

## Do religious destinations suffer more? Causal evidence from a difference-in-differences analysis of Himalayan Tourism

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### Abstract

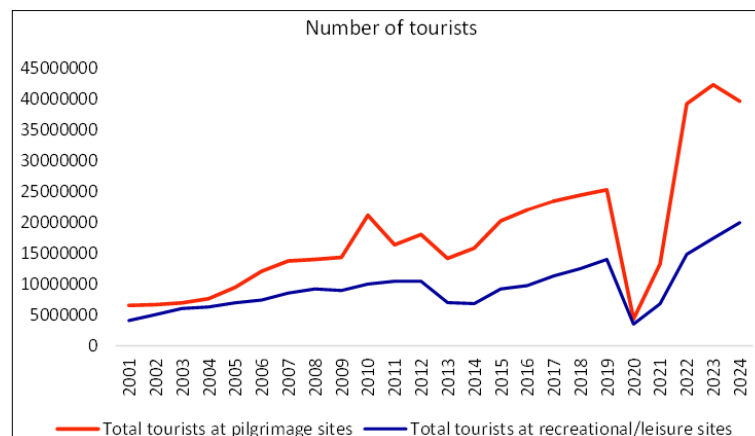
Pilgrimage destinations in Uttarakhand were hit far harder by the Covid-19 pandemic than their recreational counterparts, yet the reasons remain poorly understood. Drawing on a balanced panel of 28 tourist destinations over 2001 to 2024, a Difference-in-Differences framework is applied with destination fixed effects to isolate the causal effect of the pandemic on religious tourism. Major Himalayan pilgrimage sites form the treatment group, while the remaining recreational destinations serve as controls. Religious destinations experienced a considerably larger decline in tourist arrivals, with the differential impact symmetric across both domestic and foreign visitors. This symmetry points to the cancellation of mass pilgrimage events, rather than international travel restrictions, as the primary mechanism of disruption. A placebo test and panel causality analysis confirm the robustness of the findings.

**Keywords:** Religious Tourism, Covid-19, Difference-in-Differences, Uttarakhand, Char Dham Yatra

### Introduction

Located in the heart of the Himalayas, Uttarakhand represents a unique blend of religious heritage and geographic splendour that is perceived as a single entity by visitors. This state is home to the Char Dham, a group of the four most revered pilgrimage sites in Hinduism: Kedarnath, Badrinath, Gangotri, and Yamunotri. Every season, these sites attract millions of devotees, and the routes leading to them are counted among the most beautiful and enchanting routes in South Asia. Haridwar, perched where the river *Ganga* enters the plains, hosts the *Kumbh Mela* on a rotating cycle, one of the largest human

gatherings on earth (Balsari *et al.*, 2016). Beyond this pilgrimage geography, the state offers alpine meadows, wildlife reserves, white-water rivers, and hill stations that have attracted leisure travellers since the colonial era. In Uttarakhand's mountain economy, tourism is not a peripheral activity; it is the organising principle. Figure 1 illustrates a long-term upward trend in tourist arrivals for both pilgrimage and recreational destinations, with pilgrimage sites consistently attracting a higher volume of visitors. A sharp contraction is observed in 2020, reflecting the severe disruption caused by the COVID-19 pandemic across both categories.



Source: Uttarakhand Tourism Development Board tourism statistics

**Fig 1:** Number of tourist arrivals in Uttarakhand (2001-2024) <sup>[7]</sup>

In the years immediately before the Covid-19 pandemic, annual tourist arrivals to Uttarakhand had crossed 35 million, of which pilgrimage travel accounted for a dominant share (Government of India, 2019) <sup>[14]</sup>. The Char

Dham Yatra alone typically sees millions of registrations in a single season (Kaeley *et al.*, 2025) <sup>[17]</sup>. Entire communities along the pilgrimage corridors, from the *dhabas* of Guptkashi to the guesthouses of Joshimath to the pony

operators of Gaurikund, derive virtually all of their income from the short seasonal window between the opening of the shrines in May and the first heavy snowfall in November. The economic precariousness of this dependence was always understood; what the pandemic made starkly visible was its scale.

