




Article

The Role of Public Events as a Tool for Economic Recovery in an Urban Environment

David Dyason ^{1,2} , Wenyue Ruan ³, Tim Baird ⁴  and Peter Fieger ^{5,6,*} 

¹ Department of Land Management and Systems, Lincoln University, Lincoln 7647, New Zealand; david.dyason@lincoln.ac.nz

² TRADE Research, North-West University, Potchefstroom 2520, South Africa

³ School of Landscape Architecture, Lincoln University, Lincoln 7647, New Zealand; ruanwenyue123@gmail.com

⁴ Department of Agribusiness and Markets, Lincoln University, Lincoln 7647, New Zealand; tim.baird@lincoln.ac.nz

⁵ Institute of Education, Art and Community, Federation University, Mount Helen 3350, Australia

⁶ Business School, University of New England, Armidale 2350, Australia

* Correspondence: p.fieger@federation.edu.au

Abstract: This study investigates the effects of events in the New Zealand city of Christchurch's Central Business District (CBD) on pedestrian movements over the period from 2018 to 2020. Christchurch represents an ideal example of how contemporary urban design and marketing techniques can be combined to attract people to places that have been negatively affected by a natural disaster. Events played an integral part of the regeneration efforts to attract pedestrians and support economic recovery. Through analysing hourly pedestrian movements in the rebuilt and revitalised parts of the city, results show that public events contribute positively to pedestrian volumes; however, the result is not statistically significant. Common cause, rather than entertainment events, draw larger pedestrian volumes, reflecting a stronger preference for events that contribute to social coherence after the disruptive event. Pedestrian visitations during the summer months, holidays, and from Thursday to Saturday have a positive effect on pedestrian volume and even non-event days draw pedestrians to the CBD, a likely result from the regeneration narrative and personal experience associated with the renewed CBD. This research shows how the importance of temporal effects challenges the role of events as a stand-alone tool designed to drive economic recovery within a revitalised urban environment.



Academic Editor: Jesús M. González-Pérez

Received: 27 February 2025

Revised: 26 March 2025

Accepted: 8 April 2025

Published: 21 April 2025

Citation: Dyason, D.; Ruan, W.; Baird, T.; Fieger, P. The Role of Public Events as a Tool for Economic Recovery in an Urban Environment. *Urban Sci.* **2025**, *9*, 135. <https://doi.org/10.3390/urbansci9040135>

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: urban revitalisation; urban resilience; urban renewal; tourism; events; Ōtautahi; Christchurch; earthquakes; disaster tourism

1. Introduction

It is not often that the Central Business District (CBD) of a city an opportunity to start afresh in redefining and regenerating urban framework that has often been subjected to decades, and sometimes even centuries, of urban development which can make for a high degree of complexity in urban renewal projects. While overcoming the detrimental effects of the 2010/2011 earthquakes which resulted in significant damage to the central city, the city of Christchurch in New Zealand had this opportunity. The ensuing rebuild of the city required demolition of substantial parts of the CBD [1]. Local decision makers decided that this process of regeneration should be accompanied by an economic recovery that prioritised social, economic, cultural, and environmental factors which supported both the natural and built environments [2]. Attracting people into the central city to work and play

was a key part of this strategy [3]. The ability to attract pedestrians into the CBD was seen as contributing to regenerating the central city as this would bring with it the opportunity to generate economic activity through expenditure by locals, visitors and tourists [4].

Similar to other cities aiming for economic recovery, Christchurch rebuild strategy provided an opportunity to improve pedestrian infrastructure in order to attract pedestrians, encouraging interactions with local businesses and boosting the overall economic environment for the affected area [5]. The positive relationship between pedestrian interactions and retail sales have strong support in the literature [4,6,7]. Well-developed urban fabrics support positive interaction between retail and pedestrian volumes, leading to economic vitality [8]. In addition, major events have been used as a tool to regenerate areas experiencing economic deterioration resulting from deindustrialisation. Events support the development of certain industries and serve as a tool to enhance a place's image [9], with public events playing a crucial role in attracting pedestrians. Therefore, it is reasonable to advocate for such events as they play a central part as an economic recovery tool within the mechanisms of urban regeneration [10].

In a contemporary urban environment, the regeneration of urban spaces alongside pedestrian activity fulfills an important role in enhancing the sustainability of communities. It contributes to not only the economic and social aspects which regeneration can bring but also contributes to environmental well-being aspects as well [11]. Within the Christchurch central city, the greening and development of shared spaces has provided a strong focus for urban planners who wanted to improve walkability in the area in order to support increased foot traffic [3,12]. Such efforts often boost retail sales, creates more vibrant public spaces, and builds a positive public image, making these cities more appealing to residents and visitors whilst also promoting sustainable urban growth [13–15]. Therefore, this research explores whether events have played a meaningful role in attracting more pedestrians to the area concerned [10], with the overarching objective being to understand the role that events play during economic recovery through attracting pedestrians to urban areas. The findings from this research aims to support the development of more resilient and sustainable CBDs, which also in turn helps to foster economic growth and social vibrancy within these urban spaces.

This study utilizes a time series regression analysis of pedestrian Smart Data from within the Christchurch CBD to analyse pedestrian flows between 2018 and 2020. This area offered a unique and insightful case study on the relationship between pedestrian behaviour and events to provide guidance for those in positions of governance who are involved in the planning of activities and conducting urban development research.

The following research questions were formulated to achieve this research objective. Firstly, the question was posed as to whether public events were supporting the economic recovery of the Christchurch CBD through attracting a greater number of visitors. Secondly, this research asked what types of events were preferred while the third question focused on how important temporal aspects were to event attendance in the Christchurch CBD.

The structure of this paper is as follows; the next section provides a literature review on pedestrian behaviour, events, urban regeneration, resilience, and how pedestrian behaviour is measured. The focus of this study then turns to introduce the data sources alongside detail around the analytical processes utilised in this study. This then leads into a discussion based around the methods used in this study followed by a presentation of the results. Finally, an assessment of the key findings is provided, which is then followed by a discussion of the limitations of this study and the overall conclusion that was reached.

2. Literature Review

The extant literature within this topic area indicates that a broad series of approaches have been applied by researchers in this domain. To examine these approaches, the following section will firstly examine research into pedestrian behaviour and then examine this behaviour within event situations. Several of the approaches which have been used to measure pedestrian behaviour will then be discussed before research into the area of urban regeneration and resilience is highlighted

Knowing how pedestrians behave is very important for city planning, design, and management; it influences not only the aesthetic appeal of an urban environment but also plays a significant part in the economic growth of these areas [16–18]. The importance of this concept of aesthetic appeal is grounded in whether an area is pleasant to walk around, and by encouraging people to do so, cities as a direct consequence can become safer, more welcoming, and environmentally friendly [19]. However, the ease with which people walk around urban environments can easily be compromised by the number of unnecessary obstacles placed in their way; this can also destroy the linkages between major living areas and downtown areas [20]. Knowing how pedestrians move within cities introduced three key ideas designed to guide urban design which were accessibility, visibility, and intelligibility [21]. These three concepts helped to explain the physical, visual, and mental aspects needed for pedestrians to move around easily within the built environment [21]. Walkability is increasingly seen as a principle that forms part of urban regeneration where it contributes to the social, economic and environmental attractiveness of places [22], and the popularity and positive association of events often mean that government agencies are keen to use this ‘power’ to achieve social, economic and environmental outcomes [9].

A study of pedestrian movements in the Abu Dhabi city centre suggested that the mix of land use and patterns of development affects pedestrian traffic in streets and public spaces [23]. This research highlighted the importance of land use, spatial layouts, and street network configurations to enhance pedestrian activity in city centres [23]. It is also important to acknowledge that pedestrian behaviour not only occurs at ground level; a study of the Montreal underground found that while location had a significant impact on pedestrian behaviour, but service availability also had a mixed impact on pedestrian behaviour in these environments [24]. The inclusion of wider paths and more plants in parks has been shown to encourage walking, especially among teenagers, and city planners need to be aware that the placement of such features in parks can help people to become more active [25]. The implementation of green spaces and changing infrastructure to create an ease within which pedestrian behaviour can occur has been identified as having the ability to enhance both the living quality and economic activities which occur within urban areas [26]. As events represent an important economic draw card in terms of both domestic and international tourism for many urban areas [27], studying pedestrian behaviour in these situations can help reduce congestion and serve to make events a more memorable experience for the participants involved [28]. Within the event space festivals can affect pedestrian accessibility in urban spaces, and this can impact visitor satisfaction during events [29]. Three factors—which included the accessibility of amenities, pedestrian safety, and—mobility were found to significantly influence visitor satisfaction with the festivals [29]. Being able to analyse patterns of crowd movement at large scale events has been noted as presenting a challenge in terms of predicting the actual patterns of movement which occur, and this has pointed towards the importance of realistic crowd simulation models [30].

