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Modelling inbound international tourism demand in Australia: Lessons from the pandemics

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Abstract

The study explores how international tourism demand in Australia is impacted not only by traditional economic factors but also by uncertainty and risk emanating from pandemics. Using an augmented demand model the paper examines the main determinants of tourism in Australia during the favourable period and what lessons can be drawn to reboot international tourism in the post-pandemic situation. To the best of our knowledge, this study is the first of its kind, which employs a robust second-generation panel model to examine the impact of pandemic augmenting economic uncertainty upon the international tourism demand in Australia.

KEYWORDS

Australia, economic policy uncertainty index, global uncertainty, pandemics, panel data, tourism demand

1 | INTRODUCTION

The tourism industry has gained immense importance globally during the last decade because of its direct and indirect growth augmenting and employment generating benefits. According to the World Travel and Tourism Council (2019) globally, the travel and tourism industry contributed US\$8.9 trillion to the global share of GDP. It has a share of 10.3% of the world's GDP during 2019 and generated 1 in 10 jobs worldwide.

Before the occurrence of the pandemics in the early 2020, international tourist arrivals in Australia increased to the level of 3.0% during 2019 compared to 2018. According to the Tourism Australia Research (2020) tourism sector was a major driver of economic growth for Australia during 2018–2019. As far as tourism expenditure is concerned Australia was among the top 10 countries when ranked globally. Australia is ranked seventh globally by the Travel and Tourism Competitiveness Index (2019). Globally, Australia is promoted as the desired travel destination for high-value tourists. However, owing to the pandemic situation the arrival of international travellers to Australia started to decline at the beginning of 2020, and during April and May 2020 the number further declined to an ebb low. Although COVID-19 is having a substantial adversative effect on the tourism industry, in not only Australia but also globally, considerations on how to re-open borders and invigorate the tourism industry have been into

a discussion of late (UNCTAD, 2020). Against this backdrop, this paper attempts to explore the major determinants of international tourist arrivals to Australia during periods of tourist boom and what lessons can be drawn to revitalise tourism in the recovery phase aftermath of COVID-19.

This paper contributes to the existing seam of the literature in five major ways. First, we use comprehensive and extensive data sets covering eight origin countries of inbound international tourist that explain about 55% of total international tourist arrivals to Australia, the time range is 2007M1 to 2020M8. Second, the study explores a wide range of possible determinants of international tourism demand for Australia. Specifically, the paper discusses how (i) prices, (ii) the substitute price, (iii) income level in the country of origin, (iv) past pandemics, and (v) economic policy uncertainty impact international inbound tourism. Third, the study attempts to explore how economic uncertainty augmented with pandemics impact tourism. The rising significance of the effect of uncertainty in today's globalised world has motivated many researchers to include it as an additional explicatory variable in studying tourism demand along with the standard explanatory variables (Işık et al., 2020). Following the useful and distinct index on economic policy uncertainty (EPU) postulated by Baker et al. (2016) the paper explores how during uncertainty travel plans get significantly affected. Kumar et al. (2020) observe that tourism demand is affected not only by prices and income but factors like

economic instability, disasters and diseases that also affect tourism. So, the paper adds to the on going debate on how both economic and non-economic factors are crucial drivers of tourism demand. Fourth, employing the panel econometric model the study examines the long-run association between Australia's inbound international tourism and its major determining factors. The selection of the panel model in the current study is driven by the superiority of estimation techniques compared to the cross-sectional and time-series analysis (Baltagi, 2005; Hsiao, 2007). Fifth, given the different levels of development, the panel set of countries may be heterogeneous. The impact of economic policy uncertainty is thus different across the countries. Furthermore, the shocks emanating from one country due to disasters and uncertainty may have transmissions in other countries owing to globalisation. Therefore, there may be a cross-sectional dependence among the panels. To overcome the problems associated with heterogeneity in the panel behaviour and cross-sectional dependence, the paper adopts novel estimation techniques that are robust to panel heterogeneity and cross-sectional dependence. The study uses Common Correlated Effects Estimation (Pesaran, 2006) and Augmented Mean Group (AMG) Estimation (Eberhardt & Teal, 2010). Furthermore, the study analyses the impact of pandemics along with the traditional variables in affecting tourism in Australia. Therefore, the study contributes to the extant seam of literature on the empirical context.

The remainder of the paper is designed as follows: Section 1 discusses the main findings of the existing literature related to EPU and pandemics, impacting tourism; Section 2 describes the datasets and methodology used in the study; Section 3 presents the major empirical results; Section 4 makes the possible policy suggestion; and Section 5 concludes.

2 | REVIEW OF LITERATURE

2.1 | Tourism demand and its major determinants

A wide range of factors impact international tourism demand, namely economic, social and political factors, as well as the occurrence of disasters, wars and diseases. Among the economic factors determining tourism demand include factors like income of the tourists, relative prices and prices of substitute products. The notable recent studies of Kumar et al. (2020), Nguyen (2020), Konishi (2019), Dogru et al. (2017), Culiuc (2014) and Laframboise et al. (2014) among others discuss the importance of economic factors impacting tourism demand. The studies by Eryigit et al. (2010), Cortés-Jiménez and Blake (2011), and Dogru et al. (2017) contrary to the law of demand find positive elasticities and negative income elasticities affecting tourism demand. Such confounding results could be due to the choice of the indicator to measure tourism prices. According to Nguyen (2020) data on tourism-related product prices are scant; so the literature proxy's tourism prices with consumer price index weighted by bilateral exchange rates. The literature on tourism economics also suggests that substitute prices of tourism of the destination country could also affect tourism demand in the concerned country.