When India entered its first national lockdown on 25 March 2020<sup>[18]</sup>, it did so with the most sweeping legal restrictions on public movement in the country's post-independence history. The Char Dham Yatra, which had been scheduled to open in late April, was postponed indefinitely and then conducted under such severe caps, at one point limited to a small number of local priests at each shrine that it ceased to function as a pilgrimage in any meaningful sense. The Haridwar *Ardh Kumbh Mela* of 2021<sup>[28]</sup> was eventually permitted, though curtailed at the last minute following a sharp rise in cases, generating considerable controversy (The Lancet, 2021)<sup>[28]</sup>. Religious tourism, which depends on the physical co-presence of large numbers of believers at specific sacred locations on specific calendar dates, was structurally incompatible with the logic of pandemic control in a way that most forms of leisure and adventure tourism were not.

This structural incompatibility between pilgrimage and pandemic control is the empirical puzzle the paper addresses. The tourism literature has long recognised that different types of destinations respond differently to external shocks. Beach and heritage destinations, for instance, tend to recover faster from political disruptions than from health crises, while adventure tourism is more sensitive to transport disruptions than to changes in accommodation capacity (Ritchie, 2004<sup>[25]</sup>; Gössling *et al.*, 2020). Within-country comparisons of this type are less common, partly because destination-level panel data of sufficient length are rarely available. Uttarakhand, with its unusually clear division between pilgrimage and non-pilgrimage tourism and with over two decades of destination-level arrival records maintained by the (Uttarakhand Tourism Development Board, 2025)<sup>[29]</sup>, offers an unusually clean natural experiment (Meyer, 1995)<sup>[21]</sup>.

The present study uses a Difference-in-Differences (DiD) framework (Bertrand *et al.*, 2004)<sup>[5]</sup> applied to a balanced panel of 28 tourist destinations in Uttarakhand over the period 2001 to 2024<sup>[7]</sup> to estimate the causal impact of the Covid-19 pandemic on religious tourism relative to recreational tourism. Six major pilgrimage destinations constitute the treatment group; the remaining 22 destinations form the control group. The post-treatment period corresponds to 2020 and 2021<sup>[20, 28]</sup>, the two years during which central government restrictions on mass gatherings and inter-state travel were in force.

This study contributes to the existing literature in three ways. It provides the first destination-level DiD estimate of the differential Covid-19 impact on religious versus recreational tourism in India, extending a literature that has so far relied mainly on aggregate state or national data (Arshad *et al.*, 2023; Maiti, 2022; Kumar *et al.*, 2020)<sup>[2, 18, 19]</sup>. It also adds to work on the uneven distribution of pandemic-related shocks within tourism economies (Hall *et al.*, 2020)<sup>[20]</sup> by showing that destination type, specifically the event-driven, congregation-based character of pilgrimage tourism, is a primary determinant of vulnerability. Finally, it contributes to methodological work on natural experiments in tourism by exploiting the

structural incompatibility between pilgrimage travel and pandemic-era gathering restrictions as a source of exogenous variation.

## Review of Literature

Tourism has long been recognised as a sector uniquely vulnerable to external shocks, given that it depends entirely on the movement of people, which is precisely what public health crises seek to restrict. The Covid-19 pandemic brought this vulnerability into sharp relief on a global scale. The earliest comprehensive accounts show that international travel bans covering over 90 per cent of the world population, combined with restrictions on domestic mobility and public gatherings, brought tourism to a near standstill within weeks of the first major outbreaks (Gössling *et al.*, 2020)<sup>[20]</sup>. Whether the volume-growth model promoted by bodies such as the UNWTO and WTTC remains appropriate (World Tourism Organization, 2019)<sup>[32]</sup>, given the sector's structural fragility, is a question that carries weight for destinations whose economies depend on mass congregation events rather than dispersed leisure travel.

Evidence from the ASEAN region confirms bidirectional causality between Covid-19 case counts and tourist arrivals across seven countries, establishing the severity and statistical traceability of the pandemic shock to Asian tourism (Beh & Leong, 2021)<sup>[4]</sup>. At the aggregate, cross-country level at which that work operates, however, it is impossible to distinguish between destination types within a single country. That kind of disaggregation matters most for understanding why some destinations were devastated while others merely struggled.

