Ice Position (Again)

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The Idea

Can players affect their team results by gaining or losing territory?

The Idea

Can players affect their team results by gaining or losing territory?

- Not really.

The Idea

~~Can~~ players affect their team results by gaining or losing territory?

The Correct Idea

How much do players affect their team results by gaining or losing territory?

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- A fair bit!

The Correct Idea

How much do players affect their team results by gaining or losing territory?

- A fair bit!
- (I think it might be more)

The Approach

- Focus on transitions across blue lines.

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  - Exits and exit defence

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    - INTO the neutral zone

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    - INTO the neutral zone
  - Entries and entry defence

The Approach

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  - Exits and exit defence
    - INTO the neutral zone
  - Entries and entry defence
    - OUT OF the neutral zone

Model Meat

Logistic Regression with terms:

- Five skaters trying to make the transition happen.
- Five skaters trying to prevent it

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- The time in the game
- Some interactions between score and time

Model Meat

Logistic Regression with terms:

- Five skaters trying to make the transition happen.
- Five skaters trying to prevent it
- The score
- The time in the game
- Some interactions between score and time
- Team, as a cheap proxy for coaching systems

Model Target

- Exit Model: an observation every second the puck could enter the neutral zone.
  - Target variable 1 if it does, 0 if it does not.
  - In 19-21:
    - 92k transitions
    - 3.7m attempts
    - $\approx$ 2.5% success.
- Entry model: an observation every second the puck could leave the neutral zone.
  - Target variable 1 if it does, 0 if it does not.
  - In 19-21:
    - 101k transitions
    - 1.7m attempts
    - $\approx$ 6.1% success.

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(Not as many exits as entries because of goals and period ends)