Baker et al. (2016) formulated the economic policy uncertainty index (EPU) which is widely used in the tourism literature to study its implications upon tourism demand. The studies by Ongan and Gozgor (2018) in the context of international inbound tourists from Japan to the United States; Gozgor and Ongan (2017) for international inbound tourists to the United States and Işık et al. (2020) for international inbound tourists in the United States from Mexico and Canada find that EPU has a significant adverse impact on tourism demand. Khan et al. (2021) explain that there is a need for time-varying estimates to forecast tourism demand with accuracy. The general agreement that emerges from the literature is that EPU has adverse implications on tourism in the end.

Non-economic factors have been explored in the literature to include how external shockwaves may affect tourism demand. These include seasonality behaviour, political unrest, wars, terrorism, diseases and tourism-related policies (Sio-Chong and So (2020), Ridderstaat et al. (2014); Kumar et al., 2020).

The occurrence of diseases and pandemics also unfavourably affect tourism demand (Wilder-Smith, 2006; Hu and Lee 2020; Foo et al., 2020). Wu et al. (2020) study on the impact of hotel bookings in Hong Kong during the pandemic situation showed that the 4-star hotels were severely impacted rather than the 5-star hotels. Sharma and Nicolau (2020) study related to the impact of pandemics on airlines, hotel and cruise industries found that among all the cruise industry is the worst affected. The paper recommended that there is an increasing need for prioritisation of resources so that the cruise industries receive financial assistance to uplift the situation in the post-crisis period. Using the long and short-term memory method Polysoz et al. (2020) found that international inbound tourism to the United States from China will face a substantial decline and it may take more than 6 months for the current situation to resume normalcy. Gossling et al. (2021) reviewing how the earlier pandemics impacted the tourism sector, explains that COVID-19 would bring unprecedented damage to the tourism industry. The paper concludes that even when business resumes tourism sector unlike other industries cannot sell its unsold accommodation and this will have major implications on tourism revenue. The discussion on the impact of pandemics on tourism particularly COVID-19 reviews how the occurrence of pandemics has modified society, the economy and the tourism sector. There is a need for further research to understand how the changes owing to the pandemics will impact the growth of the tourism demand.

2.2 | Australia's inbound tourism and its major determinants

Despite the rapid expansion of Australia's international inbound tourism, empirical studies based on the panel model on tourism demand in the context of Australia continue to be scarce. The existing studies mostly examined bilateral international tourist flows to Australia from the major markets (Kulendran, 1996; Lim & McAleer (2001); Chan et al., 2005). Seetaram and Dwyer (2009) study in the context of international inbound tourism to Australia from the countries of

New Zealand, United Kingdom, Japan, United States, Hong Kong, Malaysia, South Korea and Singapore over 1992–2006 demonstrate the importance of immigrant population in explaining international tourism demand for Australia apart from economic growth and exchange rate fluctuations. Seetaram (2012) further discuss the importance of immigration in the context of international inbound Australian tourism has important policy implications for enhancing efficiency in the tourism business in Australia. Ma et al. (2016) using long time series data, 1991–2015 explore tourism-forecasting demand for international inbound Chinese tourists to Australia. The paper forecasts that there is an exponential rise in tourism demand from China to Australia however there is a tendency for seasonality in international tourist arrivals. Kourtzidis et al. (2018) based on monthly observations from 1991M1 to 2017M8 found convergence in international inbound tourism demand in Australia. Such findings have important implications for the major stakeholders in the tourism business for expanding the tourism industry in Australia. Volgger et al. (2019) using quarterly observations from 2015 to 2017 discuss the expansion of Airbnb hospitality demand in Australia. Shafiullah et al. (2019) discuss how prices and the income of the country of origin and exchange rate impact international tourism demand for the different states in Australia. Based on the panel model the paper observes that there is a wide variation across states of Australia as far as the demand for international tourism is concerned. Nguyen and Valadkhani (2020) employing mixed data sampling explore how inbound tourism in Australia from 1998 to 2018 is impacted by fluctuations in the exchange rate. The results suggest that the tourists are concerned about exchange rate fluctuations preceding 3 weeks of their departure.

Balli et al. (2018) explores how EPU Index impact tourism demand in Australia. The paper concludes that apart from the global EPU, the local EPU is a significant determinant of international inbound tourism to Australia. International tourists may postpone travel plans owing to the uncertainty arising from price fluctuations. Wen et al. (2020) study explores how natural disasters impact tourism in Australia. The paper explores how climate changes and bush fires bring alterations in the travel plans for Chinese tourists to Australia.

The findings from the previous literature confirm that apart from the economic and non-economic factors significantly impact international tourism in Australia. As international tourists respond adversely to disaster situation, there is a need for further research to examine the international tourism demand against the backdrop of the pandemics and what countermeasures can be adopted to mitigate the impact of uncertainty arising due to the pandemics.

2.3 | Methodology and data sets

2.3.1 | Model

To study the determinants of international tourism demand to Australia from the country of origin i , following Song et al. (2003) the Equation (1) explains the basic mathematical function of the model.

$$T_{it} = AP_t^{\beta_1} IP_t^{\beta_2} SP_t^{\beta_3} u_{it}, \quad (1)$$

here T_{it} denotes international tourism demand in Australia from the country of origin i during the time t ; P_t denotes the relative price level of tourism in Australia at the time t ; IP_t denotes the income level of the country i during the time t ; SP_t indicates the substitute price of tourism during time t in the competitive tourism destination of Australia; A is a positive constant and u_{it} is the usual residual term. The demand function for tourism as explained in Equation (1) analogous to the demand for any other goods and services is a function of its own prices, income, price of substitute products and other non-economic factors which may be captured through u_{it} .