Within India, several strands of research have examined the pandemic's impact on tourism, each covering part of the picture. A seasonal ARIMA model applied to foreign tourist arrivals estimates a shortfall of roughly 7.5 million visitors between March and December 2020, equivalent to roughly three quarters of a normal year's inflow (Arshad *et al.*, 2023)<sup>[2]</sup>.

Income and wage losses among tourism and hospitality workers, estimated through a representative household panel and a difference-in-differences approach, show a stark picture (Maiti, 2022)<sup>[19]</sup>. For workers who retained some earnings, income fell by 3 to 6 per cent; once those who lost all income are counted, the average fall rises to nearly 59 per cent. The study is a useful corrective to aggregate arrival statistics, which tend to mask the human cost of disruption, though it treats tourism as a homogeneous sector and cannot say whether losses were evenly distributed across destination types or concentrated in particular corridors.

Survey evidence from workers and businesses in Haridwar and Dehradun, the two principal gateway cities for the Char Dham Yatra, provides a geographically closer view (Kumar *et al.*, 2020)<sup>[18]</sup>. Around 60 per cent of respondents reported significant professional disruption, with income regularity and payment schedules the most common casualties. The survey captures ground-level detail that aggregate data cannot, though its non-probabilistic sample and early 2020 fieldwork window mean the full duration and depth of the disruption remained outside its scope.

The Uttarakhand-specific literature offers a fuller sense of local context without yet providing the causal estimates that would allow confident conclusions. Drawing on secondary sources, evidence from Uttarakhand's mountain tourism communities suggests that the pandemic deepened pre-

existing social inequities and that state interventions, though well-intentioned, fell short over the longer term (Mishra & Mishra, 2021) <sup>[22]</sup>.

Firm-level surveys have produced useful revenue loss estimates and revival proposals, though coverage is limited and the analysis does not separate religious destinations from leisure ones (Shrikaant *et al.*, 2023) <sup>[26]</sup>.

Perhaps most relevant to the present paper is evidence on how tourism development along pilgrimage corridors, particularly under the Char Dham National Highway project, shapes disaster recovery at the village level (Chouhan *et al.*, 2023) <sup>[8]</sup>. Mann-Whitney U test results show that villages on tourist routes recover faster from shocks than those off the routes, partly through better livelihood diversification. The finding establishes both the economic centrality of pilgrimage corridors for Uttarakhand's Mountain communities and the acute vulnerability that comes with dependence on a single seasonal flow of visitors.

The literature on religious and pilgrimage tourism in India, though growing, remains predominantly qualitative and prescriptive. The pandemic has been shown to expose structural weaknesses in how pilgrimage events are planned and managed, with a multi-stakeholder resilience framework proposed for the religious tourism supply chain (Mittal & Sinha, 2022) <sup>[23]</sup>. That framework is practically oriented but rests on no empirical estimates of how arrival numbers or revenues actually moved at specific sites.

Applying the crisis management framework of (Faulkner, 2001) <sup>[11]</sup>, the argument has been made that prominent religious sites, including Vaishno Devi, the Golden Temple, and the Ajmer Dargah Sharif, could anchor domestic tourism recovery through staycation and wellness offerings (Manhas & Nair, 2020) <sup>[20]</sup>. The argument is plausible but remains untested against post-pandemic arrival data.

Surveys of the economic potential and infrastructural constraints of the Char Dham Yatra find that inadequate road and accommodation capacity in the higher-altitude stretches limits

the circuit's ability to absorb growing pilgrim numbers, while recent helicopter services to Kedarnath have begun to widen access for elderly and mobility-impaired visitors (Chand & Mishra, 2024) <sup>[7]</sup>. These contributions are valuable for situating the Yatra within Uttarakhand's broader development story, but neither offers a before-and-after comparison of arrival data across destination types, nor any econometric method for isolating the pandemic's differential effect.

