Wondering What's Winter Weather

A data-driven approach

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The problem

- What does winter weather entail?
- Is winter cycling use a seasonal change or a response to weather?
- Weather is generally highly correlated – difficult to estimate models

Summer

September 7, 2014

Winter

September 8, 2014

Data sets

- Calgary Eco-counter data for Peace Bridge and 5th Street
  - April 2014 to Nov 2018
  - Peace Bridge: 1000 weekdays, 410 weekend days
  - 5th Street: 749 weekdays, 306 weekend days
- Environment Canada data for Calgary Airport
  - Daily weather conditions

Log-linear regression model

- Predict cyclists (Y) for each day using a function of the form:

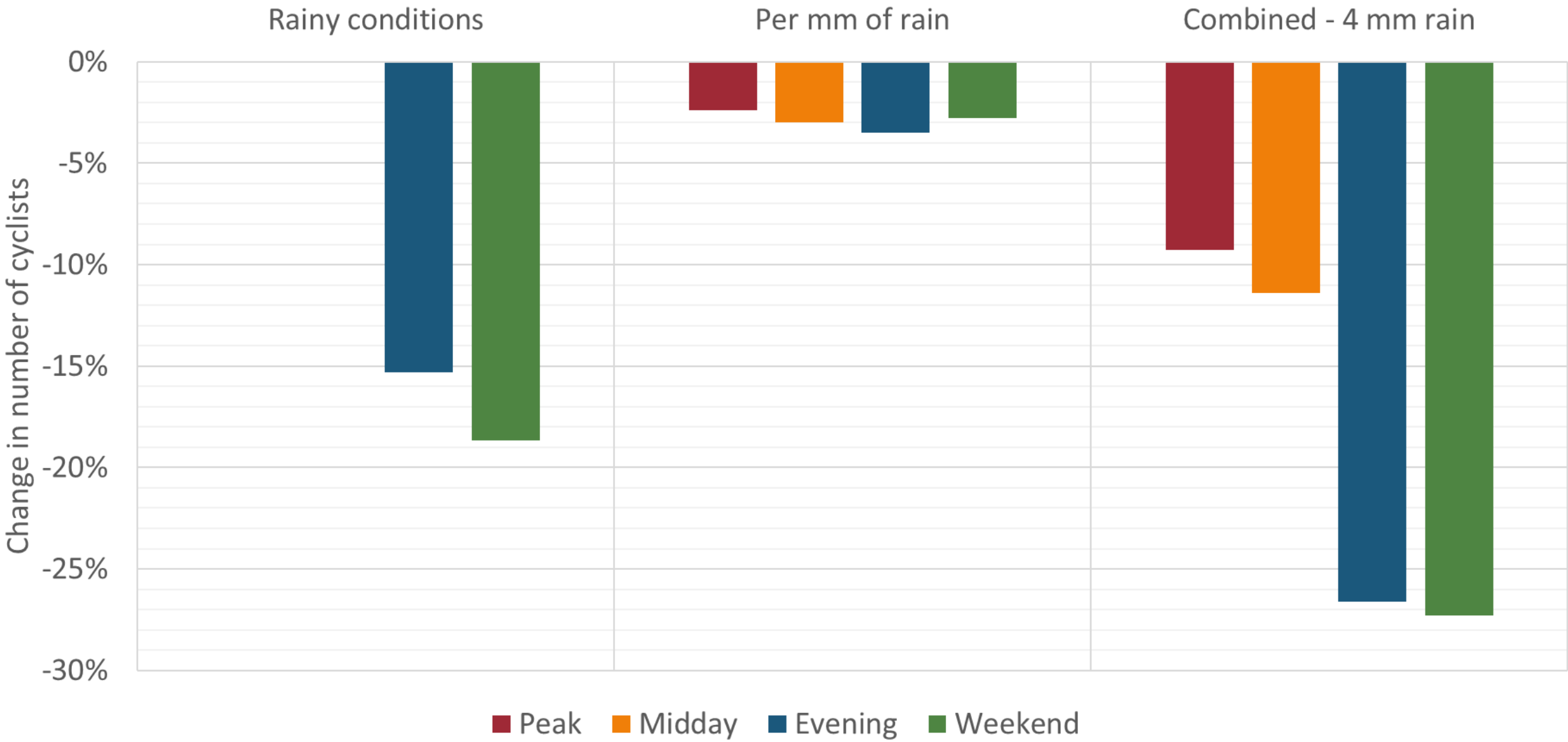
$$\ln(Y_i) = \alpha + \sum_{j=1}^{n} \beta_j X_{ij}$$