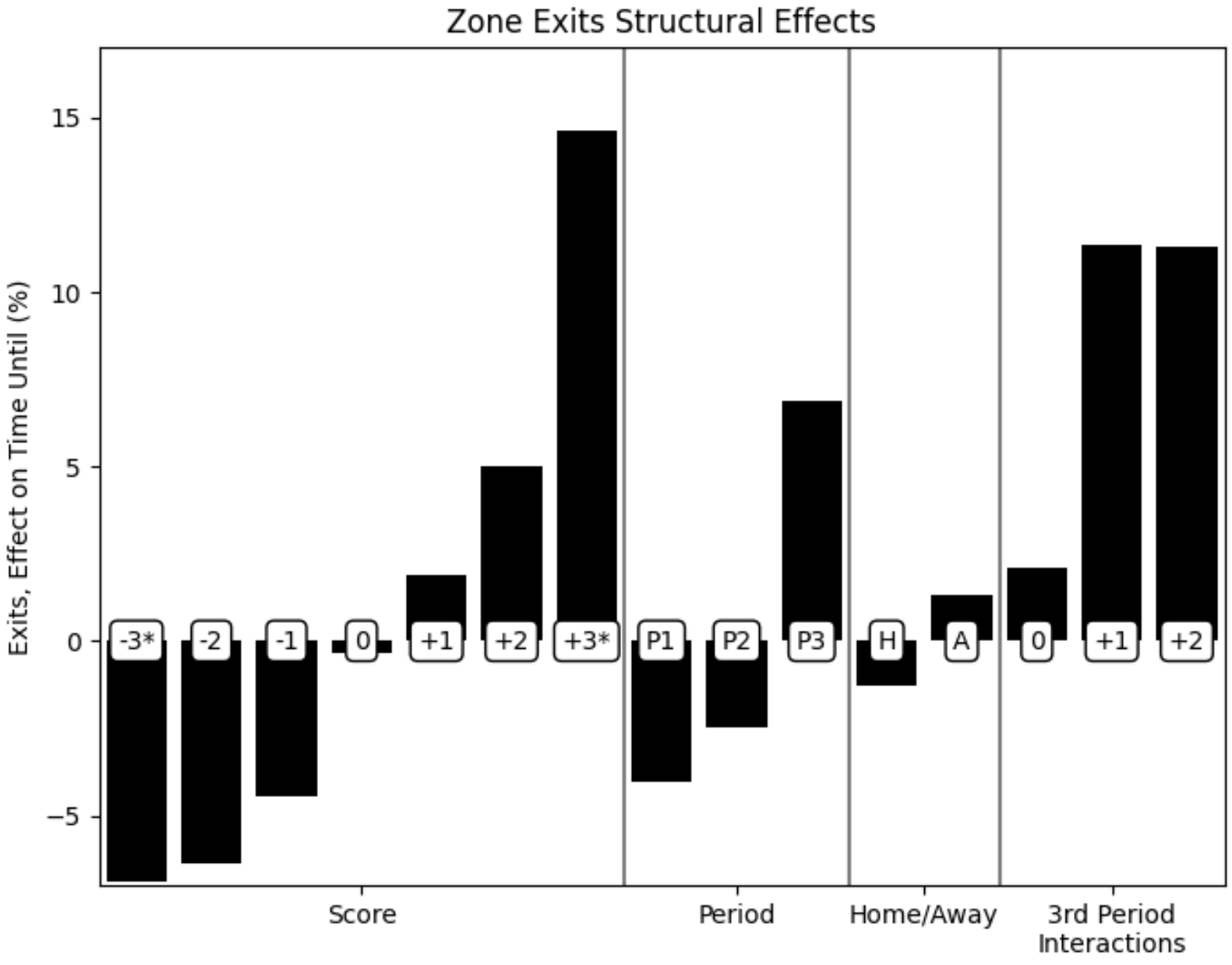
Average Time To Transition

Fit a logistic regression model with ridge penalties for all non-constant terms, some extra penalties to pool the score effects properly, technical chicanery of various other kinds which need not detain us here.

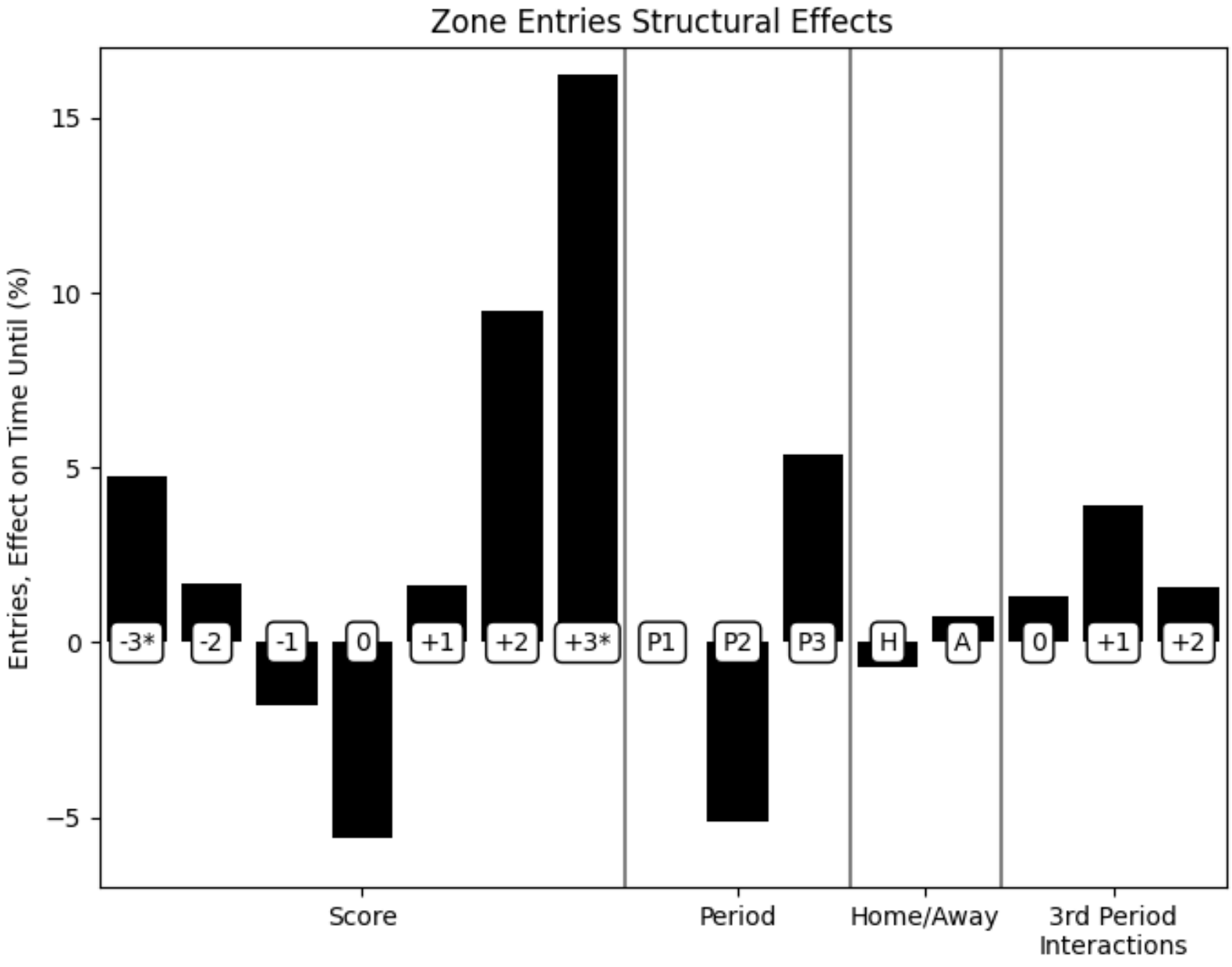
Average Time To Transition

- Exits: 27s
- Entries: 11s

Structure (Exits)