Across these three streams, a consistent gap is apparent. The global and India-wide literature establishes the severity of the pandemic shock to tourism but works at a level of aggregation that obscures differences between destination types. The Uttarakhand-specific literature captures local texture through surveys and secondary sources but does not attempt causal identification. The religious tourism literature is well-supplied with frameworks and recommendations but short on empirical estimates. No published study has applied a panel DiD framework to destination-level data to test whether the Covid-19 shock fell with differential force on pilgrimage sites relative to other destinations. This paper addresses that gap by using a balanced panel of 28 destinations in Uttarakhand over 2001 to 2024<sup>[7]</sup>, estimating separate models for total, domestic, and foreign arrivals.

## Data and Methodology

### 1. Data and Variables

This study uses a balanced panel dataset of 28 tourist destinations in Uttarakhand, India, covering the period 2001 to 2024<sup>[7]</sup>, yielding 672 destination-year observations in total. The destinations fall into two broad groups. The first consists of six major religious pilgrimage sites. The second comprises 22 recreational or leisure destinations. Annual tourist arrival figures, disaggregated by domestic and foreign visitors, were sourced from the Uttarakhand Tourism Development Board (Uttarakhand Tourism Development Board, 2025) <sup>[29]</sup>. The detailed breakdown of the dataset and the specific definitions of variables are presented in the tables below:

**Table 1:** Data Structure, Classification of Tourist Destinations and Variables

Category	Description
Dataset Type	Balanced Panel Data
Study Period	2001 – 2024 (24 Years)
Total Observations	672 destination-year observations (28 destinations×24 years)
Destination Groups	Religious (6): Kedarnath, Badrinath, Hemkund Sahib, Gangotri, Yamunotri, Haridwar. Recreational/Leisure (22): Dehradun, Mussoorie, Nainital, Rishikesh, Corbett, Almora, Pithoragarh, Pauri, Srinagar, Kotdwar, Rudraprayag, Gopeshwar, Joshimath, Auli, Valley of Flowers, Tehri, Uttarkashi, Ranikhet, Kausani/Bageshwar, Champawat, Kathgodam and Udham Singh Nagar
Variables	
LogTotal	Log transformation of total tourist arrivals
LogDomestic	Log transformation of domestic tourist arrivals
LogForeign	Log transformation of foreign tourist arrivals

Log( $x + 1$ ) transformation is applied to foreign arrivals. This is a standard econometric approach (Silva & Tenreiro, 2006) <sup>[27]</sup> to account for zero observations recorded in specific religious sites like Hemkund Sahib, Gangotri, and Yamunotri, where a direct logarithm would be mathematically undefined.

### 2. Identification Strategy

This study uses the Difference-in-Differences (DiD) method (Angrist & Pischke

, 2009; Bertrand *et al.*, 2004) <sup>[1, 5]</sup> to estimate the causal effect of the Covid-19 pandemic on religious tourism in Uttarakhand. The DiD approach compares how tourist arrivals changed between the pre-pandemic and pandemic periods for religious destinations relative to recreational destinations. Any change common to both groups is netted out, so what remains is the effect specific to the treatment group, that is, the religious destinations. The treatment assignment and temporal breakdown are summarised in Table 2 below:

**Table 2:** DiD Study Design and Treatment Assignment

Variable	Treatment Group ( $D_{Rel}=1$ )	Control Group ( $D_{Rel}=0$ )
Destination Type	Religious/Pilgrimage Sites	Recreational/Leisure Sites
Sample Size (N)	6 Destinations	22 Destinations
Pre-Treatment Period	Years prior to 2020 ( $D_{Covid}=0$ )	Years prior to 2020 ( $D_{Covid}=0$ )
Post-Treatment Period	2020–2021 ( $D_{Covid}=1$ )	2020–2021 ( $D_{Covid}=1$ )
Policy Context	Mass gathering bans & lockdowns	General mobility restrictions

### 3. Econometric Specification

The baseline DiD panel regression is:

Where  $i$  indexes destinations ( $i = 1, 2, \dots, 28$ ) and  $t$  indexes years ( $t = 2001, \dots, 2024$ )<sup>[7]</sup>. The term  $\alpha_i$  represents destination-specific fixed effects, which absorb all time-invariant characteristics at the destination level, such as geographical location, religious importance, and existing infrastructure. Because ‘ $D_{Rel}$ ’ does not vary over time for any given destination, it is completely absorbed into these fixed effects and does not appear separately in the equation. The coefficient  $\beta_1$  picks up the average effect of Covid-19 that is common to all destinations. The coefficient  $\beta_2$  is the diD estimator of interest: it measures how much more, or less, tourist arrivals at religious destinations changed during 2020 to 2021<sup>[20, 22]</sup> compared to the change at recreational destinations.