- Positive number of cyclists
- Series of elasticities for different effects
- Linear form:
  - Rain means 100 fewer cyclists
- Log-linear (used here):
  - Rain means 10% fewer cyclists

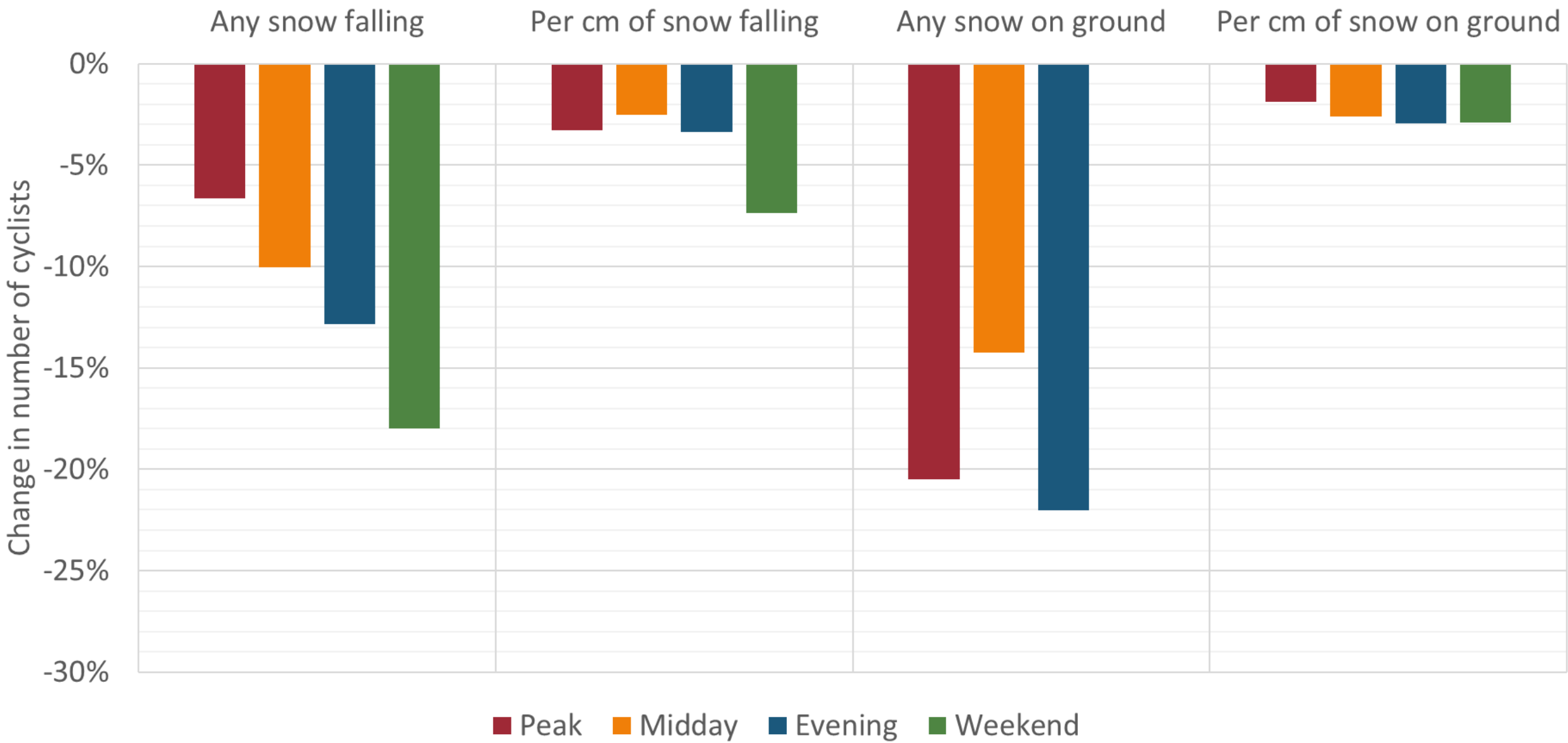
Four different models – “segments”