Structure (Entries)



Players: Best at Exits (19-21)

Player	Position	Impact on Time Until Exit
Mathew Barzal	F	-13.6%
Matthew Tkachuk	F	-12.9%
Nikolaj Ehlers	F	-11.9%
Adam Fox	D	-11.8%
Jaden Schwartz	F	-11.6%

Players: Best at Entries (19-21)

Player	Position	Impact on Time Until Entry
Mathew Barzal	F	-19.7%
Dmytro Timashov	F	-18.7%
Carl Grundström	F	-18.5%
Travis Konecny	F	-18.0%
Brandon Davidson	D	-17.2%

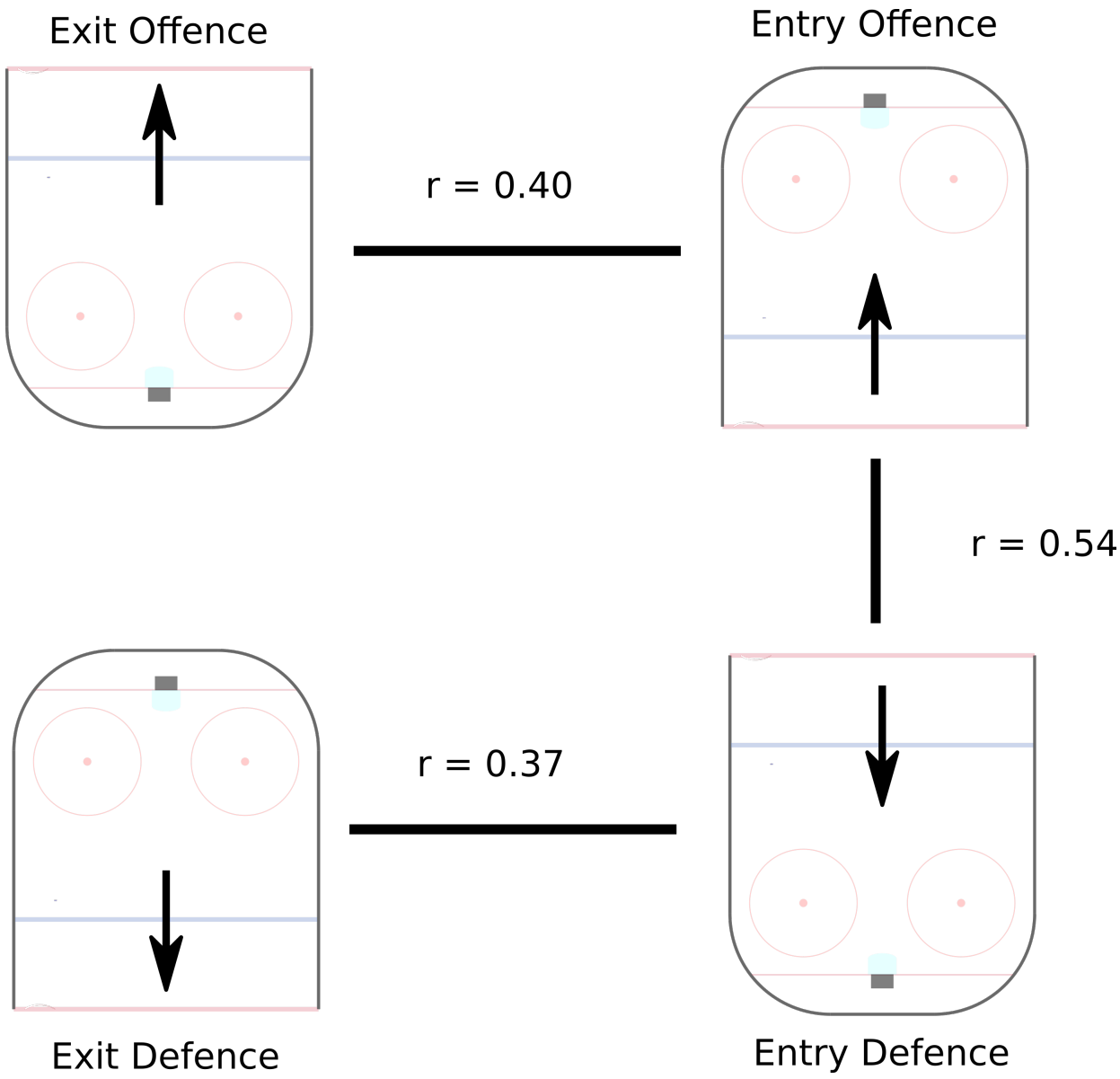
Players: Best at Preventing Exits (19-21)

