

The effect of the canal parade on the Airbnb market in Amsterdam

2022-10-25

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Introduction

The Canal Parade in Amsterdam is a parade of about 80 boats through the canals of Amsterdam, representing a variety of representatives and organizations related to the LGBTQI+ society. The Canal Parade is the highlight of the yearly Pride Week and attracts many spectators. The parade is followed by various parties in the city center of Amsterdam. Several hundred thousand visitors attend the events which makes the Canal Parade one of the biggest publicly open events in the Netherlands. The parade is also well known outside of the Netherlands.

Since the event is enormous in size, globally well-known and socially relevant we believe investigating the effect on prices and availability of Airbnb accommodations during this event is very interesting.

Data cleaning

To be able to conduct the research explained above, two datafiles needed to be merged and cleaned. These datafiles were conducted from insideairbnb.nl from the following URLs:

<http://data.insideairbnb.com/the-netherlands/north-holland/amsterdam/2021-12-05/data/listings.csv.gz>

<http://data.insideairbnb.com/the-netherlands/north-holland/amsterdam/2021-12-05/data/calendar.csv.gz>

We cleaned and merged both of the files to make it usefull to answer the research question, and created the following dataset: airbnb with the following variables:

Variable name	type	Variable explanation
listing_id	(Y)	The number related to the listing
available	(Y)	The availability of the Airbnb
price_calendar	(Y)	The price registered on a given date
date	(Y)	The date
neighbourhood_cleansed	(Y)	The price registered on a given date
price_listing	(Y)	The price of the listing
date	(X1)	Neighbourhood in Amsterdam
Oostelijk Havengebied -Indische Buurt	(X2)	Neighbourhood in Amsterdam
De Baarsjes - Oud-West	(X3)	Neighbourhood in Amsterdam
Zuid	(X4)	Neighbourhood in Amsterdam
Noord-West	(X5)	Neighbourhood in Amsterdam
De Aker - Nieuw Sloten	(X6)	Neighbourhood in Amsterdam

Variable name	type	Variable explanation
Westerpark	(X7)	Neighbourhood in Amsterdam
Watergraafsmeer	(X8)	Neighbourhood in Amsterdam
Oud-Noord	(X9)	Neighbourhood in Amsterdam
Bijlmer-Centrum	(X10)	Neighbourhood in Amsterdam
Bos en Lommer	(X11)	Neighbourhood in Amsterdam
Gaasperdam - Driemond	(X12)	Neighbourhood in Amsterdam
Oostelijk Havengebied -Indische Buurt	(X13)	Neighbourhood in Amsterdam
De Baarsjes - Oud-West	(X14)	Neighbourhood in Amsterdam
Zuid	(X15)	Neighbourhood in Amsterdam
Noord-West	(X16)	Neighbourhood in Amsterdam
De Aker - Nieuw Sloten	(X17)	Neighbourhood in Amsterdam
Westerpark	(X18)	Neighbourhood in Amsterdam
Watergraafsmeer	(X19)	Neighbourhood in Amsterdam
Oud-Noord	(X20)	Neighbourhood in Amsterdam
Bijlmer-Centrum	(X21)	Neighbourhood in Amsterdam
Bos en Lommer	(X22)	Neighbourhood in Amsterdam
Gaasperdam - Driemond	(X23)	Neighbourhood in Amsterdam
date	(Y)	Date canal parade = TRUE

Statistical tests

For testing significance of this analysis two statistical tests were executed: ANOVA and a linear regression

The ANOVA test:

```
## New names:
## Rows: 27775 Columns: 34
## -- Column specification
## ----- Delimiter: "," chr
## (1): neighbourhood_cleansed dbl (30): ...1, X_calendar, listing_id,
## price_calendar, adjusted_price, X_1... lgl (2): available, date_cp date (1):
## date
## i Use 'spec()' to retrieve the full column specification for this data. i
## Specify the column types or set 'show_col_types = FALSE' to quiet this message.
## * '' -> '...1'
```



```
## Analysis of Variance Table
##
## Response: adjusted_price
##
##           Df    Sum Sq  Mean Sq
## 'Centrum-Oost'      1  10140861 10140861
## date_cp             1    65602    65602
## Zuid               1  2195605  2195605
## 'Oostelijk Havengebied - Indische Buurt'      1    417897    417897
## 'Noord-West'        1  1558966  1558966
## 'De Aker - Nieuw Sloten'      1    270811    270811
## Westerpark         1    112800    112800
## Watergraafsmeer     1     62730     62730
## 'Oud-Noord'         1    378626    378626
```