The challenge of predicting exactly where pedestrian crowd movements will occur within dynamic environments is not just limited to events such as festivals, however. In a study of pedestrian movements in the historic city of Venice, the movements of tourists

alongside those of locals have created considerable friction, and even caused damage to important historical monuments [31]. The researchers behind this study went on to state the following:

On one hand the frailty of the cultural heritage is incompatible with presence of big tourist flows, [yet] on the other hand the daily life of residents is heavily conditioned by the presence of tourists. However, the relevance of the tourism economy advises against restriction policies that would limited a priori the tourists' numbers ([31], p. 2).

Situations such as this illustrate the struggle that city planners who work in historic cities such as Venice face when dealing with what is termed as overtourism [32,33]. GPS tracking of pedestrians was utilised in the aforementioned study designed to analyse movement patterns in Venice [31]; the value of such data becomes questionable when there is a constant movement of both visitors and locals, which then makes it difficult for urban planners to differentiate between the two groups and to know exactly where areas are which could benefit from better pedestrian flow management. The actual measurement of pedestrian behaviour within urban environments has been an area of some contention among researchers in terms of what the best method is to use to do this. The Multi-Dimensional Alignment Method [MDAM] has been used to show how urban renewal can benefit from understanding how people move around within a particular area [34]. Through employing cluster analysis pedestrians were grouped into five types, and this showed that there were common patterns in how people walked and behaved within a built environment [34]. The exploration of the relationship between the built environment and the proportion of pedestrian traffic has also suggested the need for the introduction of two different indices: one for the city level (macro), and one for the community level (micro) [35].

Macro-level pedestrian flows have been the subject of research in Barcelona, Spain, where people were tracked as they moved around in open spaces with the aim of seeing which activities attracted their attention [36]. This study created a universal modelling framework based on Langevin dynamics, which helped to show how different elements can affect how people move around in a built environment [36]. Measuring how pedestrian flows can influence economic activity at the macro-level has served as the basis of research which employed an Attraction-Based Matrix Factorisation model (ABMF) to enable the prediction of pedestrian flows at business events [5]. The concept of "Nigiwai" as an indicator of how busy an area is was another method which has been used to be able to differentiate between people actually shopping within a precinct and those who are just passing through even when an area is very crowded [37]. As most of the research in this area has occurred at the macro-level, there also needs to be a note of what occurs at the micro-level, and this is where the understanding of regional differences in pedestrian mobility has been noted as being primarily related to socio-spatial segregation [35].

The Participatory Assessment Method [PAM] examined pedestrian movements in Lisbon, Portugal through a case study approach [38]. This study found that by accessing local knowledge it was much easier to understand what problems pedestrians might face, and the results showed that this method was able to more accurately reflect what people thought about the quality of walking areas [38]. Shared spaces between cyclists and pedestrians also need to be considered in terms of not only the quality, but also the safety of, walking areas. In a study exploring non-motorised human mobility in Boston two sets of data were analysed from the same location and time which focused on how people walk and bike [39]. This research looked at the differences in how these two activities happen and their effects and explained how both weather conditions and the time of day can influence the choice of either walking or biking within urban areas [39].

A further stream of literature around the measurement of pedestrian behaviour exists within the field of what is known as Pedestrian Dynamics [PD]. Agent-Based Modelling [ABM] tools which have been used in research in this field have played a critical role in bridging the gap between theory and practice [40]. This has allowed urban planners to visualise built environments, which in turn helps to improve the understanding of pedestrian behaviour in urban settings [40]. The pros of ABM in measuring PD due to its ability to capture events as they unfold include its timeliness and cost-efficiency [41]. However, not all computational systems are perfect, and the downside is that the effectiveness of ABM can be reduced if there are large numbers of agents involved in the simulation of an urban environment [40]. Based on this evidence using camera-based methods for obtaining pedestrian count data provides a more reliable way of finding out what is actually happening at street level rather than basing urban planning decisions simply on computerised simulation methods alone.

Ensuring that urban regeneration is conducted in a way that not only considers the needs of the end user but is also mindful of the need to be resilient for future generations has seen a number of studies permeate this area. Community participation and involvement has resonated as being fundamental in research conducted into urban regeneration in Glasgow, with the findings showing that that even though social context was important, economic drivers were always at the forefront of such activities [42]. The scale upon which regeneration is undertaken has also been a topic of some contention- within the event space [9,43,44]; research which focused on the effects of the lead up to the 2016 Olympic Games in Rio De Janeiro showed that the ambitions of political leaders had failed to incorporate long-term resilience in their plans, and this had led to widespread social inequity and frustration within the local community [45]. Failure to listen to those who will be engaging with public spaces once large-scale events have come and gone and the subsequent reactions of those communities also echo what occurs to communities when a large-scale disaster happens in an urban environment. The importance of collective action and the integration of ideas around the use of urban environments as a catalyst towards ensuring that local communities [46] need to ensure lessons learnt from debacles such as the 2016 Olympic Games in Rio De Janeiro are not lost. The urban reconstruction processes should also be reframed in a way which not only incorporates the physical aspects of this process but also allows reconstruction to work as an ecosystem, which includes showing respect for local communities to further strengthen these groups in the aftermath of an event or disaster which may have caused disruption and upheaval for these sections of society [47].

3. Data

This research analyses the pedestrian traffic movements in the central city area of Christchurch from 2018 to 2020, with a particular focus on the Oxford Terrace location (see Figures 1 and 2). 'The Terrace', as it has become known since the earthquakes, is a central area within the revitalised CBD which allows for a detailed observation of urban redevelopment and pedestrian movement patterns. This study aims to understand how public events affect foot traffic, which is a key factor in urban planning and driving economic growth in the city centre [48]. The extensive rebuilding efforts following the 2010 and 2011 earthquakes in Christchurch has provided a unique case study for academics who are focused on examining the complexities of urban dynamics [49].

Pedestrian count data were sourced from the Christchurch City Council, who collect daily pedestrian volume data through the Smart Christchurch programme [50]. The programme has several cameras located within the central city to capture the hourly movement of pedestrians. For this study, pedestrian movement within The Terrace was used, which is an area adjacent to the Avon River and the Bridge of Remembrance (see Figures 1 and 2), a central location in the Christchurch CBD. This setting overlooks a green pedestrianised

area which includes parks with flower gardens, trees and other placemaking infrastructure [12]. This location is the city's current premier commercial precinct, with a strong retail and hospitality focus [12]. The Terrace is often used for public events which range from entertainment to social and common cause events [51].

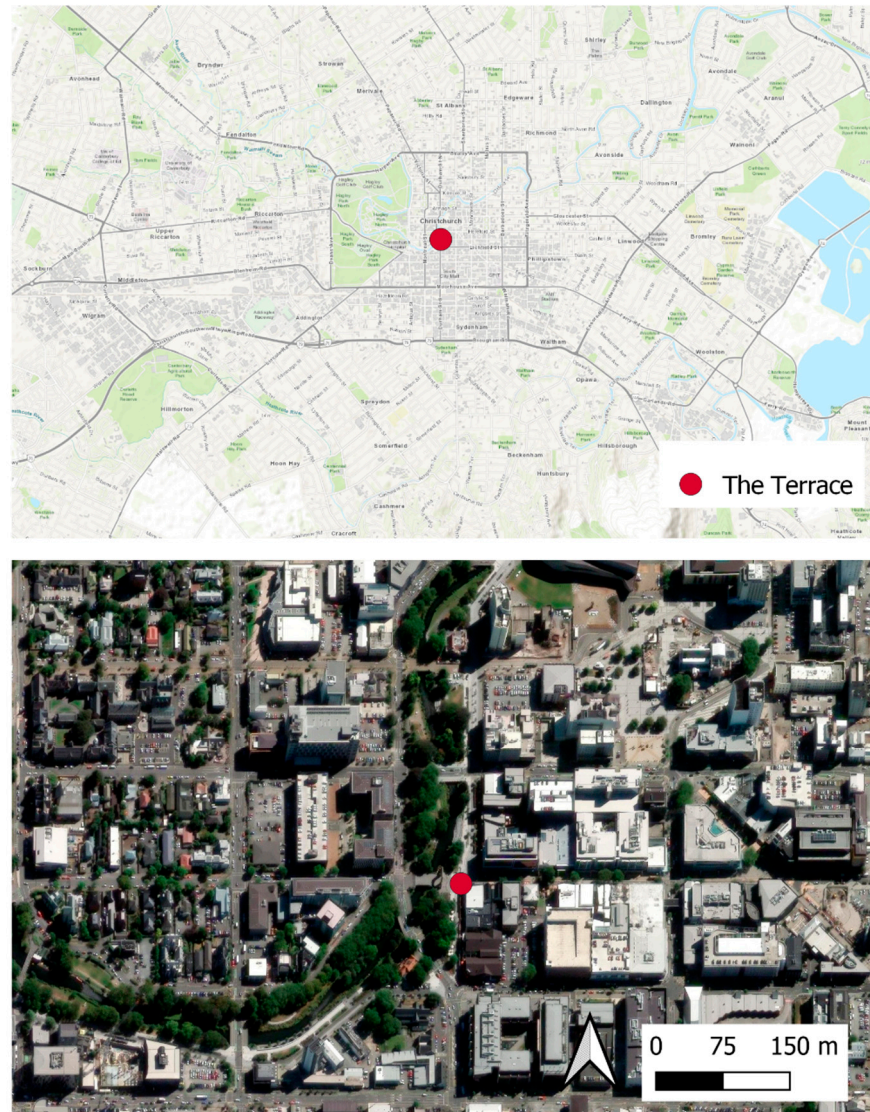


Figure 1. Location of The Terrace location. Source: Authors ex ArcGIS, 2025.