We, rewrite the international tourism demand for Australia, Equation (1) see Equation (2) in its econometric form (taking logarithmic conversion) including the augmenting impact of economic policy uncertainty and shocks emanating from the pandemics:

$$\begin{aligned} \ln T_{it} = & \beta_0 + \beta_1 \ln T_{it-1} + \beta_{21} \ln P_{it} + \beta_{22} \ln P_{it-1} + \beta_{31} \ln IP_{it} \\ & + \beta_{32} \ln IP_{it-1} + \beta_{41} \ln SP_t + \beta_{42} \ln SP_{it-1} + \beta_{51} \ln EPU_{it} \\ & + \beta_{52} \ln EPU_{it-1} + \beta_{61} \ln GEPU_{it} + \beta_{62} \ln GEPU_{it-1} \\ & + \beta_{7k} \text{Dummy}_{kt} + \beta_{8k} (\text{Dummy}_k \times \ln EPU)_{it} \\ & + \beta_{9k} (\text{Dummy}_k \times \ln GEPU)_{it} + e_{it}. \end{aligned} \quad (2)$$

here \ln denotes the logarithmic transformation; $\ln T_{it}$ and $\ln T_{it-1}$ are international tourism demand in Australia from the country of origin, the dependent variable expressed in logarithmic terms in current and the lagged form. The explanatory variables are also expressed in current and lagged form. $\ln P_{it}$ and $\ln P_{it-1}$ denote the price level expressed in logarithmic terms in current and the lagged form. $\ln IP_{it}$ and $\ln IP_{it-1}$ denote the income level in the country of origin in the current and lagged form expressed in logarithmic terms. $\ln SP_t$ and $\ln SP_{it-1}$ denote prices of substitution expressed in logarithmic terms in current and lagged form. $\ln EPU_{it}$ and $\ln EPU_{it-1}$ denote Economic Policy Uncertainty in current and lagged form expressed in logarithmic terms and $\ln GEPU_{it}$ and $\ln GEPU_{it-1}$ denotes Global Economic Uncertainty in current and the lagged form expressed in logarithmic terms.

$(\beta_{21}; \beta_{22})$, $(\beta_{31}; \beta_{32})$, and $(\beta_{41}; \beta_{42})$ denote price level, income, and substitute price elasticity, respectively, for the current period and lagged period, respectively. The expected sign of $\beta_{21} < 0$ and $\beta_{22} < 0$, a rise in the price level would have a negative influence upon tourism demand. $\beta_{31} > 0$ and $\beta_{32} > 0$ implying that the rise in the income level of the country of origin would boost tourism in the destination country. $\beta_{41} > 0$ or $\beta_{42} > 0$ depending upon whether the substitution effect dominates the income effect in the current and lagged period. The expected sign of $\beta_{51} < 0$, $\beta_{61} < 0$, $\beta_{8k} < 0$ and $\beta_{9k} < 0$; and $\beta_{52} < 0$, $\beta_{62} < 0$, for the current and lagged period, respectively. The rise in economic policy uncertainty both at the local and global level denoted by EPU and GEPU, respectively, would have an adverse impact on tourist inflows. Pandemics and pandemics weighted by EPU and GEPU would have adverse implications on international tourist inflows. The impact of pandemics is denoted by Dummy_k , the dummy variable for $k = 1, 2, \dots, 5$. We have incorporated five pandemic¹ dummy variables in the model on tourism demand; Dummy_1 for H1N1 (2009); Dummy_2 for MERS (2012); Dummy_3 for Ebola (2014);

Dummy₄ for Zika (2016) and Dummy₅ for COVID-19 (2020). The dummy variable takes the value one during the years of pandemic outbreak and zero otherwise. Dummy₁ = 1 during H1N1 (2009) and 0 otherwise; Dummy₂ = 1 during MERS (2012) and 0 otherwise; Dummy₃ = 1 during Ebola (2014) and 0 otherwise; Dummy₄ = 1 during Zika (2016) and 0 otherwise and Dummy₅ = 1 for COVID-19 (2020) and the value zero otherwise. t is the time variable and i represents the country of origin. e_{it} is the error term that includes the group fixed effect this explains the time-invariant component across cross-sections, time-varying heterogeneous effect, cross-sectional dependence and the white noise element.

2.4 | Econometric specification

2.4.1 | Pre-estimation methods

The previous literature shows that the standard estimation methods may produce spurious and invalid outcomes owing to the presence of cross-sectional dependence across panels and panel heterogeneity. So, this study adopts the second-generation panel estimation methods, which are robust to the problems, associated with panel heterogeneity and cross-sectional dependence. This study adopts the following test: Breusch and Pagan (1980) Lagrange multiplier (LM) test, the Pesaran (2004) LM test, the Pesaran (2021) cross-sectional dependence test and the Pesaran et al. (2008) LM test adjusting for bias to test for the existence of cross-sectional dependence across the panels. According to Breitung (2005), the assumption of slope homogeneity will produce erroneous results if the underlying panel is heterogeneous. Swamy (1970) proposes that cross-sectional heterogeneity has to be controlled in the process of empirical estimation. This study applies Pesaran and Yamagata (2008) test to test for the panel slope heterogeneity. The test is applied to all the variables except for the Global Economic Policy Uncertainty Index since it does not change across the sample set of the observations.