The error term  $\varepsilon_{it}$  is modelled with a first-order autoregressive correction, AR (1). Without this correction, the Durbin-Watson statistic (Durbin & Watson, 1950<sup>[10]</sup>, 1951) was approximately 0.65, pointing to strong positive serial correlation in the residuals. After adding AR (1), the Durbin-Watson statistic rose to around 2.00 across all three specifications. White cross-section heteroskedasticity-robust standard errors (White, 1980)<sup>[30]</sup> are used throughout to guard against non-constant error variances across destinations. Cross-section fixed effects are retained in all specifications, in line with standard practice in panel econometrics (Mundlak, 1978; Wooldridge, 2010)<sup>[24, 31]</sup>, because many destination-level characteristics that could confound the estimates, such as altitude, road connectivity, and seasonal closure of high-altitude shrines, do not change over the sample period.

Equation (1) is estimated three times: once with log of total arrivals as the outcome, once with log of domestic arrivals, and once with Log (foreign arrivals + 1). This disaggregation matters because domestic and international visitors faced quite different restrictions during the pandemic. Domestic travel was subject to lockdowns and curfews, while foreign arrivals were additionally constrained by visa suspensions and international flight cancellations. Comparing the DiD estimates across the two groups helps to separate these mechanisms.

## Results and Discussion

### 1. Main DiD Estimates

Table 3 reports the DiD estimates from the three panel fixed effects models with AR (1) correction. All models fit the data well. The  $R^2$  values of 0.911 for total and domestic tourism and 0.8 for foreign tourism indicate that the models account for a large share of the variation in tourist arrivals. The lower fit for foreign arrivals is expected given the higher inherent volatility of international visitor counts, especially at remote pilgrimage sites where foreign arrivals can fall to zero in some years.

**Table 3:** DiD Estimation Results (Panel Fixed Effects with AR(1) Correction)

Variable	LogTotal	LogDomestic	LogForeign
Constant	12.620*** (0.153)	12.610*** (0.154)	6.823*** (0.127)
$D_{Covid}$	-1.178*** (0.175)	-1.175*** (0.176)	-2.011*** (0.465)
DiD ( $D_{Rel} \times D_{Covid}$ )	-1.252*** (0.121)	-1.254*** (0.119)	-1.259*** (0.280)
AR(1)	0.712*** (0.068)	0.712*** (0.067)	0.524*** (0.069)
Observations	644	644	644
$R^2$	0.911	0.911	0.800
Adjusted $R^2$	0.907	0.907	0.790
Durbin-Watson Statistic	2.009	2.013	1.926
AIC	1.428	1.436	2.908

**Source:** Authors’ compilation. White cross-section robust standard errors in parentheses. \*\*\* $p < 0.01$ . All models include cross-section fixed effects.

The coefficient on  $D_{Covid}$  is negative and significant at the 1 per cent level in all three models. For total arrivals, the estimate of  $-1.178$  translates to a decline of roughly 69.2 per cent relative to the pre-pandemic period, computed as  $(e^{-1.178} - 1) \times 100$ . The corresponding figure for domestic arrivals is almost identical at 69.1 per cent. The drop in foreign arrivals is far sharper at 86.6 per cent, driven by the additional layer of international travel restrictions, visa suspensions, and disruptions to commercial aviation that hit inbound tourism in 2020 and 2021<sup>[20, 22]</sup>.

The DiD coefficient is negative and significant at the 1 per cent level across all three specifications. Religious destinations suffered an additional fall of approximately 71.4 per cent in total arrivals over and above the general pandemic decline, with near-identical figures of 71.5 per cent for domestic arrivals and 71.6 per cent for foreign arrivals. Table 4 sets out these percentage effects alongside the combined net impact on religious sites.