Player	Position	Impact on Time Until Exit
Martin Frk	F	+14.3%
Nathan Bastian	F	+13.8%
Christian Wolanin	D	+12.9%
Phillip Danault	F	+11.6%
Mikko Rantanen	F	+11.1%

Players: Best at Preventing Entries (19-21)

Player	Position	Impact on Time Until Entry
Alex Steen	F	+24.0%
Casey Cizikas	F	+21.7%
Kailer Yamamoto	F	+21.6%
Jesse Puljujärvi	F	+20.7%
Kiefer Sherwood	F	+18.7%
Jared Spurgeon	D	+18.0%

Correlations for Players



Convert to Off-ice Impact

Want to measure impact on shifts after a given player's shift.

$$T = \begin{bmatrix} \text{D to D} & \text{D to N} & \text{D to O} \\ \text{N to D} & \text{N to N} & \text{N to O} \\ \text{O to D} & \text{O to N} & \text{O to O} \end{bmatrix}$$

Convert to Off-ice Impact

Want to measure impact on shifts after a given player's shift.

$$T = \begin{bmatrix} \text{D to D} & \text{D to N} & 0 \\ \text{N to D} & \text{N to N} & \text{N to O} \\ 0 & \text{O to N} & \text{O to O} \end{bmatrix}$$

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Convert to Off-ice Impact

Want to measure impact on shifts after a given player's shift.

$$T = \begin{bmatrix} \text{D to D} & 2.5\% & 0 \\ 6.1\% & \text{N to N} & 6.1\% \\ 0 & 2.5\% & \text{O to O} \end{bmatrix}$$

Convert to Off-ice Impact

Want to measure impact on shifts after a given player's shift.

$$T_{\text{McDavid}} = \begin{bmatrix} \text{D to D} & 2.7\% & 0 \\ 6.9\% & \text{N to N} & 6.9\% \\ 0 & 2.4\% & \text{O to O} \end{bmatrix}$$

Convert to Off-ice Impact

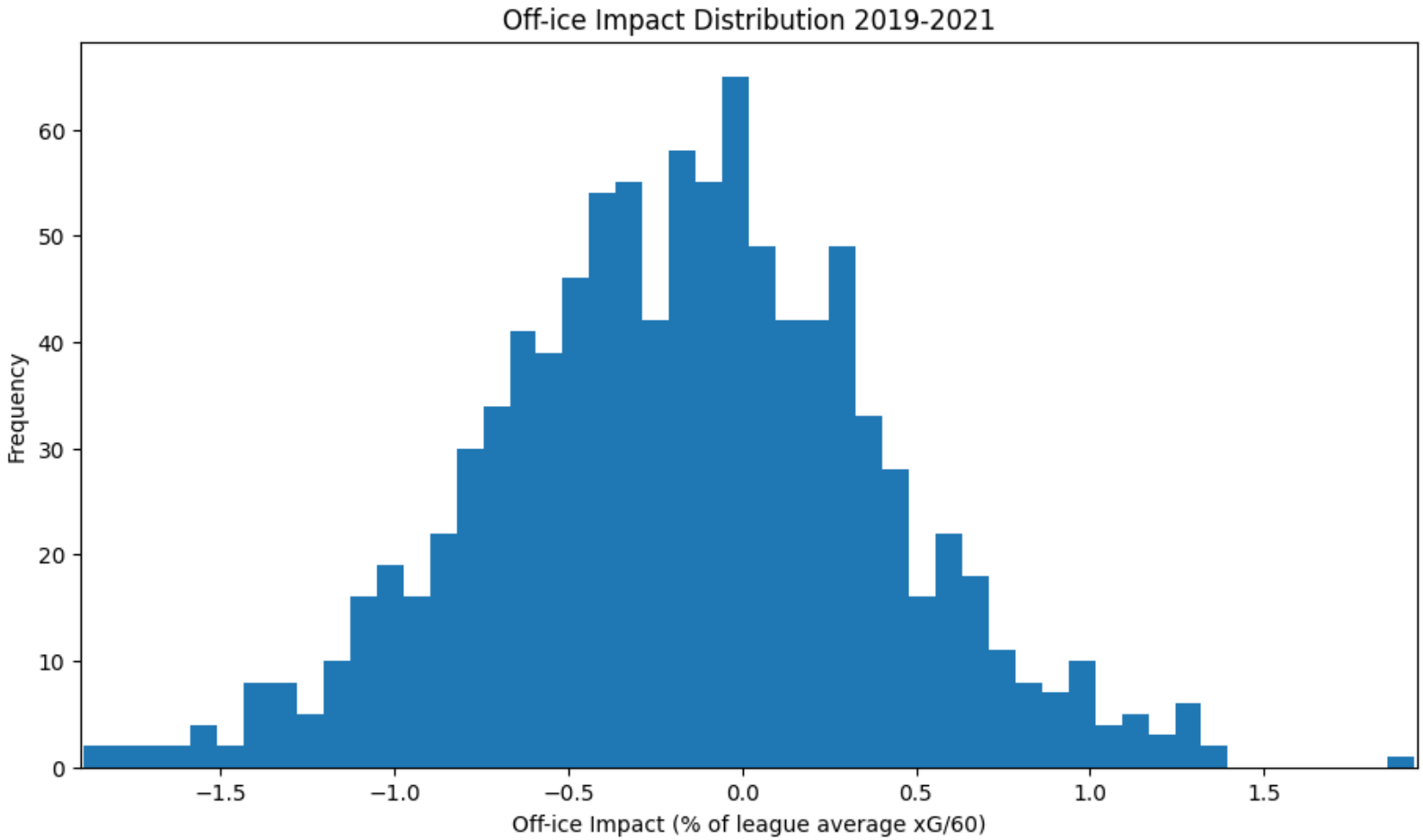
Want to measure impact on shifts after a given player's shift.