## 'Bijlmer-Centrum'	1	10573	10573
## 'Bos en Lommer'	1	1497839	1497839
## 'Gaasperdam - Driemond'	1	1756881	1756881
## 'De Pijp - Rivierenbuurt'	1	626	626
## 'Centrum-West'	1	11972927	11972927
## 'Oud-Oost'	1	41480	41480
## 'Noord-Oost'	1	329450	329450
## 'Buitenveldert - Zuidas'	1	118534	118534
## 'IJburg - Zeeburgereiland'	1	303775	303775
## Osdorp	1	88472	88472
## Slotervaart	1	1202883	1202883
## 'Geuzenveld - Slotermeer'	1	159504	159504
## 'Bijlmer-Oost'	1	129493	129493
## 'Centrum-Oost':date_cp	1	4215	4215
## date_cp:Zuid	1	1723	1723
## date_cp:'Oostelijk Havengebied - Indische Buurt'	1	925	925
## date_cp:'Noord-West'	1	1649	1649
## date_cp:'De Aker - Nieuw Sloten'	1	216	216
## date_cp:Westerpark	1	1527	1527
## date_cp:Watergraafsmeer	1	2034	2034
## date_cp:'Oud-Noord'	1	3262	3262
## date_cp:'Bos en Lommer'	1	2553	2553
## date_cp:'Gaasperdam - Driemond'	1	901	901
## date_cp:'De Pijp - Rivierenbuurt'	1	1892	1892
## date_cp:'Centrum-West'	1	38328	38328
## date_cp:'Oud-Oost'	1	2205	2205
## date_cp:'Noord-Oost'	1	201	201
## date_cp:'Buitenveldert - Zuidas'	1	139	139
## date_cp:'IJburg - Zeeburgereiland'	1	628	628
## date_cp:Osdorp	1	56	56
## date_cp:Slotervaart	1	32	32
## date_cp:'Geuzenveld - Slotermeer'	1	118	118
## date_cp:'Bijlmer-Oost'	1	73	73
## Residuals	27732	905168866	32640
##	F value	Pr(>F)	
## 'Centrum-Oost'	310.6894	< 2.2e-16	***
## date_cp	2.0099	0.1562897	
## Zuid	67.2676	2.472e-16	***
## 'Oostelijk Havengebied - Indische Buurt'	12.8033	0.0003466	***
## 'Noord-West'	47.7626	4.915e-12	***
## 'De Aker - Nieuw Sloten'	8.2969	0.0039742	**
## Westerpark	3.4559	0.0630368	.
## Watergraafsmeer	1.9219	0.1656619	
## 'Oud-Noord'	11.6001	0.0006604	***
## 'Bijlmer-Centrum'	0.3239	0.5692594	
## 'Bos en Lommer'	45.8898	1.276e-11	***
## 'Gaasperdam - Driemond'	53.8262	2.250e-13	***
## 'De Pijp - Rivierenbuurt'	0.0192	0.8898420	
## 'Centrum-West'	366.8191	< 2.2e-16	***
## 'Oud-Oost'	1.2708	0.2596194	
## 'Noord-Oost'	10.0935	0.0014896	**
## 'Buitenveldert - Zuidas'	3.6316	0.0567032	.
## 'IJburg - Zeeburgereiland'	9.3069	0.0022851	**
## Osdorp	2.7106	0.0996976	.

```

## Slotervaart 36.8532 1.290e-09 ***
## 'Geuzenveld - Slotermeer' 4.8868 0.0270713 *
## 'Bijlmer-Oost' 3.9673 0.0464009 *
## 'Centrum-Oost':date_cp 0.1291 0.7193417
## date_cp:Zuid 0.0528 0.8183067
## date_cp:'Oostelijk Havengebied - Indische Buurt' 0.0283 0.8663322
## date_cp:'Noord-West' 0.0505 0.8221741
## date_cp:'De Aker - Nieuw Sloten' 0.0066 0.9351298
## date_cp:Westerpark 0.0468 0.8287850
## date_cp:Watergraafsmeer 0.0623 0.8028555
## date_cp:'Oud-Noord' 0.0999 0.7518970
## date_cp:'Bos en Lommer' 0.0782 0.7797308
## date_cp:'Gaasperdam - Driemond' 0.0276 0.8680688
## date_cp:'De Pijp - Rivierenbuurt' 0.0580 0.8097599
## date_cp:'Centrum-West' 1.1743 0.2785331
## date_cp:'Oud-Oost' 0.0676 0.7949241
## date_cp:'Noord-Oost' 0.0062 0.9373917
## date_cp:'Buitenveldert - Zuidas' 0.0042 0.9480343
## date_cp:'IJburg - Zeeburgereiland' 0.0192 0.8896698
## date_cp:Osdorp 0.0017 0.9668170
## date_cp:Slotervaart 0.0010 0.9750079
## date_cp:'Geuzenveld - Slotermeer' 0.0036 0.9521562
## date_cp:'Bijlmer-Oost' 0.0022 0.9621850
## Residuals
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```

The linear regression:

```

##
## Call:
## lm(formula = price_calendar ~ 'Centrum-Oost' * date_cp + Zuid *
##   date_cp + 'Oostelijk Havengebied - Indische Buurt' * date_cp +
##   'Noord-West' * date_cp + 'De Aker - Nieuw Sloten' * date_cp +
##   Westerpark * date_cp + 'De Aker - Nieuw Sloten' * date_cp +
##   Westerpark * date_cp + Watergraafsmeer * date_cp + 'Oud-Noord' *
##   date_cp + 'Bijlmer-Centrum' + 'Bos en Lommer' * date_cp +
##   'Gaasperdam - Driemond' * date_cp + 'De Pijp - Rivierenbuurt' *
##   date_cp + 'Centrum-West' * date_cp + 'Oud-Oost' * date_cp +
##   'Noord-Oost' * date_cp + 'Buitenveldert - Zuidas' * date_cp +
##   'IJburg - Zeeburgereiland' * date_cp + Osdorp * date_cp +
##   Slotervaart * date_cp + 'Geuzenveld - Slotermeer' * date_cp +
##   'Bijlmer-Oost' * date_cp, data = airbnb)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -253.3  -79.5  -32.3   33.3  6230.2
##
## Coefficients:
##                                     Estimate Std. Error
## (Intercept)                      175.9445      3.1873
## 'Centrum-Oost'                     70.8164      4.8440
## date_cpTRUE                        2.3322      7.0127

```

## Zuid	44.1459	5.7172
## 'Oostelijk Havengebied - Indische Buurt'	-11.4640	7.0900
## 'Noord-West'	-36.7441	8.4035
## 'De Aker - Nieuw Sloten'	-22.1695	13.2140
## Westerpark	3.3857	5.6852
## Watergraafsmeer	2.6116	8.1298
## 'Oud-Noord'	30.1172	6.5512
## 'Bijlmer-Centrum'	2.5345	14.4057
## 'Bos en Lommer'	-22.6270	6.5813
## 'Gaasperdam - Driemond'	-74.9331	14.0369
## 'De Pijp - Rivierenbuurt'	14.7295	5.0028
## 'Centrum-West'	56.2727	4.4283
## 'Oud-Oost'	-3.6562	6.0356
## 'Noord-Oost'	-34.0816	9.9284
## 'Buitenveldert - Zuidas'	-24.6677	12.5295
## 'IJburg - Zeeburgereiland'	13.4055	7.8453
## Osdorp	-31.0278	15.4454
## Slotervaart	-52.7861	9.5692
## 'Geuzenveld - Slotermeer'	-21.4566	10.4511
## 'Bijlmer-Oost'	-37.2208	21.0457
## 'Centrum-Oost':date_cpTRUE	4.2418	10.7565
## date_cpTRUE:Zuid	-1.1788	12.7206
## date_cpTRUE:'Oostelijk Havengebied - Indische Buurt'	-0.9688	15.8027
## date_cpTRUE:'Noord-West'	-2.3708	18.7477
## date_cpTRUE:'De Aker - Nieuw Sloten'	-0.7272	29.5199
## date_cpTRUE:Westerpark	-0.5411	12.6488
## date_cpTRUE:Watergraafsmeer	-2.2557	18.1343
## date_cpTRUE:'Oud-Noord'	-1.9039	14.5936
## date_cpTRUE:'Bos en Lommer'	-1.1820	14.6613
## date_cpTRUE:'Gaasperdam - Driemond'	-2.4800	31.3616
## date_cpTRUE:'De Pijp - Rivierenbuurt'	0.7405	11.1140
## date_cpTRUE:'Centrum-West'	9.0735	9.8200
## date_cpTRUE:'Oud-Oost'	2.5903	13.4360
## date_cpTRUE:'Noord-Oost'	-2.2704	22.1641
## date_cpTRUE:'Buitenveldert - Zuidas'	-2.2876	27.9880
## date_cpTRUE:'IJburg - Zeeburgereiland'	-2.5072	17.4966
## date_cpTRUE:Osdorp	1.1955	34.5136
## date_cpTRUE:Slotervaart	-0.8273	21.3596
## date_cpTRUE:'Geuzenveld - Slotermeer'	-1.4346	23.3347
## date_cpTRUE:'Bijlmer-Oost'	-2.2138	47.0424
##	t value	Pr(> t)
## (Intercept)	55.202	< 2e-16 ***
## 'Centrum-Oost'	14.620	< 2e-16 ***
## date_cpTRUE	0.333	0.739458
## Zuid	7.722	1.19e-14 ***
## 'Oostelijk Havengebied - Indische Buurt'	-1.617	0.105907
## 'Noord-West'	-4.372	1.23e-05 ***
## 'De Aker - Nieuw Sloten'	-1.678	0.093410 .
## Westerpark	0.596	0.551500
## Watergraafsmeer	0.321	0.748033
## 'Oud-Noord'	4.597	4.30e-06 ***
## 'Bijlmer-Centrum'	0.176	0.860345
## 'Bos en Lommer'	-3.438	0.000587 ***
## 'Gaasperdam - Driemond'	-5.338	9.46e-08 ***