Figure 2. The Terrace in Christchurch CBD. Source: Authors, 2025.

The camera on the corner of Oxford Terrace and Cashel Street (see Figure 1) captures daily and hourly pedestrian movements, and its central location (see Figure 1) enables broad coverage of pedestrian interactions throughout the day. The data obtained from this spanned the period between May 2018 and March 2020. These dates were chosen as it corresponded with the start of the Christchurch Smart City programme and the collection of pedestrian data in 2018 and 2020. The analysis excludes the disruptive COVID-19 lockdown period, as it affected pedestrian movement for nearly two years.

In 2018, a large part of the rebuild programme was completed for this area of the city which includes many new commercial buildings. In addition to this, in 2020 the built environment for the region had largely returned to the demand driven levels of construction activity almost ten years after the earthquake [52]. The data employed in this analysis did not cover the period after March 2020 as the onset of COVID-19 in March 2020 and the subsequent nationwide lockdowns and movement restrictions in New Zealand may have unduly influenced pedestrian movement counts [53]. Where daily pedestrian count gaps were evident in the data, it was filled using seasonal decomposition and interpolation from the R package forecast using a model that adjusts for weekly seasonality.

Data for public events was sourced from the city's economic development agency. The event data provides a location, start and end date, and the event name. Events between May 2018 and March 2020 were identified to align with the pedestrian count data. A total of 72 event days from a total 675 days were available for analysis (see Figure 3a). Figure 3b shows the mean and spread of daily pedestrian volumes for The Terrace, showing the heterogeneity across days with the peak pedestrian movement being on Fridays.

(a) Heterogeneity of data across events (event and non-event days)

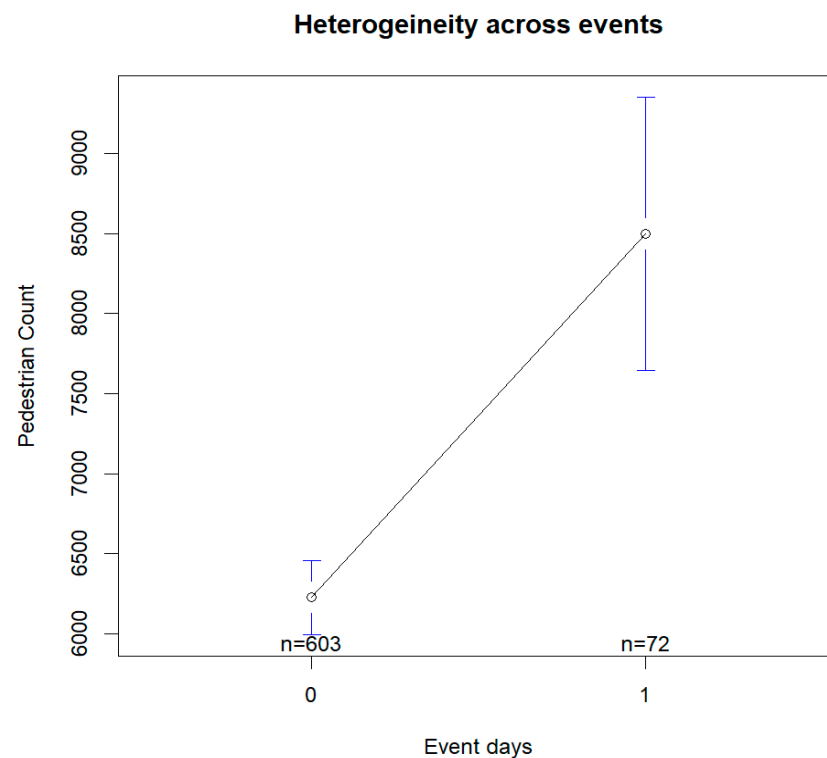


Figure 3. Cont.

(b) Pedestrian count per day of the week

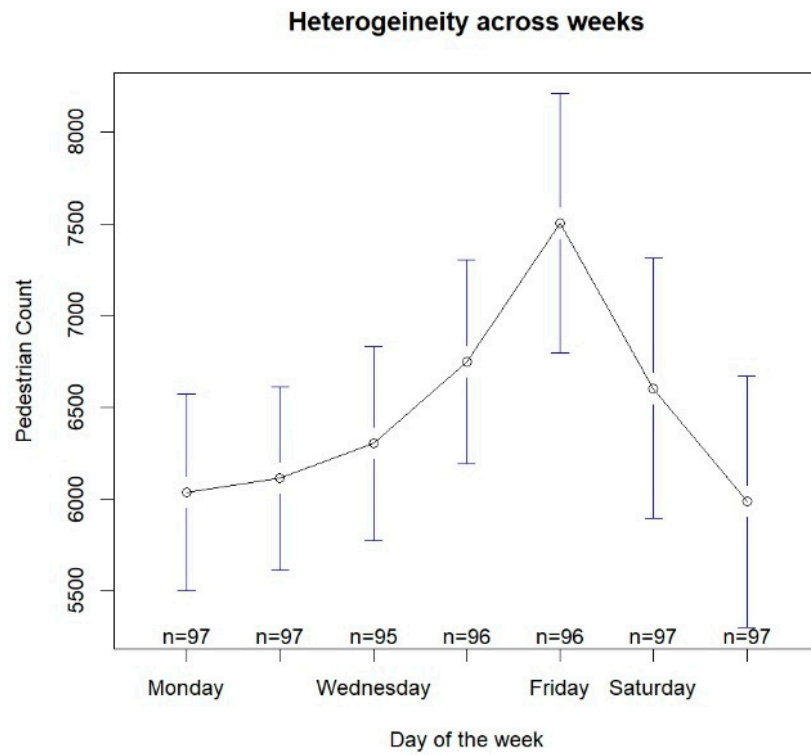


Figure 3. Pedestrian count data. Source: Authors (2025).

The pedestrian count data have changed significantly over a twenty-two-month period as evident in Figure 4, where a generally increasing trend of foot traffic due to progress in the city’s recovery as well as seasonality can be observed. In addition, the spread of the data increases from 2019 onwards, and this is observably greater compared to 2018; the researchers postulate that events could be a contributing factor to these trends.

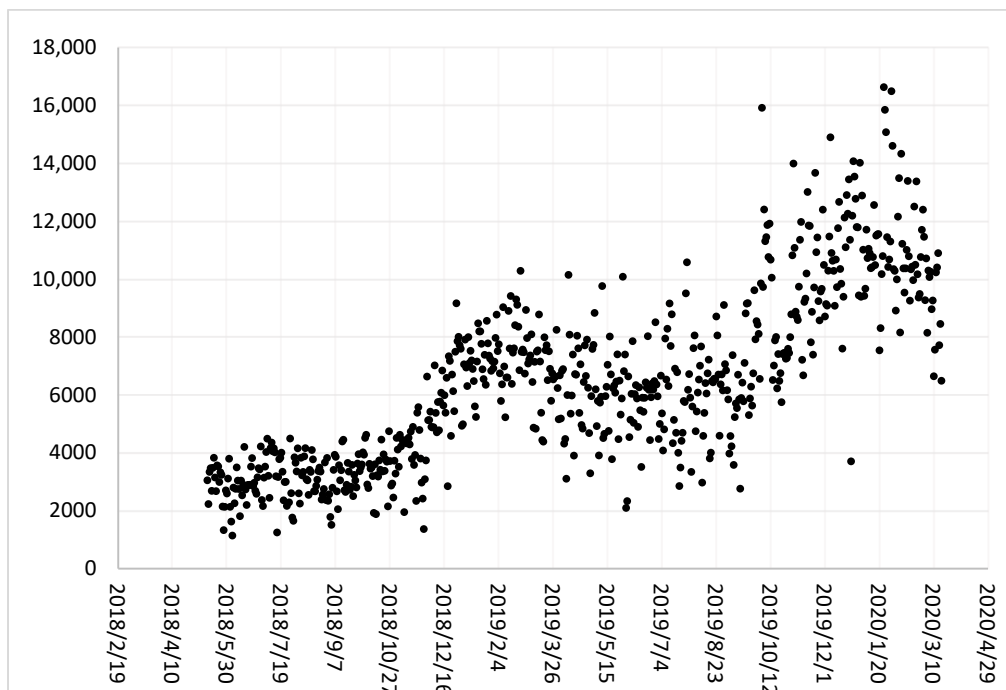


Figure 4. Daily pedestrian count data for The Terrance (2018–2020). Source: Authors (2025).