$$T_{\text{McDavid}} = \begin{bmatrix} 97.7\% & 2.7\% & 0 \\ 6.9\% & 86.2\% & 6.9\% \\ 0 & 2.4\% & 97.6\% \end{bmatrix}$$

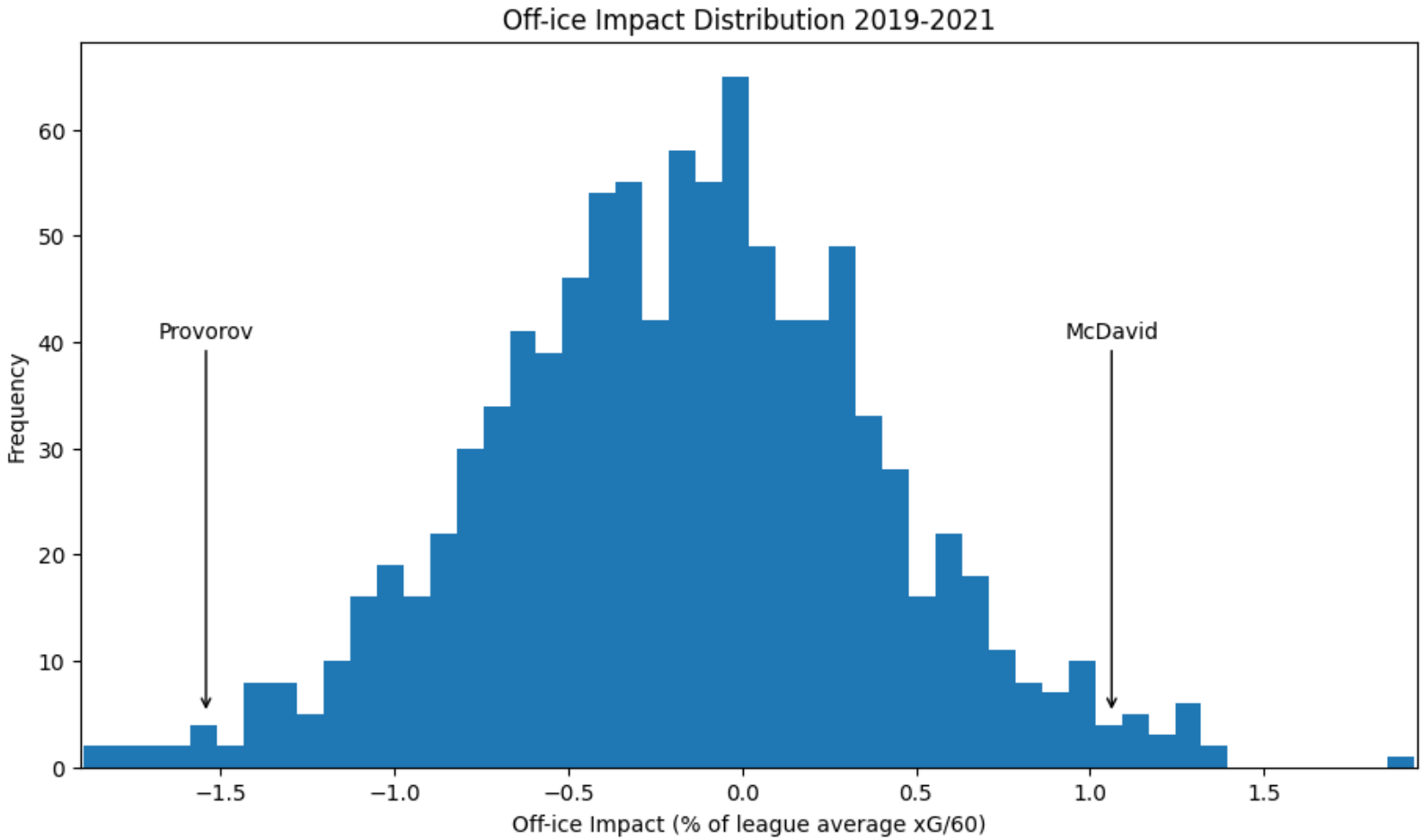
Off-ice impact

- Apply this transition matrix many times to a league-average zone-start distribution
- Subtract off league average
- Multiply by known on-ice impact of starting shifts in those zones (from my other model)
- Off-ice impact in xG/60!