- **Peak** - commuters
  - Weekdays, 7-9 AM into downtown, 4-6 PM out of downtown
- **Midday** – Couriers? Errands?
  - Weekdays, 11 AM – 3 PM
- **Evening** - leisure
  - Weekdays, 7 PM to midnight
- **Weekend** - leisure
  - Weekends, 1 PM to 7 PM
- Holidays excluded

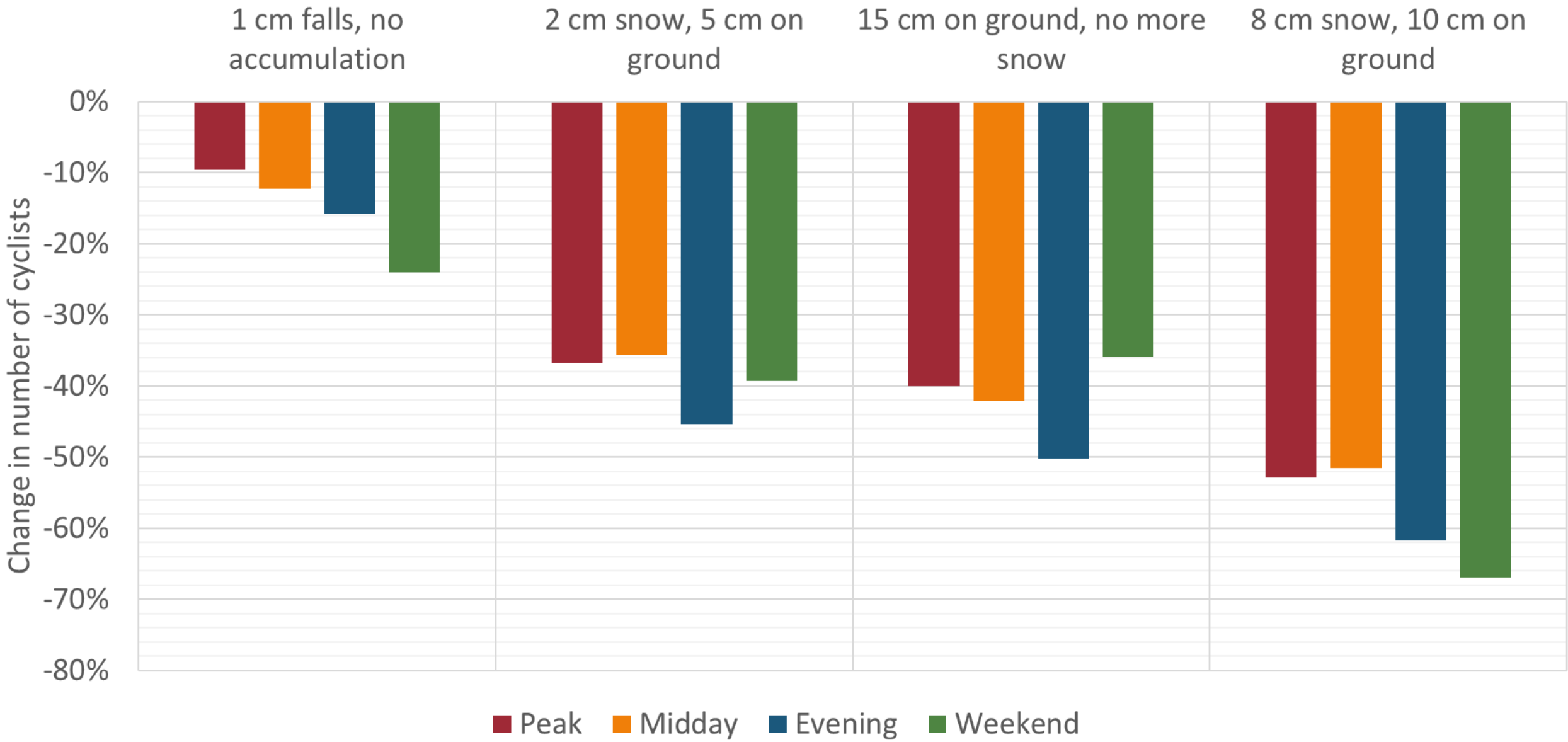
Effects of rain



