly data to study the variations in arrivals. Monthly data for the common variables used in previous studies explained above are either non-existent or difficult to access. Nevertheless, we have attempted to include proxy variables that would best meet the requirements as stated in Pham (2017). For the current study, we include the following:

- a. The dependent variable, TOURISTS_i , is the number of inbound international tourist to country i (Australia, Canada and the UK) in month t .
- b. The word of mouth effect measured by the number of tourists received in $t-1$. (Kusni et al., 2013; Pham et al., 2017; Chaisumpunsakul and Pholphirul, 2018; Fu et al., 2020). LAGN and LAGS measure non-seasonal and periodic lags to proxy for habit persistence.
- c. To account for the cost of living in the destination country, we use the real effective exchange rate of destination countries (EFFEX_t) (Gormus and Gocer, 2010). This measure consolidates relative price difference between the destination country and the home country used by some studies (Witt and Witt, 1995; Naude and Saayman, 2005; Allen and Yap, 2009; Kosnan et al., 2012; Kusni et al., 2013; Chaisumpunsakul and Pholphirul, 2018) and the nominal exchange rate by others (Kosnan et al., 2012).

- d. The MSCI World Index ($MSCI_t$) is used to capture global economic condition, and therefore the income levels of visitors. Most papers in the literature (Seetaram, 2010; Martins et al., 2017; Pham et al., 2017) used GDP per capita to measure the global economy. However, GDP data are only available quarterly, whereas the MSCI World Index offers data at a higher frequency.
- e. The number of reported terrorist attacks (both actual and potential) in the respective country in month t reported by popular media ($TERRORISM_t$) is used to proxy the stability of the destination.

In addition, we also included temperature in the destination country in month t ($TEMP_t$) as a continuous variable. Previous studies have used a dummy variable to control for seasons (Allen and Yap, 2009; Fourie and Santana-Gallego, 2011). Since the three sporting events may occur in different months/seasons, using the average monthly temperature can offer more insights without assuming any particular seasonal peak for tourists' arrival. Dummies for the years 2003 and 2008 are included to account for two major events that affected tourism worldwide, namely the SARS epidemic and the Global Financial Crisis (FIN), respectively. Time trend variable (TREND) is included to represent tourists' changing tastes and to capture other time-dependent effects (Witt and Witt, 1995).

Finally, the variables of interest, namely F1, TENNIS and GOLF representing the number of days that each sporting event was hosted by each country in month t are included. If the sporting event was held across two months (for example, the case of the Wimbledon), the variable would have two non-zero entries. If more than one sporting event was held in the

same month (for example, in the case of the UK), the number of days for each sport in that month is included in the respective sport variable.

Our data span the period from January 1995 to December 2018. Data sources for the above variables are listed in Table 2. The model described above can be written as below and fitted with monthly data for the three countries of interest:

$$\begin{aligned}
 TOURISTS_{(t)} = & \beta_0 + \beta_1 LAGN_{(t-1)} + \beta_2 LAGS_{(t-11)} + \beta_3 EFFEX_{(t)} + \beta_4 MSCI_{(t)} \\
 & + \beta_5 TEMP_{(t)} + \beta_6 TERRORISM_{(t)} + \beta_7 SARS_{2003} + \beta_8 FIN_{2008} \\
 & + \beta_9 TENNIS_{(t)} + \beta_{10} GOLF_{(t)} + \beta_{11} F1_{(t)} + \beta_{12} TREND + \varepsilon_{(t)}
 \end{aligned}$$

The model described above allows us to compare the effectiveness of a particular sporting event to attract inbound tourists to each of the three selected countries. However, we are also interested in comparing the ability of the sport to attract tourists across countries. In other words, we wish to analyze the strength of the sporting event coefficients (β_8 , β_9 and β_{10}) across equations so that comparisons can be realistically carried out, if all equations are estimated under a system of equations. Seemingly unrelated equations (SUR) is able to show the variations of the relationships across the data dimensions as well as providing a convenient vehicle for testing hypotheses about these relationships (Fiebug, 2003). The correlations among error terms of the equations represent common shocks and to take into account these features, a correct estimator must be applied to produce unbiased and consistent results. Since we are examining tourism demand of the three countries within the same time frame, contemporaneous correlations among the disturbances must be considered and the common approach for doing this is referred to as seemingly unrelated regression estimation (SURE), developed by Zellner (1962). The remedial treatment derived from