```

## 'De Pijp - Rivierenbuurt' 2.944 0.003240 **
## 'Centrum-West' 12.707 < 2e-16 ***
## 'Oud-Oost' -0.606 0.544676
## 'Noord-Oost' -3.433 0.000598 ***
## 'Buitenveldert - Zuidas' -1.969 0.048990 *
## 'IJburg - Zeeburgereiland' 1.709 0.087514 .
## Osdorp -2.009 0.044561 *
## Slotervaart -5.516 3.49e-08 ***
## 'Geuzenveld - Slotermeer' -2.053 0.040077 *
## 'Bijlmer-Oost' -1.769 0.076976 .
## 'Centrum-Oost':date_cpTRUE 0.394 0.693328
## date_cpTRUE:Zuid -0.093 0.926167
## date_cpTRUE:'Oostelijk Havengebied - Indische Buurt' -0.061 0.951115
## date_cpTRUE:'Noord-West' -0.126 0.899368
## date_cpTRUE:'De Aker - Nieuw Sloten' -0.025 0.980346
## date_cpTRUE:Westerpark -0.043 0.965876
## date_cpTRUE:Watergraafsmeer -0.124 0.901008
## date_cpTRUE:'Oud-Noord' -0.130 0.896200
## date_cpTRUE:'Bos en Lommer' -0.081 0.935743
## date_cpTRUE:'Gaasperdam - Driemond' -0.079 0.936972
## date_cpTRUE:'De Pijp - Rivierenbuurt' 0.067 0.946875