Off-ice Distribution



Off-ice Distribution



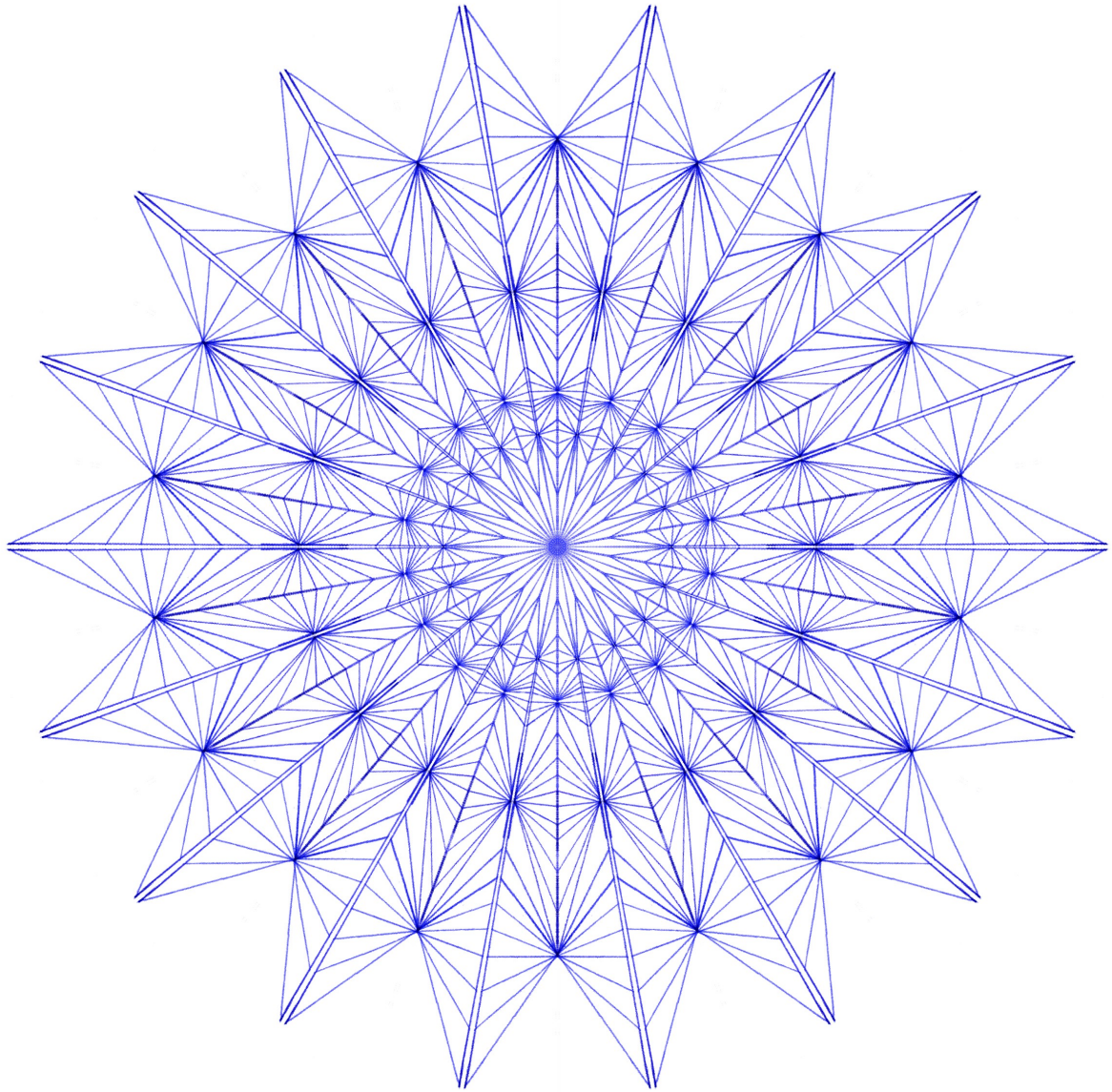
Off-ice Impact

Skater impact on the following shift is about 10% of the