Over the 22-month period under investigation, a total of 72 events occurred. This study uses the definition of events where the occurrence of an event has a time element, there are at least a couple of participants, and the event is planned [51]. In addition, this study seeks to assess whether the type of event has played a role in pedestrian interactions for the target area to promote urban recovery. Events were classified into four types [51]; these encapsulated professional events, including conferences, conventions, and trade shows; entertainment events, such as festivals, concerts, and exhibitions; social events such as those with a cultural or ethnic focus; and finally common cause events such as rallies, religious, or commemorative events [51]. A total of 72 event days were identified, which included 61 days with an entertainment focus, and 11 event days with a common cause focus.

4. Model Specifications

To determine the effect of events on pedestrian interactions within the study location, the researchers used two different models to capture the impact of the overall effects. As a result, the first model the researchers employed was Ordinary Least Squares (OLS) regression. A visual examination of the relationship between pedestrian counts and events revealed a strong upward trend with seasonal variation. Given the time series nature of the pedestrian data, it was affected by auto-correlation, which can lead to inefficient parameters estimates when using Ordinary Least Squares (OLS) regression. As a result of this, a Prais–Winsten adjustment was used to correct for first-order autocorrelation (AR(1)), thereby ensuring a more reliable parameter estimate. Christchurch is particularly influenced by seasonality as a tourism city [54], and as a result, further explanatory variables are included to account for time sensitive aspects of the data, including weather-related data which may also impact attendance at events.

The model is therefore defined as follows:

$$P_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 W_{it} + \beta_3 M_{it} + \beta_4 H_{it} + \beta_5 R_{it} + \beta_6 Y_{it} + u_{it} \quad (1)$$

where the P is the pedestrian count i at time t , and the explanatory variables for each of the event types (T), days of the week (W), months (M), holidays (H), and daily rainfall measures in millimetres (R) and the year (Y) is present as a control variable. u_{it} is the auto-correlated error term corrected by the Prais–Winsten adjustment. The Prais–Winsten adjustment allows for a more efficient estimation of the linear result by correcting the estimates of the standard errors without the loss of observations like other time-series models [55].

Incorporating the Prais–Winsten adjustment in the model acknowledges the time series nature of the data, incorporating the positive association between time and increasing pedestrian movements in a locality that is experiencing increasing pedestrian movements from externalities, which relates to the rebuilding of a central city. One such externality is the steady growth of office workers who relocated to the central city as rebuilding continued. The lack of reliable and consistent office worker data limits the ability to accurately quantify their impact on pedestrian volumes. This represents an externality within the model, and is captured through the Prais–Winsten adjustment. While there is a risk that the absence of detailed office worker data could result in an over-interpretation of the role of events in influencing pedestrian movement, the researchers do not expect this to substantially change the coefficients and significance levels derived from the model. The OLS model specifications are designed to isolate the effects of events on pedestrian volumes, thereby minimising the potential confounding influence of external forces.

In addition to this, and to ensure the analysis considers the effects of events, two fixed-effects models were presented to account for the changing pedestrian counts. As a result of

the changing pedestrian counts observable for the three years, the first fixed-effect model is to control for unobserved, year-specific characteristics that affect pedestrian counts, while the second model is to account for the event type. The time invariant effects are removed to estimate the relationship between the dependent variable and the independent variables within (i) each year and (ii) each event. The time fixed-effect model specifications are:

$$Y_{it} = \beta_0 + \beta X_{it} + F_{it} + \epsilon_{it} \quad (2)$$

where Y is the dependent variable for entity i at time t , and X is the independent variable for entity i at time t . β is the coefficient for the independent variables, F is the entity-specific fixed effect (this captures unobserved heterogeneity that is constant over time, but varies across entities), and ϵ is the error term. The fixed-effect model represents an ideal model for this research as F removes the mean pedestrian count associated with each year and each event, which allows for the coefficients of the independent variables to be year-or event-specific, and also to show the short-term fluctuations that occur within each year. The first model applies years as the fixed-effect, ensuring that the model controls for unobserved time-invariant characteristics specific to each year that may influence pedestrian counts. The second model applies the event types as the fixed effect in order to control for the event-type invariant characteristics that may affect pedestrian counts.

5. Results and Discussion

The Terrace location in Christchurch represents a greened pedestrian area, ideal for hosting outdoor public events. As highlighted in the literature review, events play a leading role in attracting pedestrians and increasing pedestrian movement, which in turn supports economic activity within these urban areas. By 2018, many new buildings had been completed within the CBD area, leading to increasing occupancy and a mixture of land uses. To quantify the impact of events on pedestrian volumes in the Christchurch CBD, this study applied the models discussed in the previous section. The results from the Prais-Winsten model, presented in Table 1, reveals the extent to which events influence pedestrian flows.

Overall, the model's adjusted R^2 of 0.66 suggests that the explanatory variables included in the model provide for a reasonable fit in modelling pedestrian volume. The results reveal that, compared to Monday (the reference day), pedestrian counts increase by 714 on Thursdays ($p < 0.01$), 1454 on Fridays ($p < 0.01$), and 552 on Saturdays ($p < 0.05$), representing the days with the highest number of pedestrian movements within the central city. The late spring and summer months of October ($p < 0.05$), November ($p < 0.01$) and December ($p < 0.01$), are statistically significant, and show positive coefficients in comparison to the winter months with lower pedestrian volumes. The monthly coefficients reveal that pedestrian volumes are higher by 1106 in October, compared to January, increasing to 2322 in November and peaking at 3509 in December revealing the seasonality effect from, amongst other things, the tourism market. Holidays are significant at the 5 per cent level, and lead to an increase of 660 in pedestrian movement in the central city. Rainfall had a negative impact on pedestrian movements with a 1 mm increase in rainfall resulting in a decrease in pedestrian counts of 85, and this is statistically significant at the 1 per cent level. This finding is supported in the existing literature [56–58]. However, it is possible that pedestrians move inside or undercover during these rainy periods and therefore could possibly still be in the vicinity of the area, but do not walk in an uncovered space [57]. In the case of the Christchurch CBD and The Terrace location, which is an uncovered public space, this implies that the area is subject to weather effects, and this therefore influences pedestrian movement. The results do not show a statistically significant difference between non-event and event days. While event days have a positive coefficient within increasing pedestrian movement, with 270 for entertainment events and 659 for common cause events,

the results suggest that other factors have a more significant effect on pedestrian volumes than events. The significance of the year-specific variables is not surprising (3912 more pedestrians than in 2018 and increasing to 7410 in 2020) and can be attributed to the fast pace of the changing urban environment in Christchurch CBD, with the incremental completions of new commercial buildings, most notably offices and local attractions (such as Tūranga, the new central city library) during the rebuilding period in Christchurch. These additions of offices and local attractions further enhanced the urban environment within this short period of time, attracting more people to the central city.

Table 1. Model Results—Pedestrian Count (Prais–Winsten–adjusted).

Characteristic			
Dependent variable: Pedestrian counts	Beta ¹	Sig ¹	SE ²
Intercept	2468	***	411
Event_type			
None (reference)	—		—
Entertainment	270		216
Common Cause	659		404
Day_of_week			
Monday (reference)	—		—
Tuesday	152		162
Wednesday	228		188
Thursday	714	***	195
Friday	1454	***	200
Saturday	552	**	188
Sunday	−96		165
Month			
January (reference)	—		—
February	614		382
March	−317		418
April	−800		465
May	50		446
June	−473		435
July	−499		403
August	−131		435
September	76		431
October	1106	**	404
November	2322	***	434
December	3509	***	398
Holidays			
None (reference)	—		—
Holiday	660	**	202
Rainfall	−85	***	12
Year			
2018 (reference)	—		—
2019	3912	***	183
2020	7410	***	364
R ²	0.67		
Adjusted R ²	0.66		
No. Obs.	675		
Durbin–Watson (transformed)	2.061		

¹ ** $p < 0.01$; *** $p < 0.001$. ² SE = Standard Error.