Aitken's generalized least square by Wang et al. (1980) is used to estimate our system of equations where the inclusion of lagged dependent variables in combination with serial correlation can be accommodated. When analyzing tourism demand with a system of demand equations specifically for different countries, the potential correlations of the disturbances across these equations may arise because a shock affecting the demand in one location may spill over and affect the demand of other countries. To account for such cross-equation contemporaneous correlations of the disturbances, SURE will result in smaller standard errors of the estimates and hence produce more precise estimates of the coefficients.

[Insert Table 2 here]

Results

The results of our estimations using the OLS and SURE methods are reported in Table 3 and 4 respectively. In the OLS estimation, we detected serial correlations when lagged dependent variables were included. Driscoll-Kraay standard errors that is robust to heteroskedasticity and serial correlation up to several lags were computed to address these.

Both the lag variables, indicating the word-of-mouth effects, are significant and quite strong in determining the size of tourist inflows in all three countries. Temperature and the proxy for wealth carry the correct sign indicating warmer temperatures and better economic conditions are both conducive to tourist arrivals. The effective exchange rates, although has the correct signs, is only significant for Canada. Thus, the cost factor does not seem relevant for Australia and the UK. News of terror in host countries is only marginally significant in the UK, perhaps the country most affected by terror related incidents among our sample countries. Our results also point to a significant negative impact of SARS, but the 2008 GFC

only affected Canada. The trend variable is significant and positive for the UK and Australia, with a relatively small magnitude. In sum, all our control variables carry the expected signs with various degrees of significance, at least for one country of interest.

Turning now to our sports variables, the impact varies from country to country. In Canada, hosting all three sports have a significant positive impact on tourist inflows, with the F1 having the largest impact. In the UK, golf and tennis are significant, whereas in Australia, only tennis seems to have a significant positive impact.

[Insert Table 3 here]

[Insert Table 4 here]

Comparing Tables 3 and 4, OLS and SURE estimates are very consistent for most of our control variables. As for the sports variables, both models produce very similar results for Canada and the UK but remarkably different for the Australian model where in addition to the Grand Slam tennis tournament, the F1 is also positively significant. PGA golf is marginally significant but has a negative impact on additional tourists' inflow. The OLS estimates are obtained while ignoring any correlation between the error terms of across equations. However, if the error terms are contemporaneously correlated, as is most likely in the case of tourism demand studies, the estimation procedure should take this into account. In this case, the SURE estimator leads to more efficient parameter estimates. The SURE model shows that the impact of hosting ATP tennis tournaments on tourism demand is significant across all selected countries. Hosting a one-day ATP tennis tournament corresponds to 0.5 to 1.3 percent increase in tourist inflows, compared to a month without such events, holding everything else constant.

The Wald tests that examine the equality of coefficients of hosting sports events across the three models were computed. The test statistics are 120 (Tennis), 49.75 (F1) and 22.01 (Golf), respectively. These statistics are significant at the 1% significance level, suggesting that countries do not receive the same level of tourist inflow from hosting the same sporting event. The differences among sports within countries are even more divergent. The Wald tests that examine the equality of coefficients across sports are 49.12 (Canada), 9.57 (UK) and 20.73 (Australia), respectively, significant at the 1% significance level. This suggests that the choice of sports to host can lead to different outcomes. Among all the statistically significant sports events, the F1 Grand Prix corresponds to an expected increase in tourist arrivals of 9% for Canada, whereas the ATP tennis only corresponds to an expected increase of 0.5% for the UK. Our analysis finds no significant effect from hosting the F1 in the UK while hosting PGA Golf in Australia attracts relatively lesser tourists. Our results are consistent with the Shanghai case where Huang et al. (2014) compared F1, ATP Tour Masters 1000 and Shanghai International Marathon (SIM). They found the economic impact of F1 to be nearly three times that of ATP, and nine times that of SIM. In this context, the economic impact of hosting various sports differs one from another, and further, one country to another.