2.4.2 | Panel unit root and cointegration tests

The presence of cross-sectional dependence and slope heterogeneity in the panel set of the observations may make the first-generation unit root test outcomes unreliable. So, this study adopts the augmented IPS (Im et al., 2003) panel unit root test of Pesaran (2007), popularly referred to as CIPS. We next test for cointegration across the panel to obtain the existence of the long-run association by adopting the Persyn and Westerlund (2008) error correction model test. Persyn and Westerlund (2008) accommodate the problems of cross-sectional dependence and slope heterogeneity.

2.4.3 | Long run-estimation methods

When the null hypothesis of cross-sectional independence, slope homogeneity, and stationery can be rejected at a level of significance

then the long-run impacts can be estimated by adopting the AMG estimation method proposed by Eberhardt and Teal (2010) and the common correlated effect mean group (CCEMG) estimation method postulated by Pesaran (2006). This study applies the AMG method and CCEMG estimation method to assess how economic policy uncertainty and shocks emanating from pandemics impact tourism demand in the long-run, controlling for the price level, income and substitute prices.

2.5 | Datasets

The data on international tourist arrivals in Australia is obtained from eight major source markets, which explain about 55% of international tourist arrivals in Australia. The major source countries chosen based on the availability of data include China, France, India, Ireland, Japan, Singapore, the United Kingdom and the United States. The period of observations run from 2007 M1 to 2020 M8.

The income level of the country of origin is proxied by the industrial production index. According to the International Monetary Fund, the industrial production index measures the price adjusted output of the industry.

The relative price for Australia is measured by the bilateral real exchange rate of the Australian dollar vis-à-vis of the local currency of the source market. Thus, the relative price abbreviated as P_i is expressed as,

$$P_i = \frac{CPI_i / EX_i}{CPI_{Australia} / EX_{Australia}}, \quad (3)$$

EX_i and $EX_{Australia}$ are bilateral nominal exchange rates of the country of origin and Australia, respectively. CPI_i and $CPI_{Australia}$ are the consumer price index of the country of origin and Australia, respectively (2010 = 100). A rise in P_i implies a depreciation of the currency of the source market for the Australian dollar thereby making travelling to Australia expensive from the country of origin namely i .

To calculate the substitute prices of tourism for Australia denoted as SP we follow the methodology of Kumar et al. (2020) and calculate tourism-based substitute prices for the tourism competing country of Australia namely New Zealand. SP for Australia is calculated as follows:

$$SP_{Australia} = \left(\frac{CPI_{New\ Zealand}}{EX_{New\ Zealand}} \right) TOU_{i, New\ Zealand}, \quad (4)$$

where TOU denotes the share of tourist arrivals in New Zealand from the country i . Following, Song et al. (2003) a fall in $SP_{Australia}$ either due to fall in the $CPI_{New\ Zealand}$ or depreciation $EX_{New\ Zealand}$ would imply travelling to New Zealand would be less expensive. The EPU indices for both the country and global level are used to proxy the uncertainties associated with tourism. The monthly datasets for EPU are generated from the Economic Policy Uncertainty Database.

The pandemic dummy takes into account the specified pandemics that happened during the 2007–2020 period. It takes the value 1 for the months in which the pandemic happened, and 0 otherwise. Table 1 provides the detail of the data source of the dependent and independent variables. All the variables except the dummy are converted into their natural logarithmic transformation. According to Alam and Paramati (2016) and Bhattacharya et al. (2016), the conversion into the natural logarithmic form reduces the problems associated with distributional properties. In its logarithmic transformation, the estimated coefficients are elasticities.

3 | RESULTS AND DISCUSSION

3.1 | Preliminary findings

Table 2 presents the descriptive statistics of the concerned variables. The mean of the inbound tourists is 4.42 with the standard deviation at 0.52. Tables 3 and 4 present the test statistics for the cross-sectional dependence test and slope homogeneity test, respectively. As evident from Table 3 the test statistics for the Bresusch Pagan LM test, the Pesaran CD test, the Pesaran scaled LM test and the bias-corrected LM test reject the null hypothesis of no cross-sectional dependence in the variables at 1% level of significance. The results based on Table 4 confirm that the null hypothesis of slope homogeneity can be rejected at a 1% level of significance. The results thus suggest that although the individual member countries may generate their shocks to the tourism sector, shocks emanating from one country may affect the tourism sector of the other countries in the panel.

TABLE 1 Description of the variables and data source

Description of variables	Symbol	Source
International Tourist Arrivals to Australia	T	Australian Bureau of Statistics. https://www.abs.gov.au/statistics .
Income Levels	IP	International Monetary Fund, World Economic Outlook. https://www.imf.org/en/Publications/WEO
Relative Prices	P	
Substitute Price	SP	
International Tourist Arrivals to New Zealand	TOU	New Zealand Bureau of Statistics. https://www.stats.govt.nz/ .
Economic Policy Uncertainty	EPU	Economic Policy Uncertainty Index Data Portal. https://www.policyuncertainty.com/
Global Economic Policy Uncertainty Index	GEPU	

Note: For some countries price level data are found as quarterly observations it is converted to its monthly frequency observations by taking the quadratic average to bring constancy with data sets of other associated variables.

3.2 | Results of the unit root test and cointegration tests

As the results based on the first-generation unit root tests generate spurious outcomes when there exist cross-sectional dependence and slope heterogeneity in the panel set of the observations, the paper adopts the unit root test procedure that is robust to such concerns. Table 5 reports the cross-sectionally augmented IPS Im (Im et al., 2003) panel unit root test of Pesaran (2007), popularly referred to as the CIPS unit root test. The results from Table 5 enable us to conclude that the variables are integrated of $I(1)$. Since the variables in the panel set of observations are of the order $I(1)$ we next test the cointegrating properties of the panel set of observations. Table 6 reports the cointegration results based on the Persyn and Westerlund (2008) error correction model panel cointegration test. The four test statistics of the Persyn and Westerlund (2008) error correction model (Table 6) confirm the existence of cointegration across the observations. The results confirm the existence of a long-run association between tourism demand, relative prices, income level, substitute price and economic policy uncertainty.