The role of tourism as a reason for increasing pedestrian counts since 2018 is also possible. The Christchurch earthquake significantly reduced the number of hotels in the central city from 24 in 2011 to only 6 the following year [59]. With the rebuild and economic recovery, this increased to 12 establishments by 2018 and to 20 by 2020 [59], and is likely to be a contributing factor of pedestrian movement between 2018 and 2020. In addition, employment statistics reveal that central city employment increased by 3000 people from 9000 in 2018 to 12,000 in 2020, providing a further possible reason for pedestrian count increases. While both the employment and tourism numbers have increased between 2018 and 2020, the model reveals that events did not play a significant role in attracting pedestrians to the area.

To expand this analysis, the results from the two fixed-effects models are provided in Table 2. The first pedestrian count model is a fixed-effect model for time, and controls for the temporal variations based on the years (Model 2). The reason for fixing the years is to assess the magnitude to which the explanatory variables and most importantly, event types, influenced pedestrian volumes within these years. The fixed-effects model reveals the pedestrian volumes controlling for both the event specific characteristics and time specific characteristics.

Table 2. Results for the fixed-effects models.

Characteristic	Model 2: Time-Fixed Effect			Characteristic	Model 3: Event-Fixed Effect		
	Beta ¹	Sig	SE ²		Beta ¹	Sig	SE ²
Event type				Year			
None (reference)	—		—	2018 (reference)	—		—
Entertainment	247		209	2019	3302	***	152
Common Cause	897		459	2020	5925	***	306
Day_of_week				Day_of_week			
Monday (reference)	—		—	Monday (reference)	—		—
Tuesday	164		199	Tuesday	−167		235
Wednesday	242		200	Wednesday	−110		237
Thursday	721	***	200	Thursday	−123		236
Friday	1461	***	205	Friday	91		242
Saturday	553	**	200	Saturday	292		236
Sunday	−98		202	Sunday	−42		238
Month				Month			
January (reference)	—		—	January (reference)	—		—
February	700	*	286	February	608		338
March	−292		314	March	1797	***	370
April	−825	*	336	April	−87		397
May	−4.1		331	May	87		391
June	−392		321	June	269		379
July	−471		290	July	126		343
August	−91		323	August	250		381
September	20		318	September	−64		375
October	1121	***	292	October	25		344
November	2320	***	323	November	1955	***	382
December	3480	***	290	December	1888	***	343
Holidays				Holidays			
None (reference)	—		—	None (reference)	—		—
Holiday	725	***	164	Holiday	619	**	194
Rainfall	−99	***	12.2	Rainfall	−7		14
R ²	0.53			R ²	0.63		
Adjusted R ²	0.52			Adjusted R ²	0.61		
No. Obs.	675			No. Obs.	675		

¹ * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. ² SE = Standard Error.

Controlling for the temporal effect (years), reveals that events have a positive effect; however, there are large standard errors showing little evidence that events represent a key variable in attracting pedestrians (see Table 2 and Model 2). In fact, the relatively large variability around the estimates for events suggests that pedestrians might be selective about the type of event they attend, and that merely having an event is not sufficient to attract pedestrians. The fixed-effects per year are illustrated in Figure 5a. The result from the year-specific fixed-effect model shows that 2018 had a baseline of ± 2457 daily pedestrian counts which increased to 6369 in 2019 and then to 9869 in 2020 (see Figure 5a). It is evident that pedestrian volume increased over time as the CBD continued towards economic recovery. Similarly to the original OLS regression, the temporal fixed-effect model shows that Thursdays (721), Fridays (1461), and Saturdays (553) are statistically significant and experience the highest pedestrian volumes among the days of the week. This result, combined with the pedestrian count data in Figure 3b reveals the presence of a baseline in pedestrian movement for this area, which is most likely driven by commercial employment activity. However, this changes towards the latter part of the week and over the weekends as more people visit this area for other reasons. While events have a positive coefficient and increase pedestrian volume by 247 for entertainment events and 897 for common cause events, the results are not statistically significant compared to non-event days. The results show that this increase in pedestrian volume points to external factors at play, of which events do not seem to contribute in a statistically significant manner.

Seasonality, especially summer holidays, contribute significantly towards pedestrian volumes, with higher pedestrian volumes compared to the winter months. Consequently, October (with a coefficient of 1121), November (with 2320) and December (with 3480) are statistically significant at the 1-per-cent level and February and April are statistically significant at the 10-per-cent level when compared to January. This is driven by two factors: Firstly, the international tourism market which rebounded after the earthquakes of 2010/11, and contributed to the growth of the local economy [54]. Secondly, this is also driven by the domestic tourism market which tends to be higher during the summer holiday period [60]. A significant portion of the growing interest from both international and domestic tourists for Christchurch stems from 'disaster tourism' [61]. The authors found that after the Christchurch earthquakes the tourism industry experienced various phases of evolution; tourists were drawn to the city's devastation in the initial years after the damage to see the damage first-hand, and this changed to tourism-driven approaches which highlighted the transition of the city and showcased the new infrastructure, buildings and services which had replaced those which existed pre-earthquake [61]. The time period being assessed in this study could therefore place the pedestrian interactions driven by tourism as those pedestrians who were coming to the area to experience a unique and dynamic tourism product. In other words, this type of tourism was driven by a narrative of loss and renewal.

Rainfall shows a negative and statistically significant relationship with pedestrian counts and a decrease of 99 pedestrians with an increase of 1 mm of rain. In some locations this can go beyond rainfall, and that weather conditions such as humidity and heat can result in greater pedestrian volumes early in the morning and later in the evening [62]. For the sake of comparison, in Doha, Qatar pedestrian volumes are higher in winter than those in summer [62], while in Christchurch the pedestrian volume is highest in summer, and lowest in the winter months as evident in the model presented.

The results from Model 2 in Table 2 shows that events do not play a statistically significant role in drawing more pedestrians to the area. This suggests that other aspects have a stronger role in pedestrian volumes.

A second fixed-effect model (Model 3) was utilised showing the fixed-effects for events, to assess the importance of other variables in attracting pedestrian volumes to the area

when controlling for events (see Table 2 Model 3). For clarification, Model 3 does not assess the effect of events on pedestrian counts (this is revealed in Model 2); rather it models how pedestrian counts vary within events, while the explanatory variables reveal the effect of each of these when an event takes place.

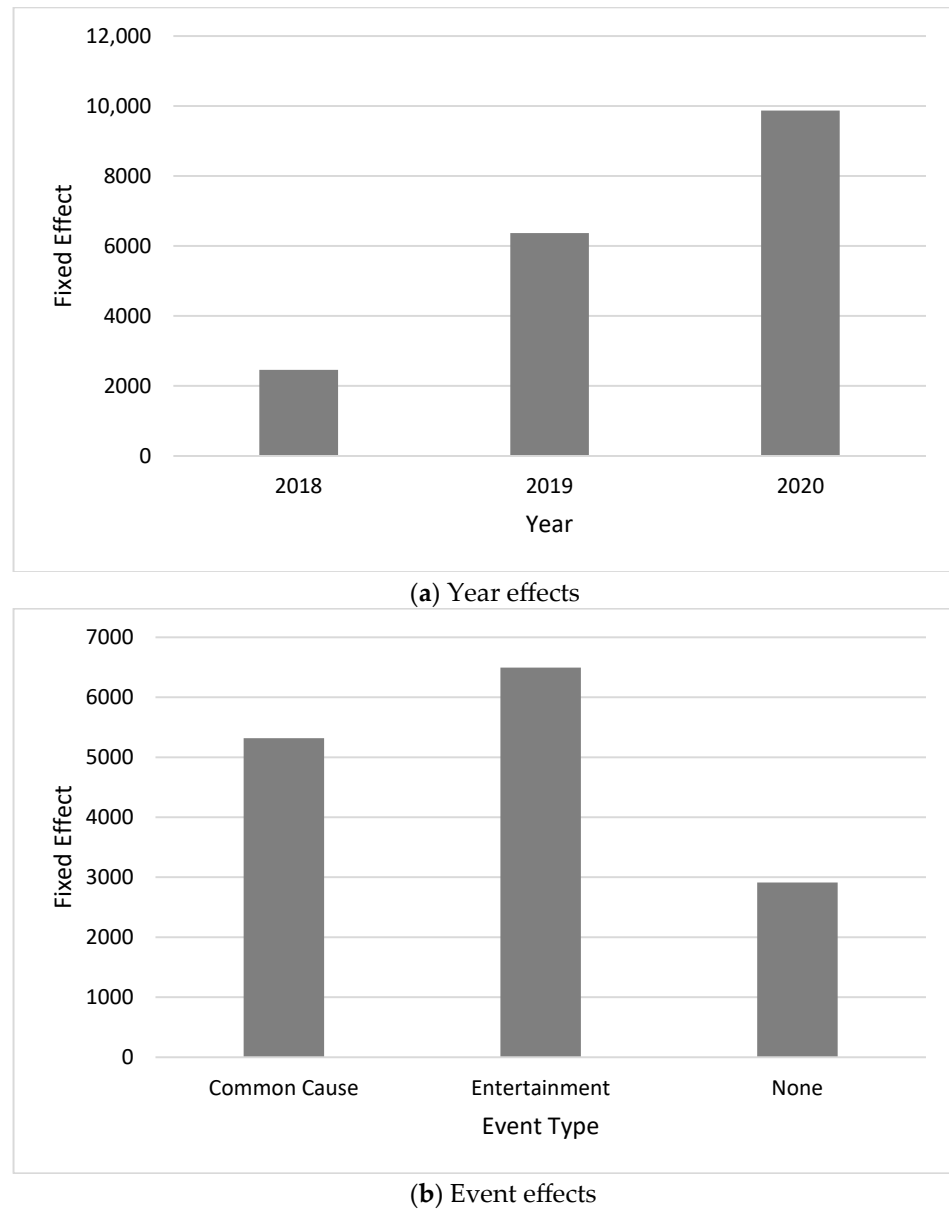


Figure 5. Fixed effects. Source: Authors (2025).