**Table 4:** Percentage Effects from DiD Estimates

Effect	Total Tourism	Domestic Tourism	Foreign Tourism
Overall Covid-19 Effect ( $D_{Covid}$ )	-69.2%	-69.1%	-86.6%
Differential Effect on Religious Destinations (DiD)	-71.4%	-71.5%	-71.6%
Combined Net Effect on Religious Destinations	-91.4%	-91.3%	-97.7%

**Source:** Authors’ compilation. Percentage effects computed as  $(e^{\text{coefficient}} - 1) \times 100$ . Combined net effect for religious destinations = overall Covid-19 effect plus differential DiD effect.

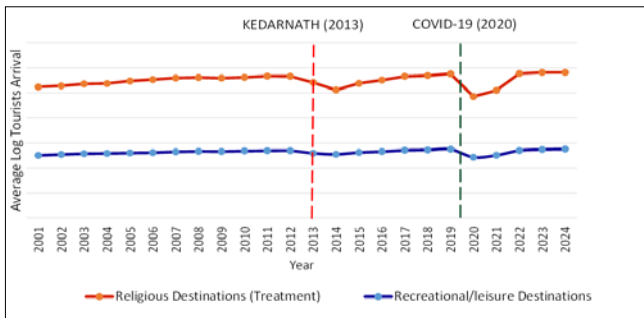
The combined net effect on religious destinations amounts to about 91 per cent for total arrivals and nearly 98 per cent for foreign arrivals. The Char Dham pilgrimage circuit and Haridwar were, for all practical purposes, closed to mass tourism through 2020 and 2021<sup>[20, 22]</sup>.

The DiD coefficients across the three models are strikingly close:  $-1.252$ ,  $-1.254$ , and  $-1.259$ . If the disruption had been driven primarily by the collapse of international tourism, the foreign-arrivals model would show a substantially larger DiD estimate than the domestic-arrivals model. The near-identical figures point elsewhere. The primary driver appears to be the cancellation or severe curtailment of mass pilgrimage events. The Char Dham Yatra, which takes the faithful to Kedarnath, Badrinath, Gangotri, and Yamunotri each summer, and the Haridwar Kumbh Mela were either called off or capped at a tiny fraction of their usual scale in 2020 and 2021<sup>[18, 28]</sup>. These gatherings draw millions of visitors every year and form the economic backbone of religious tourism in Uttarakhand. Their disruption hit domestic and foreign visitors in equal measure, which explains the near-identical DiD estimates across the two groups.

The AR(1) coefficients are positive and significant in all models, at 0.712 for total and domestic tourism and 0.524 for foreign tourism. The inverted AR roots of 0.71 and 0.52, both below unity, confirm that the models are dynamically stable. The Durbin-Watson statistics of 2.009, 2.013, and 1.926 confirm that serial correlation has been adequately addressed.

## 2. Parallel Trends

The validity of the DiD estimates depends on whether religious and recreational destinations were on parallel paths before 2020<sup>[20]</sup>. Figure 2 plots mean log tourist arrivals for the two groups across the full sample period. The two series move together from 2001 to 2019, including a simultaneous dip around the 2013<sup>[3]</sup> Kedarnath floods. This co-movement gives confidence that any difference in tourist arrival trends after 2019 can be attributed to the pandemic and not to some pre-existing divergence between the two groups. The lines part visibly from 2019 to 2020, with the religious destinations group falling more steeply, which matches the DiD estimates



Source: Authors' construction

Fig 2: Mean LogTourists Arrivals, Religious vs. Recreational Destinations, 2001-2024

It is worth noting that the DiD interaction term ( $D_{Rel} \times D_{Covid}$ ) equals zero throughout 2001 to 2019 by construction, since  $D_{Covid}$  takes the value of one only in 2020 and 2021<sup>[28]</sup>. There is therefore no differential pre-treatment variation to account for, and the identification setting is clean.

## 3. Placebo Test

As a check on the main findings, a placebo test is run by assigning a fake post-treatment period to 2015 and 2016, years that had nothing to do with the pandemic. This approach follows the standard practice in the DiD literature of using falsified treatment dates to verify that estimated effects are not artefacts of pre-existing trends (Bertrand *et al.*, 2004)<sup>[5]</sup>. A placebo DiD variable is constructed as ( $D_{Rel} \times D_{Placebo}$ ) and the baseline model is re-estimated using this variable in place of the actual DiD term. Table 5 reports the results.