3.3 | Long run estimation results

This study adopts the AMG estimation process of Eberhardt and Teal (2010) and the CCEMG estimation process of Pesaran (2006) to study how pandemics, economic policy uncertainty along with tourism demand for the previous year, income and prices impact international tourism demand for Australia. Table 7 reports the long-run estimation of the model specified in Equation (2). Both the estimation results based on the AMG and CCEMG method show that EPU and its lagged impact negatively impacts tourism demand in Australia irrespective of the pandemic situation. From Table 7 we find that a 1% rise in the EPU leads to the decline in the international inbound tourists to Australia by 0.10% (AMG method). Again, based on the CCEMG method 1% rise in the EPU leads to a decline in international inbound tourists by 0.11%. For the lagged impact of EPU, we find that a 1% rise of EPU of the previous period leads to a fall in international tourism demand by 0.12% (AMG method) and 0.21 (CCEMG) method, respectively. The findings thus show that the marginal impact of EPU on tourism demand is negative and the results confirm the studies of Gozgor and Ongan (2017) and Akadiri, Alola, and Uzuner (2020). One per cent rise in GEPU leads to a decline in international inbound tourist flows by 7.61% in Australia by AMG method and the estimation of CCEMG method shows that 1% rise in the GEPU leads to a decline in international tourist arrivals by 0.08%. The impact of GEPU of the preceding period is also negative and the results are significant. 1% rise in GEPU of the previous period leads to a fall in international tourism demand in Australia by 4.34% (AMG) method and 0.69% (CCEMG) method, respectively. Wu and Wu (2020) recommend that since tourism is sensitive to GEPU governments of the individual destination countries must pay attention to improving peace and security conventions.

TABLE 2 Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Std. dev.	Skewness	Kurtosis
T	4.42	4.52	5.35	1.30	0.52	−2.75	13.89
P	0.96	0.95	1.48	0.63	0.16	0.54	2.92
SP	0.11	0.05	0.75	0.01	0.12	1.64	5.87
IP	1.99	2.00	2.26	0.84	0.07	−2.58	41.85
EPU	2.13	2.11	2.98	1.37	0.24	0.43	3.84
GEPU	2.13	2.12	2.62	1.67	0.17	0.17	3.11

Note: Compilation author.

TABLE 3 Cross-sectional dependency test

Variables	Breusch-Pagan LM	Pesaran scaled LM	Bias-corrected scaled LM	Pesaran CD
	Test stat.	Test stat.	Test stat.	Test stat.
T	3229.09* (0.00)	56.48* (0.00)	662.79* (0.00)	61.58* (0.00)
P	1464.65* (0.00)	63.0522* (0.00)	73.85* (0.00)	32.92* (0.00)
SP	186.34* (0.00)	42.005* (0.00)	80.79* (0.00)	8.65** (0.00)
IP	476.96* (0.00)	70.83* (0.00)	499.45* (0.00)	11.79** (0.00)
EPU	1221.27* (0.00)	147.83* (0.00)	21.45* (0.00)	26.66* (0.00)

Notes: The null hypothesis is no cross-sectional dependence. Values in () are the *p* values. Compilation Author.

*denotes level of significance of 1%.

**indicates level of significance of 5%.

TABLE 4 Slope homogeneity tests

Test	T	P	SP	IP	EPU
Δ^{\wedge}	29.48 (0.00)	18.10 (0.00)	15.01 (0.00)	41.55 (0.00)	35.44 (0.00)
Δ^{\wedge}_{adj}	30.03 (0.00)	18.32 (0.00)	15.19 (0.00)	42.20 (0.00)	35.99 (0.00)

Notes: Δ^{\wedge} and Δ^{\wedge}_{adj} are the version of Swamy (1970) modified as proposed by Pesaran and Yamagata (2008). The null hypothesis is slope homogeneity. Values in () are the *p* values. Compilation Author.

TABLE 5 Panel unit root test Pesaran (2007)

Variable	Level	First difference	Level	First difference
	CIPS (Intercept only)		CIPS (with Intercept and trend)	
T	−1.22	−6.20*	−1.44	−6.42*
P	−1.29	−6.19*	−1.87	−6.44*
SP	−1.46	−5.14*	−1.75	−6.04*
IP	−1.32	−6.19*	−1.92*	−6.92*
EPU	−1.02	−6.11*	−1.36	−6.42*
GEPU	−0.06	−7.11*	−1.14	−7.21*

Notes: The null hypothesis of the CIPS unit-root test states presence of unit root in panel data with cross-sectional dependence. Critical values are obtained from Pesaran (2007). Compilation Author.

*indicates rejection of the null hypothesis at 1% level of significance.

**denotes rejection of the null hypothesis at 5% level of significance.

Results based on Table 7 further explain that all the major pandemic dummy variables significantly and negatively impact tourism demand except for Dummy₄. The study shows the negative impact of H1N1 in 2009; MERS in 2012, Ebola in 2014 and the COVID-19 in 2020 upon international tourism demand in Australia. The number of inbound international tourists decline in the year 2009 when H1N1

pandemic struck to about 4%, [$\exp\{-0.045\} - 1$] = −0.04 (AMG method of estimation); 3%, [$\exp\{-0.031\} - 1$] = −0.03 (CCEMG method of estimation). The number of inbound international tourists decline in the year 2012 when MERS pandemic struck to about 1.6%, [$\exp\{-0.017\} - 1$] = −0.016 (AMG method of estimation); 9.4%, [$\exp\{-0.099\} - 1$] = −0.094 (CCEMG method of estimation).