The fixed-effect results for events are illustrated in Figure 5b. This shows that the baseline pedestrian count when no event takes place is ± 2912 , and increases to 5318 for common cause events, and to 6496 for entertainment events. While the model does not show the statistical significance of events as a contributor to pedestrian counts, it does show that entertainment events have the highest baseline in attracting pedestrians, followed by common cause events. The majority of events held within the locality were of an entertainment type, and this aided the volume of pedestrian interactions within the central city.

Holding event-specific effects constant, pedestrian counts during events in 2019 were, on average, 3302 counts higher than in 2018, and 5925 counts higher in 2020 when compared to 2018. These results reveal an increasing trend in pedestrian interactions over time when events occurred, and this is in line with the progress of the rebuild of the CBD, independent

of event-specific factors. This increase in pedestrians could either be as a result of more popular events occurring during 2019 and 2020, or possibly associated with the combination of more office workers and visitors in the vicinity.

The day of the week reveals somewhat unexpected results, particularly on Sundays, where there is a decline in pedestrian activity (-42) when events take place in comparison to Mondays. Fridays (91) and Saturdays (292) seems to attract more pedestrians when compared to a Monday. A likely reason for this is that the event taking place means people stay longer and make multiple trips in the area as the type of event directly impacts on the duration of pedestrian activity [57]. For example, a festival might have less people attend it compared to a sporting event, but the festival goers are likely to spend a longer time walking around an area, whereas spectators of a sporting event come and go quickly [57]. Another possibility for lower pedestrian counts on Sunday could be attributed to the CBD location and limited residential use in close proximity to this location. Lower weekend pedestrian volumes have been found to occur in New York suburbs where residential use represents a smaller share of the total land use [63].

Events during summer tended to attract more people to the central city, with March, November and December showing statistically significant results at the 1 per cent level and attracting on average ± 1800 more pedestrians to the area. Events during holidays attracted more people with a positive coefficient of 619 and significant at the 5 per cent level. Rainfall was shown to decrease event attendance; however, this result is not statistically significant possibly because events were cancelled when rainy weather was forecasted.

Considering the event day timeline in Figure 6, it is evident that many of the events were held over the weekend between Friday to Sunday. Combining this with the day of the week result from Model 3 suggests that there are some marginal benefits in pedestrian numbers when events are held on Fridays (+91) and Saturdays (+292). However, none of the other days showed any meaningful benefit. In contrast, events held on Sundays (-42) did not attract more pedestrians to the area. Interestingly, Sundays represented the day with the second highest number of events with 19 events held (see Figure 6). The results show that the expected benefit of events on Sundays did not materialise. This begs the question of whether the economic cost of having an event on a Sunday is worthwhile, as the results suggest there are no meaningful benefits in the form of more pedestrians.

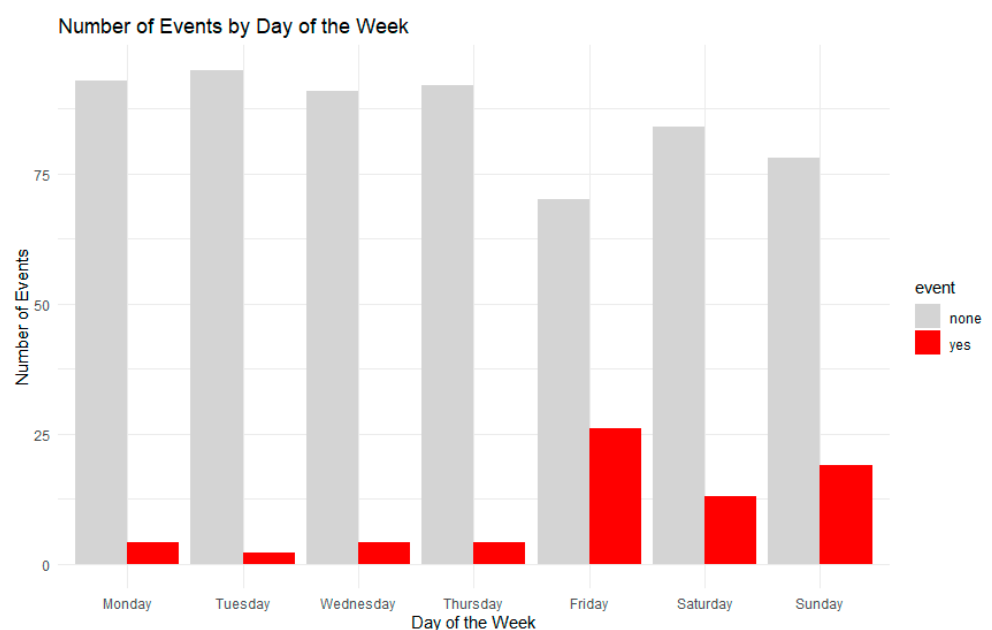


Figure 6. Number of events per day of the week. Source: Authors (2025).

Implications

The urban built environment is shaped by the environmental conditions that cities develop in [64]. In the case of Christchurch, a changing urban nature emerged during the rebuild of the central city allowing for space and place to be redefined. The focus was on a recovery strategy that prioritised the natural and built environment through social, economic, cultural and environmental factors [2]. Events played a central part in this social and cultural dimension by bringing people together whilst aligning with the economic aspect through attracting pedestrians which increased consumer expenditure locally. The results from this study are mixed, highlighting the complex environment in which cities operate. Overall, the results reveal both missed opportunities and the opportunity for learnings to be made which could potentially help other cities that might find themselves in similar situations to Christchurch in the future.

The pace of economic recovery is a likely factor that will determine the value that events add to the recovery process in Christchurch. However, within the context of this study it is evident that even though people were attracted to the area, it was not primarily for events, but for other reasons. The time fixed-effect results revealed that year-on-year growth in pedestrian volumes followed the growing popularity and interest of people in seeing how the new central city compared to the pre-earthquake CBD. Due to the nature of the urban framework, emphasis was placed on access to the renewed river front in the central city and attention focused on the natural environment next to the Avon River. Rainfall also had significant negative effect on pedestrian interactions in the Christchurch CBD, particularly in the open where it is uncovered. A possible intervention for this could be the inclusion of covered spaces that link with the existing commercial node and allow for easier pedestrian access during periods of rain.

The event type, scope, and purpose should also be carefully considered. The results showed that some events are associated with high pedestrian volumes, while others are not. Common cause events showed a higher positive effect compared to entertainment events. The positive effect resulting from common cause events seemed to reveal a strong social coherence with what the city has been through during the earthquakes. The disruption during this period in 2010/2011 provided opportunities to create a sense of unity in the community, particularly during the initial years of economic recovery. The results seem to indicate that people are willing to support a common cause, either by celebrating a religious festival or through commemorating significant events that have affected the local community.

Promotion and economic development agencies would do well to consider the timing of these events with summer, which showed significantly higher volumes of pedestrians than in winter months. However, it is often during winter and therefore out of season that events are used to attract people in order to support economic activity. The results of this study reveal that if this is the case, targeting Thursdays, Fridays, and Saturdays would provide the best outcome for this purpose. While it may be tempting to have events during the earlier part of the week to lift pedestrian volumes, the results do not support that there is an appetite amongst pedestrians for such a move.

6. Limitations

While the model provides valuable insights into the role of events in supporting urban economic recovery, the impact of events on actual pedestrian movements in the city was somewhat limited. To improve our understanding of the events and pedestrian traffic nexus, it may be useful to collect consumer expenditure data as it is suspected that employment within the central city may unduly influence pedestrian data. Furthermore,

adding visitor expenditure to future analyses would help to delineate the economic impact that events have on the urban economy.