Table 5: Placebo Test: Fake Post-Treatment Period: 2015–2016

Variable	Coefficient	Std. Error	t-Statistic	p-value
Constant	12.431	0.229	54.326	0.000
$D_{Placebo}$	0.022	0.141	0.153	0.880
$DiD_{Placebo}$	0.049	0.131	0.371	0.714
AR(1)	0.571	0.116	4.915	0.000
$R^2 = 0.851$		Observations = 644		

Source: Authors' compilation. White cross-section robust standard errors. Cross-section fixed effects included throughout. Dependent Variable: Log (Total Arrivals)

The placebo DiD coefficient is 0.049 with a p-value of 0.714, so it is neither economically meaningful nor statistically significant. The fake post-period dummy is equally insignificant. These results confirm that there was no differential trend between religious and leisure destinations in the pre-pandemic years, which in turn means that the large negative DiD estimates genuinely reflect the Covid-19 shock rather than some longer-running pattern in the data.

## 4. Panel Causality Analysis

To understand the direction of relationships among the key variables, pairwise panel causality tests are carried out (Dumitrescu & Hurlin, 2012)<sup>[9]</sup>. This procedure is well suited to heterogeneous panels because it allows causal relationships to differ across cross-sections rather than forcing a single estimate on the whole panel. Table 6 reports the W-statistics, Z bar-statistics, and associated p-values for all pairwise combinations of interest.

Table 6: Pairwise Dumitrescu-Hurlin Panel Causality Tests

Null Hypothesis ( $H_0$ )	W-Stat	Z bar-Stat	p-value	Decision	Causality
Tourism Flows					
LogDomestic does not Granger cause LogForeign	8.5677	12.8632	0.000***	Reject $H_0$	Yes
LogForeign does not Granger cause LogDomestic	3.8723	3.2779	0.001***	Reject $H_0$	Yes
Covid-19 Shock and Tourism					
$D_{Covid}$ does not Granger cause LogForeign	15.5338	27.0842	0.000***	Reject $H_0$	Yes
LogForeign does not Granger cause $D_{Covid}$	1.7754	-1.0027	0.316	Fail to Reject	No
$D_{Covid}$ does not Granger cause LogDomestic	5.2162	6.0213	0.000***	Reject $H_0$	Yes
LogDomestic does not Granger cause $D_{Covid}$	1.8433	-0.8641	0.388	Fail to Reject	No
Kedarnath Floods (2013) and Tourism					
$D_{Ked}$ does not Granger cause LogForeign	2.0894	-0.3617	0.718	Fail to Reject	No

LogForeign does not Granger cause $D_{Ked}$	0.9482	-2.6914	0.007***	Reject $H_0$	Yes
$D_{Ked}$ does not Granger cause LogDomestic	1.9402	-0.6662	0.505	Fail to Reject	No
LogDomestic does not Granger cause $D_{Ked}$	0.7679	-3.0595	0.002***	Reject $H_0$	Yes

**Source:** Authors' compilation

\*\*\* denotes rejection of the null hypothesis at the 1 per cent significance level.  $D_{Ked}$  is a binary variable taking the value one for 2013<sup>[3]</sup>, the year of the Kedarnath floods, and zero otherwise.

Domestic and foreign arrivals Granger-cause each other at the 1 per cent level. This bidirectional causality points to complementary demand: destinations that draw large numbers of domestic visitors tend over time to attract more foreign visitors as well, and vice versa. This is consistent with a gradual process of international discovery of destinations that are already well-established on the domestic circuit.

$D_{Covid}$  Granger-causes both domestic and foreign arrivals, while neither arrival series causes  $D_{Covid}$ . This one-way pattern is precisely what one would expect if the pandemic is a genuine external shock to the tourism system. The absence of reverse causality rules out the possibility that pre-existing trends in tourist flows had any bearing on the timing or intensity of the pandemic shock, which lends further credibility to the DiD identification strategy.