The number of inbound international tourists decline in the year 2014 when Ebola pandemic struck to about 2.9%, $[\exp\{-0.03\} - 1] = -0.029$ (AMG method of estimation); 1.98%, $[\exp\{-0.021\} - 1] = -0.019$ (CCEMG method of estimation). The number of inbound international tourists decline in the year (2020) when COVID-19 pandemic struck to

TABLE 6 Persyn and Westerlund panel cointegration tests

	Test statistics	p-value	Robust p-value
G_t	-3.48 (-1.94)	0.02	0.00
G_α	-52.33 (-11.44)	0.00	0.00
P_t	-8.47 (-1.03)	0.014	0.00
P_α	-60.299 (-15.24)	0.00	0.00

Notes: The null hypothesis is of no cointegration. Test statistics are obtained through 1000 bootstrap replications. The figures in the parenthesis denote the Z-statistics. Compilation Author.

*denotes the level of significance at 10%.

**denotes the level of significance at 5%.

***denotes the level of significance at 1%.

about 3.8%, $[\exp\{-0.039\} - 1] = -0.038$ (AMG method of estimation); 7.7%, $[\exp\{-0.081\} - 1] = -0.077$ (CCEMG method of estimation). Such findings corroborate the findings of the study of Wilder-Smith (2006); Kuo et al. (2009) and Lee et al. (2021). The impact of the interactive term of EPU and pandemics is also negative upon tourism demand in Australia. As reported in Table 7 the pandemics aggravate the negative impacts of EPU both by the AMG estimation method and CCEMG estimation method. Based on the results of Table 7 we find that the moderating negative impact of Pandemics Dummy₁ upon EPU increases by 4.5% (AMG method) and 3.1% (CCEMG method), respectively; moderating negative impact of Pandemics Dummy₂ upon EPU increases by 1.7% (AMG method) and 9.9% respectively (CCEMG method) respectively; moderating negative impact of Pandemics Dummy₃ upon EPU increases by 3% (AMG method) and 2.1% (CCEMG method), respectively; the moderating negative impact of Pandemics Dummy₄ upon EPU increases by 2% (AMG method) and 8% (CCEMG method), respectively, and the moderating negative impact of Pandemics Dummy₅ upon EPU increases by 3.9% (AMG method) and 8.1% (CCEMG method), respectively. The negative impact of Pandemics

TABLE 7 Mean group estimates (dependent variable: inbound tourist arrivals)

Variable	AMG	p-value	CCEMG	p-value
T_{t-1}	0.54	0.00	0.31	0.00
P_t	-0.50	0.00	-0.81	0.00
P_{t-1}	-0.42	0.00	-0.31	0.03
SP_t	0.50	0.02	0.23	0.00
SP_{t-1}	0.12	0.01	0.01	0.001
IP_t	0.33	0.04	0.37	0.00
IP_{t-1}	0.53	0.40	2.64	0.31
EPU_t	-0.10	0.00	-0.11	0.00
EPU_{t-1}	-0.12	0.00	-0.21	0.01
Pandemics Dummy ₁	-0.045	0.01	-0.031	0.00
Pandemics Dummy ₂	-0.017	0.03	-0.099	0.00
Pandemics Dummy ₃	-0.03	0.02	-0.021	0.00
Pandemics Dummy ₄	-0.06	0.13	0.038	0.55
Pandemics Dummy ₅	-0.039	0.00	-0.081	0.00
EPU * Pandemics Dummy ₁	-0.045	0.01	-0.031	0.00
EPU * Pandemics Dummy ₂	-0.017	0.68	-0.099	0.00
EPU * Pandemics Dummy ₃	-0.03	0.02	-0.021	0.00
EPU * Pandemics Dummy ₄	-0.02	0.03	-0.08	0.012
EPU * Pandemics Dummy ₅	-0.039	0.00	0.081	0.00
$GEPU_t$	-7.61	0.00	-0.08	0.00
$GEPU_{t-1}$	-4.34	0.00	-0.69	0.00
$GEPU_t$ * Pandemics Dummy ₁	-0.07	0.00	-0.021	0.49
$GEPU_t$ * Pandemics Dummy ₂	-0.03	0.06	-0.04	0.01
$GEPU_t$ * Pandemics Dummy ₃	-0.05	0.02	-0.10	0.09
$GEPU_t$ * Pandemics Dummy ₄	-0.02	0.00	-0.04	0.006
$GEPU_t$ * Pandemics Dummy ₅	-	-	-0.012	0.002

Notes: AMG denotes Augmented mean group (AMG) estimator of Eberhardt and Teal (2010) and CCEMG denotes Common correlated effects mean group (CCEMG) estimator of Pesaran (2006). Compilation Author.

Dummy₁ upon GEPU increases by 7% (AMG method) and 2.1% (CCEMG method) respectively; the negative impact of Pandemics Dummy₂ upon GEPU increases by 3% (AMG method) and 4% (CCEMG method), respectively; the negative impact of Pandemics Dummy₃ upon GEPU increases by 5% (AMG method) and 10% but the results are not significant (CCEMG method) respectively; the negative impact of Pandemics Dummy₄ upon GEPU increases by 2% (AMG method) and 4% (CCEMG method), respectively; as far as the negative impact of the Pandemics Dummy₅ is concerned the AMG estimation shows an absence of impact however according to CEMG it rises by 1.2%.