impact on the current shift.

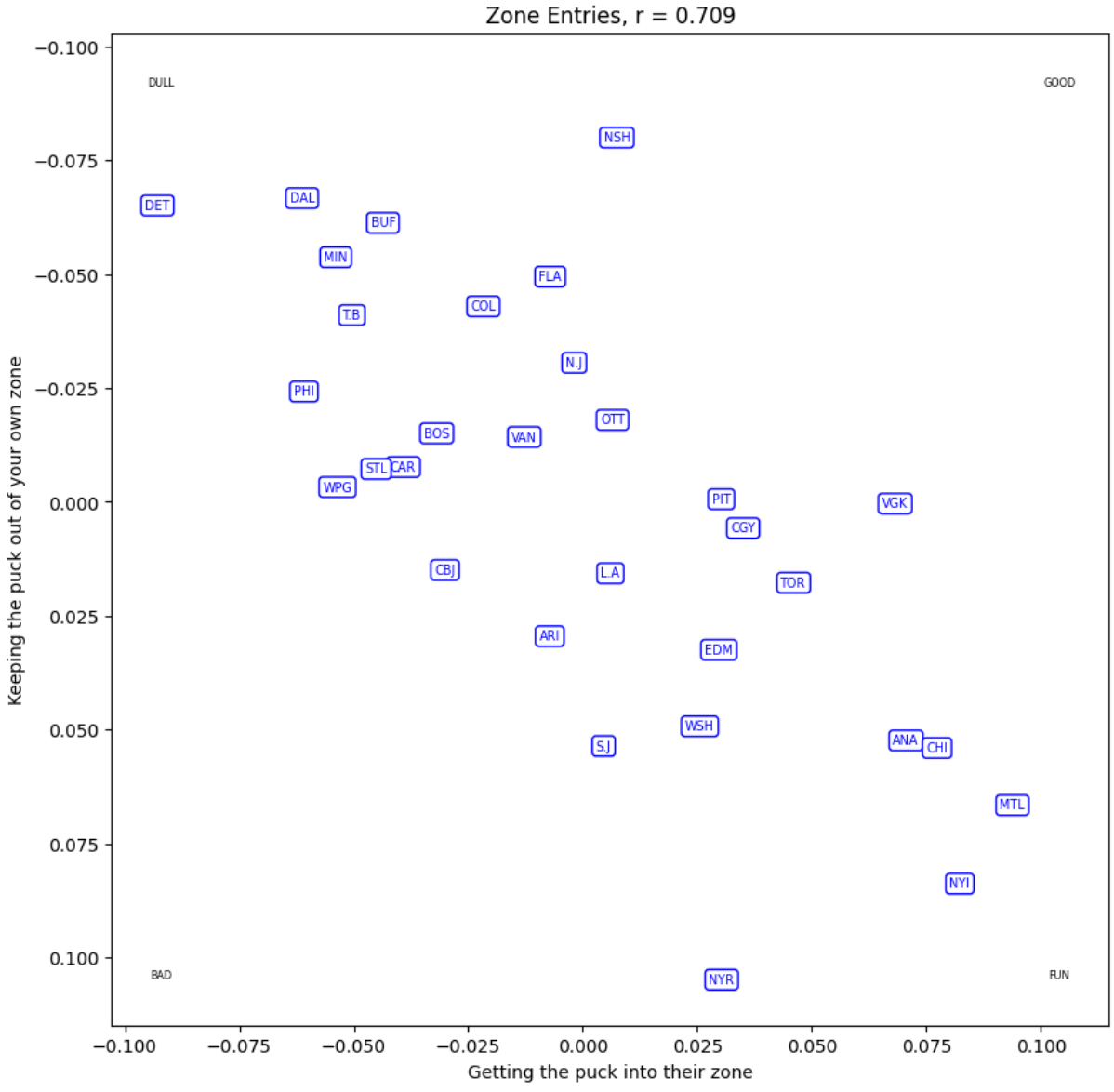
Future Work

- Synchronize diffuse impact (here) with direct-impact microstats (Sznajder).