$D_{Ked}$  does not Granger-cause either domestic or foreign arrivals at conventional significance levels. The reverse, however, holds: both arrival series Granger-cause  $D_{Ked}$ . This result is best understood in the context of how the Dumitrescu-Hurlin test works. The test operates across the full panel of 28 destinations, not just Kedarnath. The 2013<sup>[3]</sup> floods affected only Kedarnath directly, while the other 27 destinations continued on their usual trajectories. Across the panel as a whole, therefore, tourist arrival patterns systematically precede the dummy variable, producing the observed direction of causality. The result should not be read as implying that tourist volumes in some way caused the floods; rather, it reflects a statistical artefact of a heterogeneous panel where the shock was highly localised.

### Discussion

The results are consistent across all three model specifications and hold up to a placebo test. Pilgrimage destinations were hit considerably harder than leisure destinations, with total arrivals falling by around 91 per cent at the former compared to roughly 69 per cent at the latter.

The near-identical DiD coefficients for domestic and foreign arrivals are perhaps the most telling feature of the results. Pilgrimage tourism in Uttarakhand is overwhelmingly domestic in character: foreign visitors account for a very small share of arrivals at Char Dham sites and Haridwar under normal conditions. One might therefore have expected the pandemic to affect religious and recreational destinations more or less equally on the domestic side, with the differential impact showing up mainly on the foreign side through international travel restrictions. The data indicate otherwise. The symmetric differential impact points to a supply-side mechanism, not a demand-side one. The cancellation of the Char Dham Yatra and the scaling back of the Kumbh Mela removed the very events around which pilgrimage tourism is organised. Unlike leisure or adventure tourism, where visitors can reschedule or choose alternative destinations, pilgrimage travel is tied to specific sites and, in many cases, to specific dates on the religious calendar. Cancelling the event is, in effect, equivalent to closing the destination.

The policy consequences are fairly direct. The economic consequences of the pandemic fell with particular force on the communities that line the pilgrimage routes: the small guesthouses, dhabas, palanquin operators, pony owners, and local guides who depend almost entirely on the seasonal flow of pilgrims. These communities already face a short earning window each year, generally from May to November, before high-altitude roads close for winter. A near-total loss of income for two consecutive seasons would have been extremely difficult to absorb, especially in the absence of a formal social safety net. Future pandemic preparedness plans for mountain tourism states like Uttarakhand should include income support mechanisms specifically designed for the informal pilgrimage economy, alongside broader measures for the tourism sector as a whole.

The finding contributes to work on the uneven distribution of pandemic-related shocks within tourism economies (Gössling *et al.*, 2020; Hall *et al.*, 2020) <sup>[20]</sup>. The Uttarakhand case shows that the vulnerability of a destination depends not just on its reliance on tourism in general but on whether its tourism is event-driven and congregation-based. Where it is, the disruption from public health restrictions goes well beyond what aggregate tourism statistics suggest.

### Conclusion

The study addresses the critical question of whether the Covid-19 pandemic impacted pilgrimage destinations differently from other tourist locations in Uttarakhand using causal methods. Through a balanced panel analysis of 28 destinations over 24 years, the research confirms that religious sites were hit significantly harder than recreational ones. Pilgrimage destinations experienced an additional decline of approximately 71 percent beyond the general pandemic effect. This resulted in a combined net fall of roughly 91 percent for domestic visitors and 98 percent for foreign visitors, marking a disruption without parallel in the post-independence period for the tourism sector of the state. The primary mechanism behind these findings is the dependence on mass congregation events. Pilgrimage travel to the Char Dham shrines and Haridwar is organised around large gatherings that are structurally incompatible with public health restrictions and social distancing. Unlike leisure travellers who might substitute one hill station for another, the cancellation of the Char Dham Yatra effectively closes the destination because the travel is tied to specific sacred dates and locations. These findings lead to two major policy conclusions. First, pandemic preparedness frameworks must treat congregation-based tourism as a distinct category with specific support instruments, as generic schemes for hotels and transport often fail to reach the informal pilgrimage economy. Second, while pilgrimage tourism is vulnerable during a crisis, it is also exceptionally fast to recover once events resume. Therefore, medium-term planning should focus on diversifying the income base of communities along pilgrimage corridors rather than

reducing the centrality of the pilgrimage itself. Future work should extend these causal estimates to other regions to better target policy support for vulnerable mountain economies.

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