As regards the impact of the control variables, it can be seen from Table 7 that the lagged impact of the dependent variable is positive and significant suggesting that factors that generated tourism demand in Australia in the previous year will bring in more demand in the current year. As far as the income of the country of origin is concerned it positively impacts tourism demand, as found from the results of Table 7 when the income of the country of origin rises by 1% international inbound tourist inflows rise by 0.33% (AMG estimation) and 0.37% (CCEMG estimation). So rising income implies a rise in the spending power of the consumers and hence leading to a boost in tourism.

The rise in the relative price level negatively impacts tourist arrivals in the long-run. Results based on Table 7 indicate that when the relative price level rises by 1% international tourist inflows fall by 0.50% (AMG method) and 0.81 (CCEMG method) respectively. The impact of the previous period prices are also negative and significant, international tourism demand falls owing to rising prices in previous period by 0.42 (AMG method) and 0.31 (CCEMG method) respectively. The impact of substitute price as per expectations is positive, 1% rise in the substitute price leads to rising in tourism demand by 0.50% (AMG estimation) and 0.23% (CCEMG estimation) respectively. Further rise in the substitute prices of the previous year led to a rise in international tourism demand in Australia by 0.12 (AMG method) and 0.01 (CCEMG method) respectively. The findings of the study based on income, relative price level and substitute price level upon tourism demand show that the traditional economic variables impact tourism as per expectations, conforming to the works of Santana-Gallego et al. (2010), Okafor et al. (2018), Kumar et al. (2020).

4 | DISCUSSION

The empirical results based on the econometric methods indicate that economic policy uncertainty has a long-run adverse impact upon international tourism demand in the destination country of Australia. Both the local and global economic policy uncertainty are significant factors in impacting tourism demand and hence the economy of the destination country. Tourism in the most countries is an important driver for economic growth, Akadiri, Lasisi, et al. (2020) and Liu and Song (2018), the boom in tourism demand is critically dependent upon economic policies and the thrust of emphasis should be to remove asymmetry in the information emanating from economic policy. This

will affect the perceptions of tourists in a positive way. The rapid expansion of Australia's inbound international tourism demand from the major markets of Asia and Europe and the United States was to a large extent due to the government of Australia's efforts to make the tourism industry competitive in the international markets. Further, the familiarity of language and common culture also favoured tourism expansion in Australia (Ghosh, 2020). However, the pandemics have in the past and the current situation adversely impacted tourism in Australia. Pandemics experienced by mankind has brought health devastations and adverse impact on the economy and the society. This study makes a unique attempt to infer how the outbreak of past epidemics impacted the international tourism demand for Australia. Further, the study also explained the impact of COVID-19 on the international tourism demand for Australia. The world faced the disaster aftermath of the financial crisis of 2008 owing to the H1N1 flu virus also called the swine flu in 2009. Leggat et al. (2009) discuss that the H1N1 pandemic adversely impacted the Australian economy and the significant drop in international travel impacted the tourism sector. Such findings confirm the results of the present study. Ebola was a fatal disease, which had an outbreak in 2014 in Africa and spread rapidly in the Asian, American, and European regions. According to the study by Cope et al. (2014) owing to the spread of the fatal pandemic Ebola, the Government of Australia had announced policy modifications as far as visas were concerned. To contain the spread of the virus the Government had cancelled new visas. This had a wide-ranging setback on the tourism economy. The recent study of Pham et al. (2021) using the general equilibrium model explained that COVID-19 severely impacted the Australian tourism economy. The study urges that the Australian Government should take the responsibility to support the tourism sector to generate resilience. Our findings confirm the study of Pham et al. (2021). Efforts have to be put to revive tourism in the post-pandemic phase-proper targeting of the major markets of Asia and Europe may enable the country to recover the tourism sector. The government of Australia has in the recent times introduced a campaign to target the youth from the countries of the United Kingdom, Germany and France who can fulfil the twin objectives of work and holiday in the destination country (Tourism Research Australia, 2019). The study by Hall and Prayag (2020) discuss that the capability of the tourism destination country to respond in the post-pandemic situation depends on the extent the countries learn from the lessons of the past pandemics. The way a destination responds is crucially dependent upon the tourism business in the competing destinations.

4.1 | Policy implications

The fundamental reasons for the rise in the pandemic threat in the 21st century are due to rise in international mobility, urbanisation, the rise in consumption of processed food including meat and the rise in the global transport networks (Labonté et al., 2011). Gössling et al. (2020) discuss that systematic understanding and research on country studies relating to challenges of pandemics and vulnerability of the