7. Conclusions

In many instances, events are seen as the go-to strategy to promote a locality, city, or region that is trying to change the perceptions of consumers. The devastation experienced during the 2010/2011 earthquakes in the Christchurch central city required action from local authorities to promote economic recovery for an area which was the economic core of the city's commercial and tourism hub. By early 2018, many of the damaged buildings had already been demolished, and the repair and construction of new public services such as the Tūranga, the new central city public library was well underway, alongside the many new public entertainment areas and commercial buildings which have since opened.

The research aimed to answer three questions related to the use of public events as a tool for economic recovery. In answering the first question, the results reveal that events played a supporting role rather than a key role in attracting pedestrians to the Christchurch CBD. Events seem to support pedestrian volumes in the city; however, since the results are not statistically different to non-event days, it suggests that people are interested in coming to the CBD for other reasons, most likely to see how the new CBD compares to the old CBD. The second research question is concerned with the type of events that attract pedestrians. The results show that common cause events, rather than entertainment events attracted more pedestrians over the 2018 to 2020 period. This is most likely due to a strong social coherence from the resident population in response to the earthquakes. The third question relates to temporal aspects associated with pedestrian movements. Pedestrian volumes increased drastically between 2018 and 2020, and only a portion of this increase could be attributed to public events. Temporal aspects had the largest positive effect on pedestrian movement, particularly on Fridays and Saturday's, as well as summer months and holiday periods. In conclusion, the results from Christchurch shows that using events as an economic recovery strategy to draw pedestrians to the revitalised area has benefits; however, the urban recovery narrative rather than the events themselves seems to be the major reason why pedestrians interact with and are attracted to the area. Knowing this allows the formulation of appropriate policy and strategy to use events as a supportive tool, rather than the main tool, for economic recovery. In addition, the event type, scope, and purpose should also be carefully considered to enhance the pedestrian experience to encourage return visits to the area.

Author Contributions: Conceptualization, D.D., P.F., T.B. and W.R.; methodology, D.D.; software, D.D. and W.R.; validation, P.F.; formal analysis, D.D. and P.F.; investigation, D.D. and W.R.; resources, W.R.; data curation, W.R.; writing—original draft preparation, D.D., P.F., T.B. and W.R.; writing—review and editing, P.F. and T.B.; visualization, D.D.; supervision, D.D.; project administration, D.D. and W.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Event data is not available due to privacy restrictions, however, pedestrian data is available through the Christchurch City Council.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Chang, S.E.; Taylor, J.E.; Elwood, K.J.; Seville, E.; Brunson, D.; Gartner, M. Urban Disaster Recovery in Christchurch: The Central Business District Cordon and Other Critical Decisions. *Earthq. Spectra* **2014**, *30*, 513–532. [[CrossRef](#)]
2. Francis, T.R.; Wilkinson, S.; Mannakkara, S.; Chang-Richards, A. Post-disaster reconstruction in Christchurch: A “build back better” perspective. *Int. J. Disaster Resil. Built Environ.* **2018**, *9*, 239–248. [[CrossRef](#)]

3. Strongman, L. Ōtautahi Revisted: Urban Regeneration and a Sense of Identity in the Rebuilding of Christchurch. *Int. J. Constr. Environ.* **2014**, *5*, 13–21. [[CrossRef](#)]
4. Fieger, P.; Prayag, G.; Dyason, D.; Rice, J.; Hall, C.M. Exploring CBD Retail Performance, Recovery and Resilience of a Smart City Following COVID-19. *Sustainability* **2023**, *15*, 8300. [[CrossRef](#)]
5. Gu, J.; Song, C.; Ren, Z.; Lu, L.; Jiang, W.; Liu, M. Pedestrian Flow Prediction and Route Recommendation with Business Events. *Sensors* **2022**, *22*, 7478. [[CrossRef](#)] [[PubMed](#)]
6. Graham, C.; Khan, K.; Ilyas, M. Estimating the value of passing trade from pedestrian density. *J. Retail. Consum. Serv.* **2019**, *46*, 103–111. [[CrossRef](#)]
7. Yim Yiu, C. The impact of a pedestrianisation scheme on retail rent: An empirical test in Hong Kong. *J. Place Manag. Dev.* **2011**, *4*, 231–242. [[CrossRef](#)]
8. Kang, C.D. Spatial access to pedestrians and retail sales in Seoul, Korea. *Habitat Int.* **2016**, *57*, 110–120. [[CrossRef](#)]
9. Smith, A. *Events and Urban Regeneration: The Strategic Use of Events to Revitalise Cities*, 1st ed.; Routledge: London, UK, 2012. [[CrossRef](#)]
10. Brand, D.; Nicholson, H. Public space and recovery: Learning from post-earthquake Christchurch. *J. Urban Des.* **2016**, *21*, 159–176. [[CrossRef](#)]
11. Yıldırım, Ö.C.; Çelik, E. Understanding pedestrian behavior and spatial relations: A pedestrianized area in Besiktas, Istanbul. *Front. Archit. Res.* **2023**, *12*, 67–84. [[CrossRef](#)]
12. Dyason, D.; Fieger, P.; Rice, J. Greened shopping spaces and pedestrian shopping interactions: The case of Christchurch. *Int. J. Tour. Cities* **2024**, *10*, 1247–1265. [[CrossRef](#)]
13. Baobeid, A.; Koç, M.; Al-Ghamdi, S.G. Walkability and Its Relationships with Health, Sustainability, and Livability: Elements of Physical Environment and Evaluation Frameworks. *Front. Built Environ.* **2021**, *7*, 721218. [[CrossRef](#)]
14. Navon, Y.; de Silva, A. Measuring Local Economic Activity Using Pedestrian Count Data*. *Econ. Rec.* **2023**, *99*, 35–49. [[CrossRef](#)]
15. Shahmoradi, S.; Abtahi, S.M.; Guimarães, P. Pedestrian street and its effect on economic sustainability of a historical Middle Eastern city: The case of Chaharbagh Abbasi in Isfahan, Iran. *Geogr. Sustain.* **2023**, *4*, 188–199. [[CrossRef](#)]
16. Habibian, M.; Hosseinzadeh, A. Walkability index across trip purposes. *Sustain. Cities Soc.* **2018**, *42*, 216–225. [[CrossRef](#)]
17. Lai, Y.; Kontokosta, C.E. Quantifying place: Analysing the drivers of pedestrian activity in dense urban environments. *Landsc. Urban Plan.* **2018**, *180*, 166–178. [[CrossRef](#)]
18. Ton, D.; Duives, D.C.; Cats, O.; Hoogendoorn-Lanser, S.; Hoogendoorn, S.P. Cycling or walking? Determinants of mode choice in the Netherlands. *Transp. Res. Part A Policy Pract.* **2019**, *123*, 7–23. [[CrossRef](#)]
19. D’Amico, A. Urban spaces and pedestrian mobility: The role of urban design for enhancing walkability. *TeMA-J. Land Use Mobil. Environ.* **2023**, *16*, 639–644.
20. Delso, J.; Martín, B.; Ortega, E. A new procedure using network analysis and kernel density estimations to evaluate the effect of urban configurations on pedestrian mobility. The case study of Vitoria–Gasteiz. *J. Transp. Geogr.* **2018**, *67*, 61–72. [[CrossRef](#)]
21. Fan, P.Y.; Chun, K.P.; Mijic, A.; Tan, M.L.; Liu, M.S.; Yetemen, O. A framework to evaluate the accessibility, visibility, and intelligibility of green-blue spaces (GBSs) related to pedestrian movement. *Urban For. Urban Green.* **2022**, *69*, 127494. [[CrossRef](#)]
22. Cysek-Pawlak, M.M.; Pabich, M. Walkability—the New Urbanism principle for urban regeneration. *J. Urban. Int. Res. Placemak. Urban Sustain.* **2021**, *14*, 409–433. [[CrossRef](#)]
23. Kashef, M. The building blocks of walkability: Pedestrian activity in Abu Dhabi city center. *Front. Archit. Res.* **2022**, *11*, 203–223. [[CrossRef](#)]
24. Zacharias, J. Underground pedestrian trips—Trip generation, spatial distribution and activities in the Montréal underground. *Tunn. Undergr. Space Technol.* **2015**, *46*, 46–51. [[CrossRef](#)]
25. Paydar, M.; Kamani Fard, A.; Gárate Navarrete, V. Design Characteristics, Visual Qualities, and Walking Behaviour in an Urban Park Setting. *Land* **2023**, *12*, 1838. [[CrossRef](#)]
26. Brownrigg-Gleeson, M.L.; Monzon, A.; Cortez, A. Reasons to pedestrianise urban centres: Impact analysis on mobility habits, liveability and economic activities. *Sustainability* **2023**, *15*, 16472. [[CrossRef](#)]
27. Fieger, P.; Dyason, D. Economic Perspectives on Tourism. In *The Wiley Blackwell Companion to Tourism*; Wiley-Blackwell: Hoboken, NJ, USA, 2024; pp. 61–77.
28. Morikoshi, S.; Onishi, M.; Itoh, T. Visualizing congestion at large-scale events with an interactive-view system incorporating proximity-based networks. *Inf. Vis.* **2024**, *23*, 297–311. [[CrossRef](#)]
29. Pratiwi, A.R.; Zhao, S.; Mi, X. Quantifying the relationship between visitor satisfaction and perceived accessibility to pedestrian spaces on festival days. *Front. Archit. Res.* **2015**, *4*, 285–295. [[CrossRef](#)]
30. Duives, D.C.; Wang, G.; Kim, J. Forecasting pedestrian movements using recurrent neural networks: An application of crowd monitoring data. *Sensors* **2022**, *19*, 382. [[CrossRef](#)]
31. Mizzi, C.; Fabbri, A.; Rambaldi, S.; Bertini, F.; Curti, N.; Sinigardi, S.; Luzi, R.; Venturi, G.; Davide, M.; Muratore, G.; et al. Unraveling pedestrian mobility on a road network using ICTs data during great tourist events. *EPJ Data Sci.* **2018**, *7*, 44. [[CrossRef](#)]