Conclusion

In this study, we conduct a comparative analysis of three annual international sporting events across three countries to determine the economic impact of hosting the sport, in particular international tourist inflow. Using monthly data spanning 1995 to 2018 and OLS and SURE modelling, we compare the performance of each sport within a country as well as across countries. Based on the SURE model, we find that the impact of hosting ATP tennis tournaments on tourism demand is significant and positive across all selected countries.

However, in each country, the annual sporting event that shines is different. An additional day of F1 brings in an astounding 9% increase in tourism demand (compared to a normal month without any events) in Canada, while golf and tennis both have a much lower estimated impact at around 1%. Our result is consistent with Sylt (2016) that the F1 GP in Montreal is perhaps the largest tourist event in Canada, generating more than USD 90 million in spending by visitors in the Greater Montreal area. F1 is also the lead runner for Australia, with an estimated increase of 2.1% on tourism demand, almost double the value compared to hosting tennis tournaments. Tourism Victoria (2011) showed that about 10% of the attendees of the 2011 F1 in Melbourne were international visitors and that the GP provides significant branding and positioning for the city of Melbourne. For the UK, F1 is not significant but PGA Golf brings in a 3% increase in tourist inflow, above the 0.5% increase from hosting the ATP Tennis tournaments. An interesting result is that hosting the PGA Golf in Australia has a negative impact on tourism demand - an estimated 0.7% decrease compared to the previous month is expected. This indicates that there is no “one-size-fits-all” rule for sports tourism. Although holding tennis tournaments may lead to an increase in tourist numbers for all three countries, it is not the optimal event for all. The UK benefits more from holding golf tournaments, whereas Australia would expect a decrease in tourism if they followed the same strategy.

Our analysis makes two important contributions. First, we study how hosting different international sporting events can attract tourists to a country. Our study shows that no two sports have the same economic impact. For the \$6.8 billion a year sport tourism industry in Canada (Statistics Canada, 2016)³ for instance, a 9% increase in foreign tourists month-on-month from an additional day of the F1 Grand Prix would take the country’s sports tourism

³ <https://canadiansporttourism.com/about-csta/about-csta.html>

industry to an even higher level, compared to hosting a PGA Golf tournament. Second, our findings suggest that each sport event leads to different results in different countries. It is unlikely that a country can enjoy success by copy-paste sporting events that are popular in another country. According to the UN World Tourism Organization, in 2016, sports tourism accounts for as much as 55 percent of total tourism receipts in Australia (Macintosh et al., 2019), yet we find that hosting PGA Golf is not beneficial for boosting tourism demand in Australia, compared to hosting the same event in the UK. These contributions lead to an important implication to policy-makers. Hosting international sporting events can act as an attractive feature of a country to attract international tourists. When the Covid-19 pandemic subsides and international travel resumes, governments will be scrambling to revive their respective tourism industry. Hosting large scale events, including sports, will be high on their agenda. However, when deciding which major sporting event to host, it is best to examine ones that would give the biggest bang-for-the-buck. The F1 races, which attracts nearly the same teams to every race, may be more attractive to visitors, compared to say, ATP tennis that might not feature leading players in every tournament. Although the policy-maker may consider hosting a range of international sporting events, like the city of Shanghai, allocation of resources to the various host organizations should take into account the likely economic impact based on a cost-benefit analysis. Hosting a tennis tournament for instance could result in a lower social cost compared to an F1 city circuit, if one considers the congestion and inconvenience caused to local residents.

In this study, we only considered three sports and three countries. Future studies could consider other popular sports like the international marathons, cycling races and athletics as well as more countries, particularly developing countries, to further confirm the findings of the present study. Furthermore, in our study we did not dwell into reasons why a particular

sport is able to attract more tourists. Why is it, one may ask, that the proportionate increase in international tourists to the Grand Slam Tennis in Melbourne, Australia is much higher than the one in Wimbledon, England? Similarly, what makes the British Open Golf the most attractive tournament across the three locations and across the three sports within the UK? Although these questions also form some of the limitations of the present study, we hope it will open new avenues for further study as these annual sporting events would benefit more countries than the few that get the opportunity to host mega sporting events once in a lifetime.