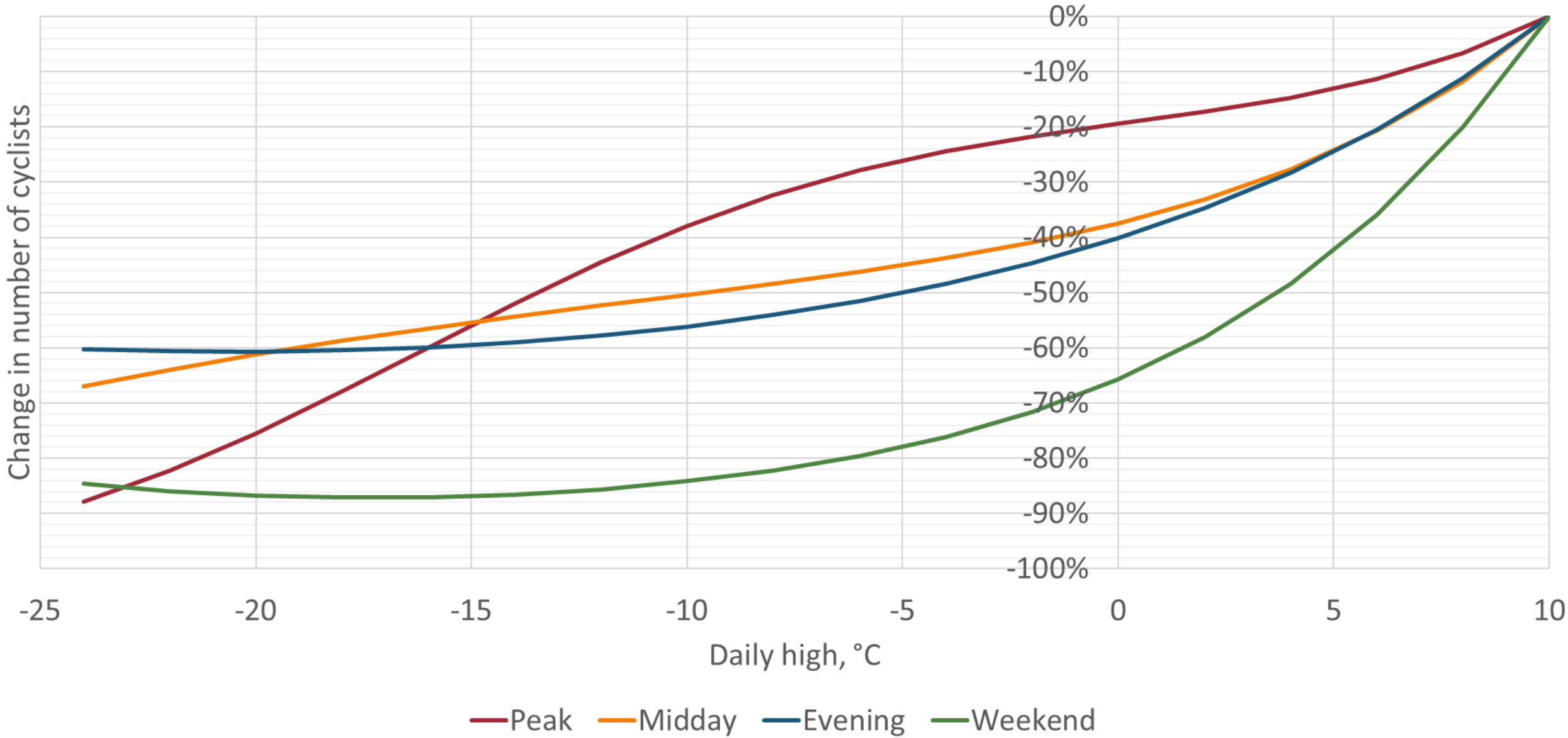
Effects of snow



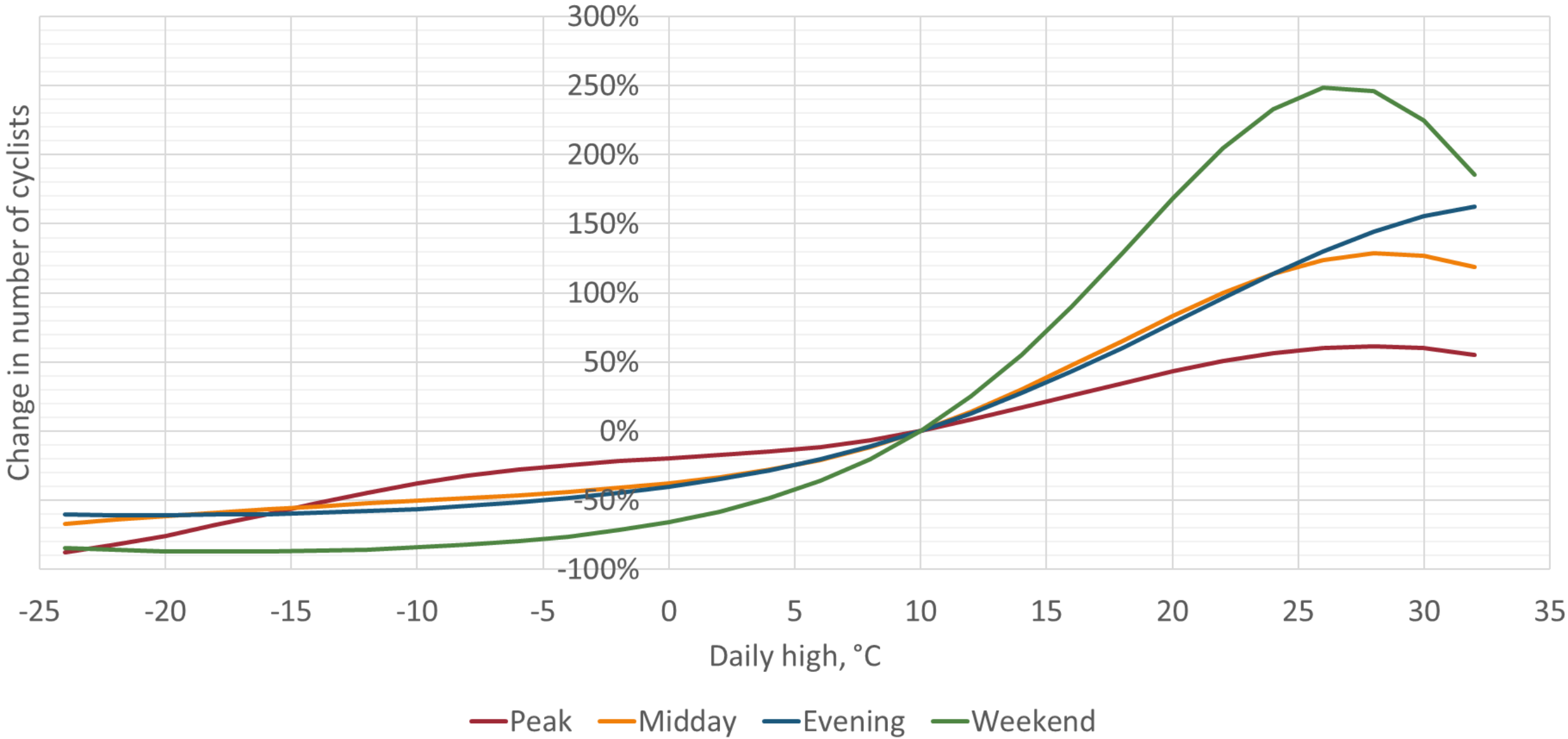
Example snow situations



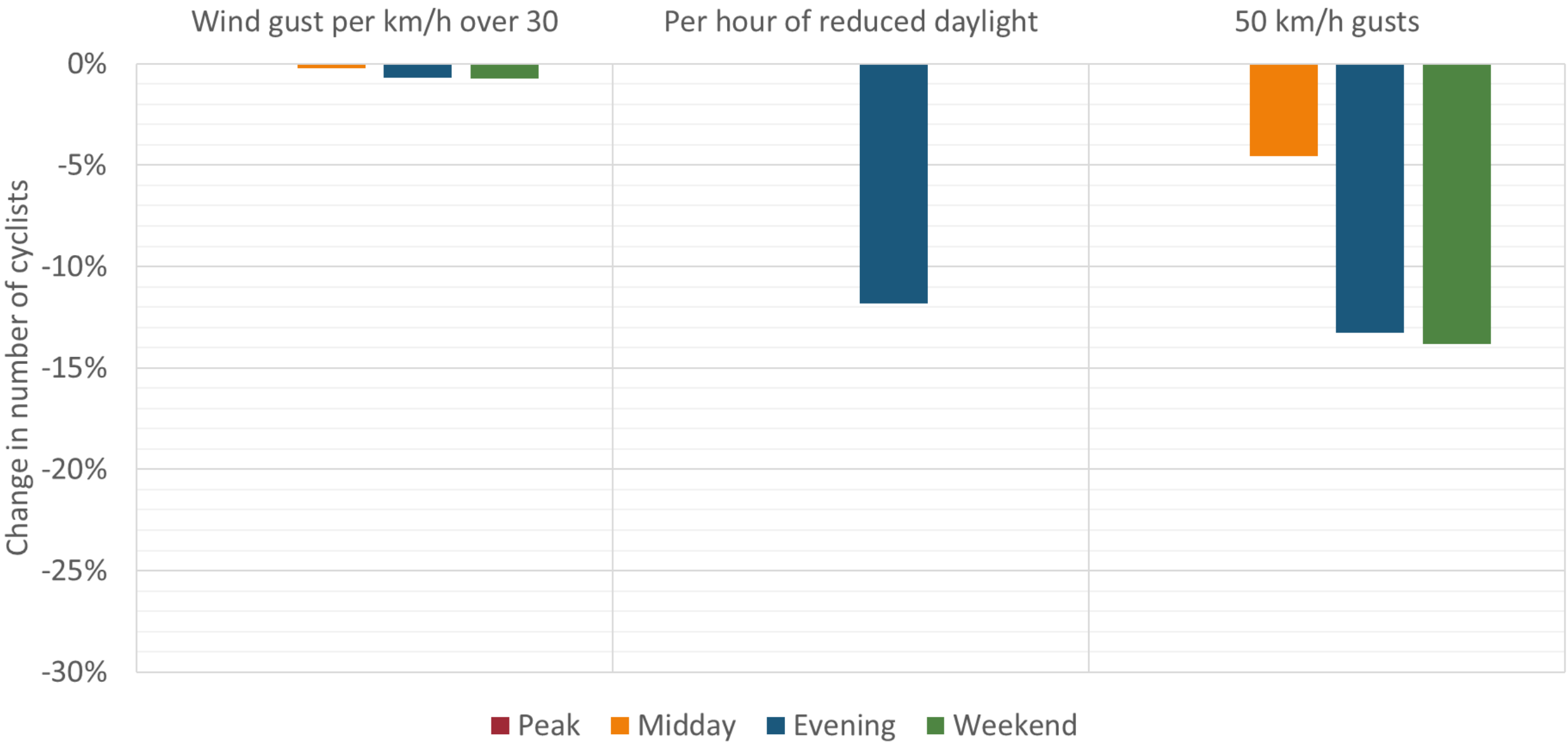
Effect of temperature



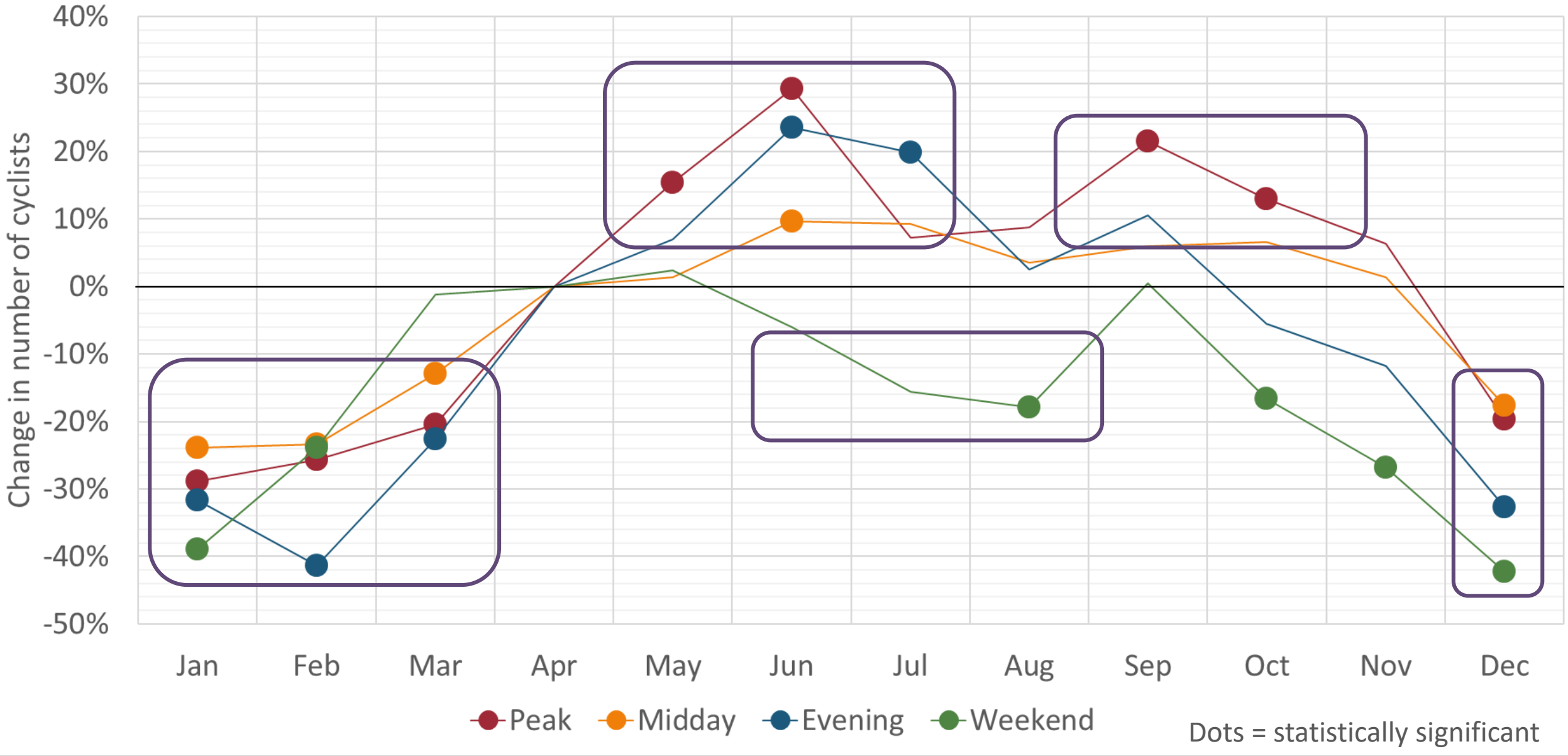
Effect of temperature



Other weather effects



Month constants



Remaining bits in model

- Friday effect:
  - 26% reduction in peak, 15% increase in midday
- Peace Bridge area construction 2018:
  - Heavy reduction; 68% for peak, 63% for evening, 66% others
- Growth over time:
  - Peak - 5.5% growth per year
  - 8 to 11% growth per year other three segments – Peace Bridge only

Key conclusions

- Rain mostly affects evening/weekend cyclists
- Snow has similar effect on all groups
- Weekend cyclists most sensitive to temperature, peak cyclists least
- Wind not very important
- Lack of daylight only affects evening
- Bikes get put away in December, pulled out early summer – peak cyclists keep theirs out longer in the fall

Thanks to:

- Micheal Jones:
  - https://github.com/Chealion/yycbike
- City of Calgary
- Environment Canada
- My colleagues at HBA Specto, esp. John Abraham
- Congress organizers & volunteers

HBA specto

Full model estimations available on my blog:

Mean Median Mode Choice

www.meanmedianmodechoice.com