tourism industry is still lacking. The current study renews the scope of research in its attempt to understand the challenges of pandemics, uncertainty and its implications for the tourism industry in the context of Australia. To ensure gradual recovery in the international flow of inbound tourists the Australian government needs to seriously consider the interplay between tourism demand and public health interventions. The tourism sector will be gradually revamping if concerted efforts are put on the conditions of hygiene in the airlines and the hospitality sector. Against the background of COVID-19 situation, investment in technology that is “touch-less” will be effective in expanding the tourism sector. International travellers now prioritise social distancing, cashless transactions and other contagion-prevention measures. Efforts toward such directions imply a positive trajectory for tourism in Australia. A strong governmental motivation to understand the market behaviour by involving all the stakeholders in the market will certainly go a long way to boost tourism in the periods' aftermath of the crisis. Inclusion of the tourism sector in the Disaster Risk Management Programme is urgently required to combat the challenges and in designing specific tourism plans for tackling the situation of emergency. The UNWTO (2020) urges all countries to adopt an integrated tourism crisis management system and develop task forces for the crisis units. Research and development must be fostered towards “technology-enabled” communication so that the travellers are informed about the destination. Diversification and packaging of tourism products can be a key to recovery. For example, shifting from holiday-based tourism to event-based tourism can enhance tourism. In such cases, travel may be a necessity and may not be postponed. Proper training programmes need to be introduced to generate awareness among the workers as to how they should be prepared to work in the situation of challenges imposed by the pandemic. Finally, for a short-term perspective, the following practices will foster tourism in Australia during the recovery phase in the post-pandemic situation: gainful interaction with prospective travellers by the travel agents to understand the travel plans and present the proper information so that the perceptions of the travellers are not risked. The diverse groups of stakeholders should try to build new strategies to develop new forms of business collaboration that transpires into faster recovery roadmaps. Renewal and the reassessment of the marketing efforts towards healthy and crowd-free tourism thereby responding to the tourists' concerns for healthy travel is urgently required. Emphasis should be put to develop research capacity that has concerns about tourism with sustainability in the new normal order.

As our findings confirm that pandemics increase economic policy uncertainty and hence lead to a further decline in tourist inflows, this necessitates the creation of destination-specific policies to combat crisis arising from economic policy uncertainty. Tourism is a fragmented industry and, in many instances, there occurs a lack of coordination across different levels of government. For setting long-term goals in the post-crisis, it is necessary to consolidate all the stakeholders' programmes. The government should put efforts to raise awareness in the sharing of information that would help to enhance tourism competitiveness. Concerted efforts to boost the tourism sector when the situation gradually normalises should focus on the important stakeholders like tourists, the business houses associated with tourism, the

media and the government of the destination country. The country's efforts to improve security, safety and hygiene of tourists will be effective in the long-term for promoting tourism. Negative publicity and panic created by the media houses create a negative perception among tourists. Thus, business houses should take steps for managing the negative perceptions through dialogues and marketing strongly on the concerns for the visitor's comfort and safety.

5 | CONCLUSION

This paper examined the relationship between pandemic situation, economic policy uncertainty and international inbound tourism demand in Australia within a multivariate panel model. The study first developed the traditional demand function for tourism where tourism is a demand of relative prices, substitute price, income. Furthermore, the traditional tourism demand model was augmented with economic policy uncertainty, global economic policy uncertainty and pandemics. The study incorporated five dummy variables to explore the impact of past pandemics and the current one which devastated the economy in general and the tourism economy in particular namely H1N1 (2009); MERS (2012); Ebola (2014); Zika (2016) and recently COVID-19 (2020). We also examined the interactive effect of past pandemics and the present one with economic policy uncertainty and how it impacts international inbound tourism. The important panel set of countries chosen as important markets for tourism in Australia include China, France, India, Ireland, Japan, Singapore, the United Kingdom, and the United States. The period of observations run from 2007M1 to 2020M8. The paper adopted the Persyn and Westerlund (2008) cointegration method to obtain the long-run cointegrating relationship among the variables. Through the AMG estimation and the CCEMG estimation, the study explored the long-run implications of relative prices, income, substitute prices, economic uncertainty and pandemics on international inbound tourism demand in the context of Australia. These estimation techniques addressed the problems of cross-sectional dependence and heterogeneity associated with panel estimation. Both EPU and GEPU negatively impact tourism in the long-run. 1% rise in the EPU leads to the decline in the international inbound tourists to Australia by 0.10% (AMG method) and 0.11% (CCEMG) method respectively. Again, a 1% rise in GEPU leads to a decline in international tourism demand by 7.61% (AMG method) and 0.08% (CCEMG) method respectively. Inclusion of lagged impact of explanatory variables strengthens the impact furthermore on international tourism demand for Australia. The number of inbound international tourists declined in the years of the pandemic. The number of inbound international tourists declined in the year (2009) when H1N1 pandemic impacted the economy to about 4%, (AMG method); and 3%, (CCEMG method), respectively. The number of inbound international tourists decline in the year (2012) when MERS pandemic affected the globe to about 1.6% (AMG method); and 9.4%, (CCEMG method), respectively. The number of inbound international tourists declined in the year (2014) when Ebola pandemic struck to about 2.9%, (AMG method) and 1.98%, respectively (CCEMG method).

The number of inbound international tourists decline in the year 2020 when COVID-19 pandemic spread to about 3.8%, (AMG method) and 7.7% (CCEMG method), respectively. The impact of the pandemic weighted EPU is also negative upon tourism demand in Australia. Tourists' decision to travel is not only impacted by income and prices but also by uncertainty emanating from economic policy and risks of pandemics. Economic stability, fiscal packages to boost tourism and investment in "touch-less technology" will help to reboot Australian tourism in the long run.

The study has two major limitations: first owing to a paucity of data it could not consider how different categories of tourism is impacted by economic and non-economic factors, the different categories of tourism include travel for business purpose, travel for leisure, travel for work and travel for education. Second, owing to lack of data it considered only one competitive destination in the Oceania region as a substitute destination of Australia. We, therefore, suggest that with the increasing availability of tourism data the scope for future research lies in exploring tourism in a more disaggregate context.

CONFLICT OF INTEREST

No funding is associated with this research. Further, there is no conflict of interest. This is an original research work not submitted elsewhere.

DATA AVAILABILITY STATEMENT

The data sets utilised are available at doi: 10.6084/m9.figshare.13369664/ URL: <https://figshare.com/s/db61b30322d9a6e4ba50>.

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ENDNOTE

¹ Due to lack of data for 2003 for other explanatory variables we could not consider the impact of the SARS epidemic.

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