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Table 1. Tennis, Formula-1 and Golf in Australia, Canada and the UK: Some basic facts.

The Association of Tennis Professionals (ATP) is the governing body for tennis, and the ATP Tour is the main tennis tournament played across several cities around the world. The ATP also has a system of ranking players based on the performance of the player at 19 specific tournaments. Among the popular tournaments include the Grand Slams and the ATP Tour Masters 1000. The tournaments considered in this study are the Australian Open, Wimbledon (both are part of the Grand Slam) and the Canadian Open (one of eight mandatory tournaments that accrue points for the world rankings). The Australian Open, which is normally played in January in Melbourne, was first held in 1905. The Wimbledon was inaugurated in 1877, and is normally played in June and July. The Canadian Open (also known as the Rogers Cup) goes as far back as 1881. The tournament is usually played in August and is alternated between Montreal and Toronto. In 2019, Novak Djokovic won the Australian Open and Wimbledon while Rafael Nadal won the Canadian Open. In the women's tournament, Naomi Osaka, Simona Halep and Bianca Andreescu won the Australian, Wimbledon and Canadian Open respectively.

Formula 1 racing started in 1950 and has become the foremost motor racing competition, taking place in 22 countries, either on dedicated circuits or on public roads. The races are sanctioned by the Fédération Internationale de l'Automobile (FIA) and are owned by the Formula One Group. The F-1 calendar starts in March and ends in December. The Australian GP in Melbourne usually starts the year, with the Canadian GP taking place in June and the British GP in July. All three races are held in dedicated circuits. All three Grand Prix have a long history in their respective countries. The British, Canadian and Australian GPs started in 1950, 1967 and 1985 respectively. In 2019, the winner of the British and Canadian GPs was Lewis Hamilton (Mercedes) while Valtteri Bottas (Mercedes) won the Australian GP.

The Australian Open is the most prestigious golf tournament in Australia. It is part of the PGA Tour of Australasia and has been played since 1904. Although several cities have hosted this tournament, Sydney and Melbourne have been the most popular hosts. Founded in 1860, the British Open is the oldest golf tournament in the world. Played usually in July, the tournament is rotated around several golf courses in the United Kingdom. The Canadian Open is co-organized by Golf Canada and the PGA Tour and has a history that begins in 1904. Although played at various courses in Canada, Ontario has hosted most of this tournament in recent years. In 2019, Matt Jones, Shane Cowry and Rory McIlroy won the Australian, British and Canadian Open respectively

Sources: www.atptour.com ; www.formula1.com ; www.pgatour.com ; www.en.wikipedia.org

Table 2. Data Sources

Variable	CANADA	UK	AUS
$TOURISTS_{(t)}$	Statistics Canada https://www150.statcan.gc.ca/n1/en/subjects/travel_and_tourism	UK Office for National Statistics https://www.ons.gov.uk/peoplepopulationandcommunity/leisureandtourism	Australia Bureau of Statistics https://www.abs.gov.au/AUSSSTATS/abs@.nsf/DetailsPage/3401.0Mar%202020?OpenDocument
$EFFEX_{(t)}$	Bank for International Settlements https://www.bis.org/statistics/eer.htm		
$MSCI_{(t)}$	Thomson Reuters's Datastream		
$TEMP_{(t)}$	Data portal of Canadian Centre for Climate Services www.climate.data.ca	Met Office The national meteorological service for the UK www.metoffice.gov.uk	Bureau of Meteorology, Australia www.bom.gov.au
$TERRORISM_{(t)}$	Global Terrorism Database from The National Consortium for the Study of Terrorism and Responses to Terrorism, University of Maryland, https://www.start.umd.edu/data-tools/global-terrorism-database-gtd		
$F1_{(t)}$	www.fl.com		
$GOLF_{(t)}$	PGA of Canada www.pgaofcanada.com	PGA www.pga.info	PGA of Australia www.pga.org.au
$TENNIS_{(t)}$	Rogers Cup www.rogerscup.com	Wimbledon www.wimbledon.com	Australia Open www.ausopen.com