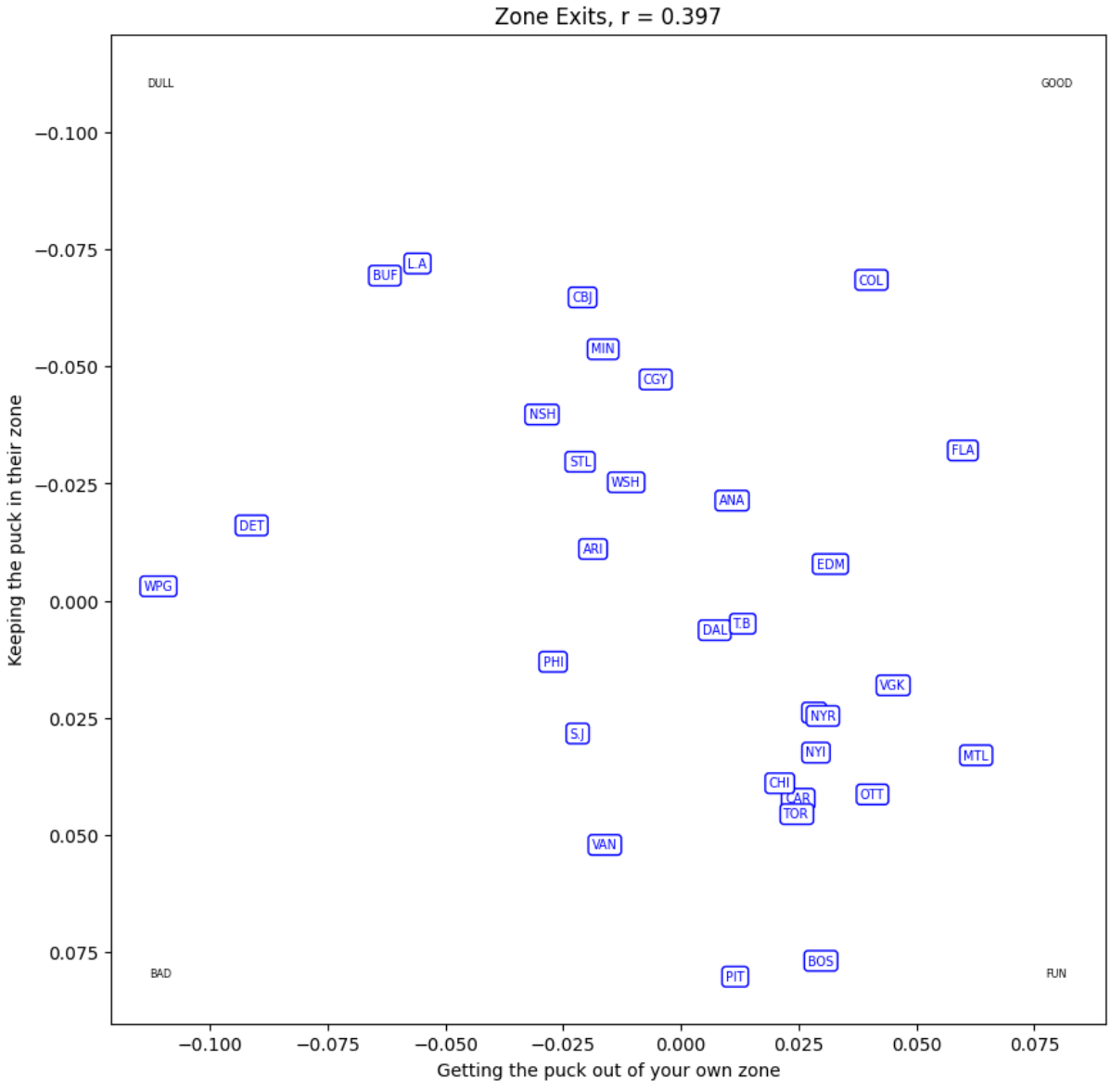
Thanks!



Team Entries



Team Exits


Zone Exits, r = 0.397
DULL
GOOD
BAD
FUN
Keeping the puck in their zone
Getting the puck out of your own zone
−0.100
−0.075
−0.050
−0.025
0.000
0.025
0.050
0.075
BUF
L.A
CBJ
COL
MIN
CGY
NSH
FLA
STL
WSH
ANA
DET
ARI
EDM
WPG
DAL
T.B
PHI
VGK
NYR
SJ
NYI
MTL
CHI
CAR
OTT
TOR
VAN
BOS
PIT