## date_cpTRUE:'Centrum-West' 0.924 0.355506
## date_cpTRUE:'Oud-Oost' 0.193 0.847128
## date_cpTRUE:'Noord-Oost' -0.102 0.918411
## date_cpTRUE:'Buitenveldert - Zuidas' -0.082 0.934858
## date_cpTRUE:'IJburg - Zeeburgereiland' -0.143 0.886055
## date_cpTRUE:Osdorp 0.035 0.972367
## date_cpTRUE:Slotervaart -0.039 0.969105
## date_cpTRUE:'Geuzenveld - Slotermeer' -0.061 0.950976
## date_cpTRUE:'Bijlmer-Oost' -0.047 0.962466
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 181.4 on 27732 degrees of freedom
## Multiple R-squared:  0.0351, Adjusted R-squared:  0.03364
## F-statistic: 24.02 on 42 and 27732 DF,  p-value: < 2.2e-16

```

Graph representation

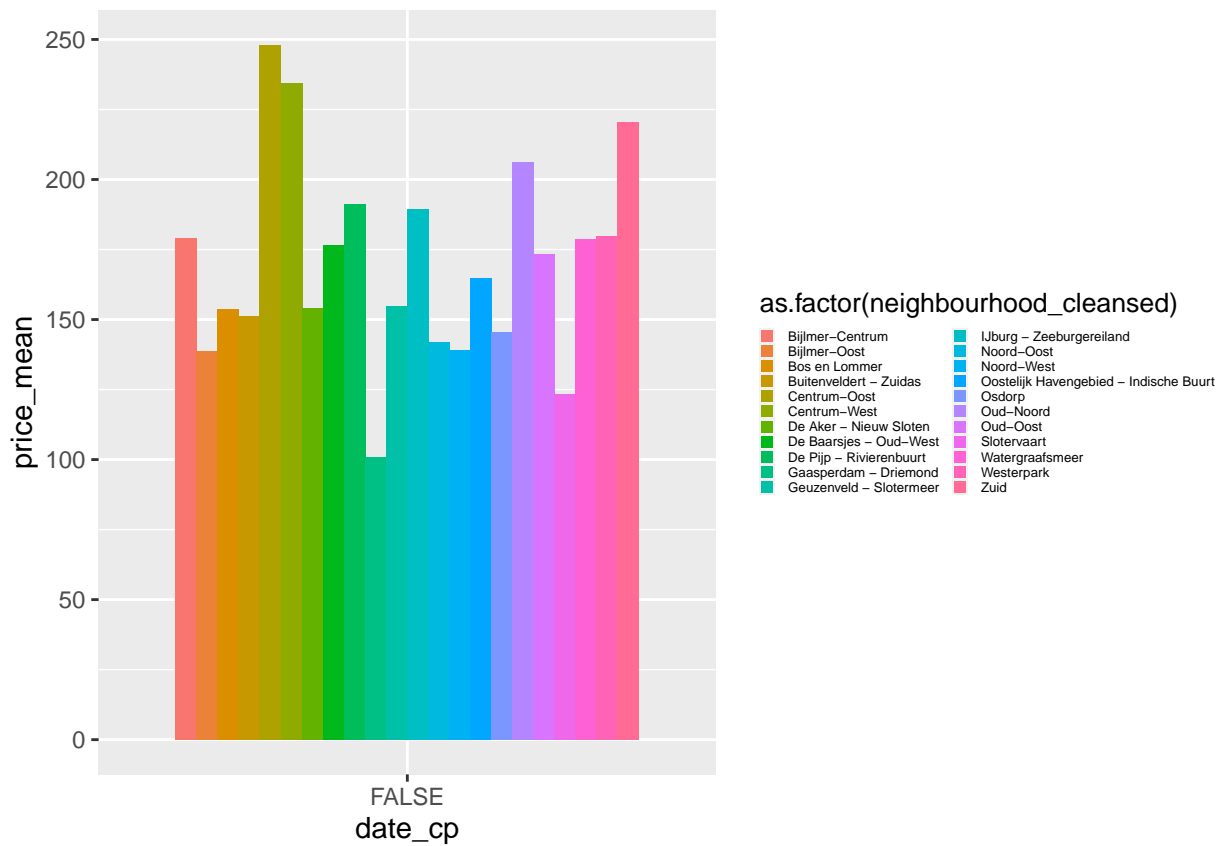
From these tests can be seen that there are no significant differences in the prices during 'normal' weekends and the weekends of the canal parade, and that this also does not differ in the different neighbourhoods. This can also be seen in the graphs below:

```

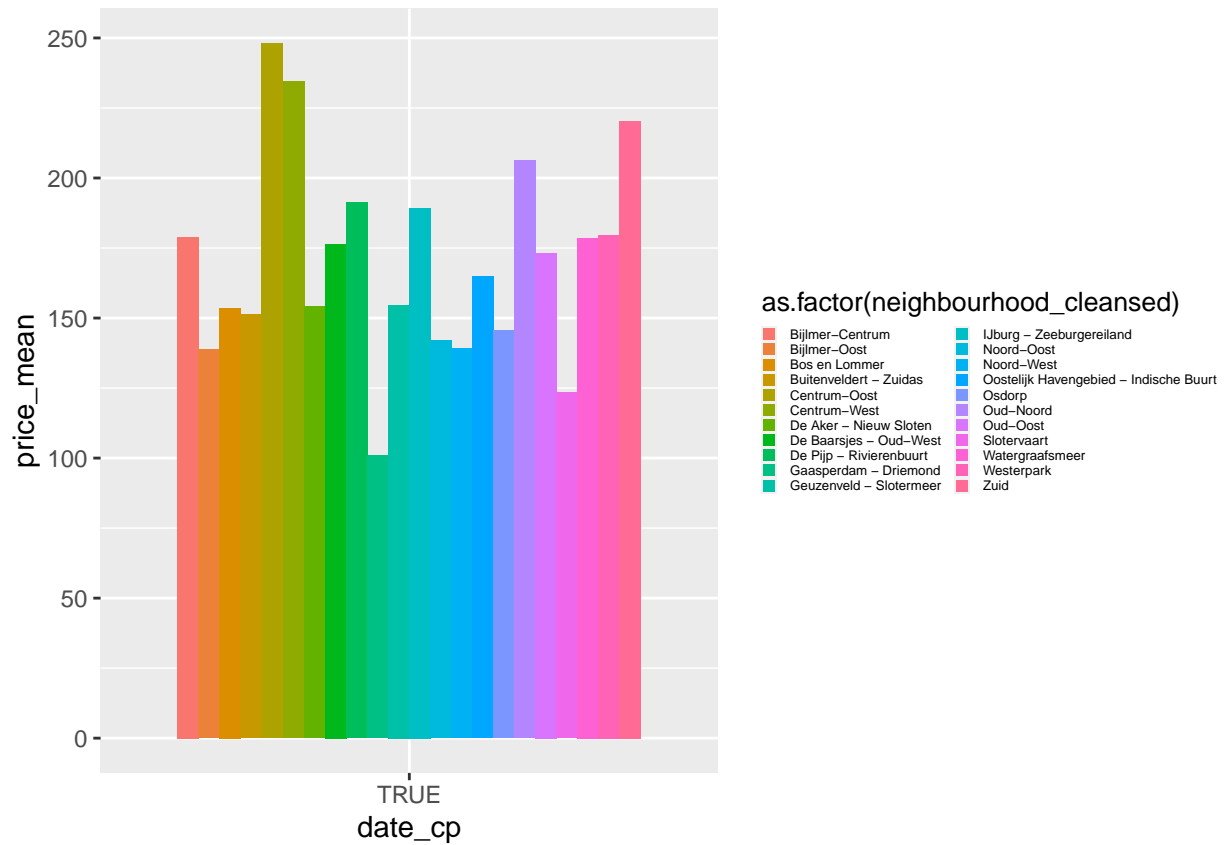
## New names:
## Rows: 27775 Columns: 34
## -- Column specification
## ----- Delimiter: "," chr
## (1): neighbourhood_cleansed dbl (30): ...1, X_calendar, listing_id,
## price_calendar, adjusted_price, X_1... lgl (2): available, date_cp date (1):
## date
## i Use 'spec()' to retrieve the full column specification for this data. i
## Specify the column types or set 'show_col_types = FALSE' to quiet this message.

```

```
## 'summarise()' has grouped output by 'neighbourhood_cleansed'. You can override
## using the '.groups' argument.
## * '' -> '...1'
```



```
## 'summarise()' has grouped output by 'neighbourhood_cleansed'. You can override
## using the '.groups' argument.
```



Conclusion

So found is that there is no significant difference between the prices of airbnb's in Amsterdam during and not during the Canal parade.

Implications