Table 3. Estimates using OLS

	CANADA		UK		AUSTRALIA	
	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value
Constant	4.566***	0.000	2.398***	0.000	4.039***	0.001
<i>LAGN</i> _(<i>t</i>-1)	0.209***	0.000	0.303***	0.000	0.571***	0.000
<i>LAGS</i> _(<i>t</i>-11)	0.493***	0.000	0.292***	0.000	0.148**	0.015
<i>EFFEX</i> _(<i>t</i>)	-0.308***	0.000	-0.001	0.531	-0.001	0.294
<i>MSCI</i> _(<i>t</i>)	0.090***	0.016	0.095***	0.008	0.074*	0.052
<i>TEMP</i> _(<i>t</i>)	0.080***	0.000	0.016***	0.000	0.114***	0.005
<i>TERRORISM</i> _(<i>t</i>)	-0.059	0.231	-0.029*	0.054	0.011	0.588
<i>SARS</i> ₂₀₀₃	-0.207***	0.000	-0.182***	0.000	-0.196***	0.000
<i>FIN</i> ₂₀₀₈	-0.300***	0.000	-0.007	0.657	-0.031	0.257
<i>TENNIS</i> _(<i>t</i>)	0.020***	0.000	0.008***	0.000	0.018***	0.000
<i>GOLF</i> _(<i>t</i>)	0.010**	0.044	0.030***	0.000	-0.011	0.209
<i>F1</i> _(<i>t</i>)	0.098***	0.000	-0.002	0.914	0.010	0.328
TREND	0.001	0.905	0.010**	0.034	0.001*	0.058
R ²	0.89		0.88		0.83	

The stationarity of the data series were examined by applying the usual unit root tests. There were significant evidence to reject the unit root hypothesis, including the MSCI. Results are available upon request. The Newey-West method, correcting for autocorrelation heterogeneity of variances in the errors were applied. Observing PP- and QQ- plots, despite a minor and trivial deviation from normality for the Canadian model, we concluded that the residuals are close to a normal distribution.

Table 4. Estimates using SURE

	CANADA		UK		AUSTRALIA	
	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value	Coeff.	<i>p</i> -value
Constant	1.097*	0.071	2.237***	0.000	4.116***	0.000
<i>LAGN</i> _(<i>t</i>-1)	0.514***	0.000	0.297***	0.000	0.371***	0.000
<i>LAGS</i> _(<i>t</i>-11)	0.386***	0.000	0.315***	0.000	0.268***	0.000
<i>EFFEX</i> _(<i>t</i>)	-0.119**	0.017	-0.001	0.581	-0.001	0.169
<i>MSCI</i> _(<i>t</i>)	0.050*	0.077	0.096**	0.017	0.087***	0.004
<i>TEMP</i> _(<i>t</i>)	0.181***	0.000	0.014***	0.000	0.044*	0.077
<i>TERRORISM</i> _(<i>t</i>)	0.009	0.188	-0.023*	0.081	0.008	0.576
<i>SARS</i> ₂₀₀₃	-0.659***	0.000	-0.132***	0.000	-0.159***	0.000
<i>FIN</i> ₂₀₀₈	-0.065***	0.004	-0.007	0.618	-0.283***	0.000
<i>TENNIS</i> _(<i>t</i>)	0.013***	0.000	0.005***	0.000	0.012***	0.000
<i>GOLF</i> _(<i>t</i>)	0.010*	0.086	0.031***	0.000	-0.007*	0.073
<i>F1</i> _(<i>t</i>)	0.091***	0.000	0.007	0.760	0.021***	0.002
TREND	0.001**	0.032	0.001**	0.043	0.001***	0.001

An R^2 for Aitken's generalized least square model is not computed here as it is not well defined as to which particular type of a pseudo R^2 that should be used as a suitable replacement for the usual R^2 in OLS models and to what extent they are relevant to SUR estimations.