32. Butler, R. Sustainable tourism in sensitive environments: A wolf in sheep's clothing? *Sustainability* **2018**, *10*, 1789. [CrossRef]
33. Dodds, R.; Butler, R. The phenomena of overtourism: A review. *Int. J. Tour. Cities* **2019**, *5*, 519–528. [CrossRef]
34. Saarloos, D.; Joh, C.H.; Zhang, J.; Fujiwara, A. A segmentation study of pedestrian weekend activity patterns in a central business district. *J. Retail. Consum. Serv.* **2010**, *17*, 119–129. [CrossRef]
35. Humberto, M.; Laboissière, R.; Giannotti, M.; Marte, C.L.; Cruz, D.A.; Primon, H. Walking and walkability: Do built environment measures correspond with pedestrian activity? *Ambiente Construído* **2019**, *19*, 23–36. [CrossRef]
36. Gutiérrez-Roig, M.; Sagarra, O.; Oltra, A.; Palmer, J.R.; Bartumeus, F.; Díaz-Guilera, A.; Perelló, J. Active and reactive behaviour in human mobility: The influence of attraction points on pedestrians. *R. Soc. Open Sci.* **2016**, *3*, 160177. [CrossRef]
37. Abdelwahab, M.A.; Kaji, S.; Hori, M.; Takano, S.; Arakawa, Y.; Taniguchi, R.I. Measuring “nigiwai” from pedestrian movement. *IEEE Access* **2021**, *9*, 24859–24871. [CrossRef]
38. Moura, F.; Cambra, P.; Gonçalves, A.B. Measuring walkability for distinct pedestrian groups with a participatory assessment method: A case study in Lisbon. *Landsc. Urban Plan.* **2017**, *157*, 282–296. [CrossRef]
39. Bongiorno, C.; Santucci, D.; Kon, F.; Santi, P.; Ratti, C. Comparing bicycling and pedestrian mobility: Patterns of non-motorized human mobility in Greater Boston. *J. Transp. Geogr.* **2019**, *80*, 102501. [CrossRef]
40. Lakmali, R.G.N.; Genovese, P.V.; Abewardhana, A.A.B.D.P. Evaluating the Efficacy of Agent-Based Modeling in Analyzing Pedestrian Dynamics within the Built Environment: A Comprehensive Systematic Literature Review. *Buildings* **2024**, *14*, 1945. [CrossRef]
41. Bazghandi, A. Techniques, Advantages and Problems of Agent Based Modeling for Traffic Simulation. *Int. J. Comput. Sci. Issues* **2012**, *9*, 115–119.
42. Inroy, N.M. Urban Regeneration and Public Space: The Story of an Urban Park. *Space Polity* **2000**, *4*, 23–40. [CrossRef]
43. Bassolas, A.; Gallotti, R.; Lamanna, F.; Lenormand, M.; Ramasco, J.J. Scaling in the recovery of urban transportation systems from massive events. *Sci. Rep.* **2020**, *10*, 2746. [CrossRef] [PubMed]
44. García, B. Urban Regeneration, Arts Programming and Major Events: Glasgow 1990, Sydney 2000 and Barcelona 2004. *Int. J. Cult. Policy* **2004**, *10*, 103–118. [CrossRef]
45. Sánchez, F.; Broudehoux, A.M. Mega-events and urban regeneration in Rio de Janeiro: Planning in a state of emergency. *Int. J. Urban Sustain. Dev.* **2013**, *5*, 132–153. [CrossRef]
46. March, A.; Kornakova, M.; Leon, J. Integration and collective action: Studies of urban planning and recovery after disasters. In *Urban Planning for Disaster Recovery*; Butterworth-Heinemann: Oxford, UK, 2017; pp. 1–12.
47. Neglia, G.A. Urban recovery processes for public spaces in Middle eastern cities. In *Urban Challenges in the Globalizing Middle-East: Social Value of Public Spaces*; Springer: Berlin, Germany, 2021; pp. 139–151.
48. Howes, T.; Cheesebrough, T. Infrastructure impact and recovery following the 2010–2011 earthquakes in Christchurch, New Zealand. *Proc. Inst. Civ. Eng.-Civ. Eng.* **2013**, *166*, 57–64. [CrossRef]
49. Hunt, E. Before and After: How the 2011 Earthquake Changed Christchurch. *The Guardian*, 22 February 2021. Available online: <https://www.theguardian.com/world/2021/feb/22/before-and-after-how-the-2011-earthquake-changed-christchurch> (accessed on 5 February 2025).
50. Christchurch City Council. Smart Christchurch. 2023. Available online: <https://ccc.govt.nz/contact-us/about-this-site/terms/smart-Christchurch-terms> (accessed on 13 October 2024).
51. Dolasinski, M.J.; Roberts, C.; Reynolds, J.; Johanson, M. Defining the Field of Events. *J. Hosp. Tour. Res.* **2021**, *45*, 553–572. [CrossRef]
52. Dyason, D. Disasters and Investment: Assessing the Performance of the Underlying Economy Following a Large-Scale Stimulus in the Built Environment. *J. Risk Financ. Manag.* **2022**, *15*, 263. [CrossRef]
53. Hall, C.M.; Fieger, P.; Prayag, G.; Dyason, D. Panic Buying and Consumption Displacement during COVID-19: Evidence from New Zealand. *Economies* **2021**, *9*, 46. [CrossRef]
54. Prayag, G.; Fieger, P.; Rice, J. Tourism expenditure in post-earthquake Christchurch, New Zealand. *Anatolia* **2019**, *30*, 47–60. [CrossRef]
55. Bangdiwala, S.I. Assessing trends over time. *Int. J. Inj. Control Saf. Promot.* **2016**, *23*, 224–226. [CrossRef]
56. Aultman-Hall, L.; Lane, D.; Lambert, R.R. Assessing Impact of Weather and Season on Pedestrian Traffic Volumes. *Transp. Res. Rec. J. Transp. Res.* **2009**, *2140*, 35–43. [CrossRef]
57. Eom, S.; Nishihori, Y. How weather and special events affect pedestrian activities: Volume, space, and time. *Int. J. Sustain. Transp.* **2022**, *16*, 462–475. [CrossRef]
58. Miranda-Moreno, L.F.; Lahti, A.C. Temporal trends and the effect of weather on pedestrian volumes: A case study of Montreal, Canada. *Transp. Res. Part D Transp. Environ.* **2013**, *22*, 54–59. [CrossRef]
59. Statistics New Zealand. Business Demography Statistics. 2024. Available online: <https://datainfolplus.stats.govt.nz/Item/nz.govt.stats/bdb02aa2-866e-418f-83e8-342234867a0f> (accessed on 23 November 2024).

60. ChristchurchNZ. Christchurch Canterbury Quarterly Economic Report. 2024. Available online: https://www.Christchurchnz.com/media/yjnizs5q/quarterly_sept-2024.pdf (accessed on 9 December 2024).
61. Tucker, H.; Shelton, E.J.; Bae, H. Post-disaster tourism: Towards a tourism of transition. *Tour. Stud.* **2017**, *17*, 306–327. [[CrossRef](#)]
62. Shaaban, K.; Muley, D. Investigation of Weather Impacts on Pedestrian Volumes. *Transp. Res. Procedia* **2016**, *14*, 115–122. [[CrossRef](#)]
63. Lee, J.M. Exploring Walking Behavior in the Streets of New York City Using Hourly Pedestrian Count Data. *Sustainability* **2020**, *12*, 7863. [[CrossRef](#)]
64. Fu, A.S. Connecting urban and environmental catastrophe: Linking natural disaster, the built environment, and capitalism. Connecting urban and environmental catastrophe: Linking natural disaster, the built environment, and capitalism. *Environ. Sociol.* **2016**, *2*, 365–374. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.