To Bunt or Not To Bunt: the Situational Expected Value of Bunting Versus the Shift in MLB

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Abbreviated abstract: MLB teams are utilizing the defensive shift more often than ever before, which begs the questions: (a) When should MLB hitters bunt, as opposed to swing away, versus the shift? and (b) How much of an advantage can be obtained by bunting when it is the superior strategy? This project addresses these questions by determining the expected runs generated from bunting and swinging away for individual players in varying base-out states using a Run Expectancy Matrix and player-specific hitting data. The results vary by individual player, but generally show that bunting is almost always favorable with no outs and almost never favorable with two outs. When favorable, bunting can generate substantial increases in expected run production relative to swinging away: for example, the mean increase is 14.3% with no outs and a runner on first for 2019's top-10 most shifted left-handed hitters.

Related publications:

– Sports Info Solutions, *What We Can Learn From Rougned Odor's Bunts Against the Shift* (2019)
– Jeff Sullivan, *More About Bunting and Beating the Shift* (2014)

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Problem, Data, Challenges

Many MLB players now face shifts for a very significant portion of their at-bats (see chart below). By calculating expected runs (xRuns) for bunting versus the shift and for swinging away, we can determine which strategy is superior for every base-out situation, and furthermore, by platoon split for every individual MLB hitter.

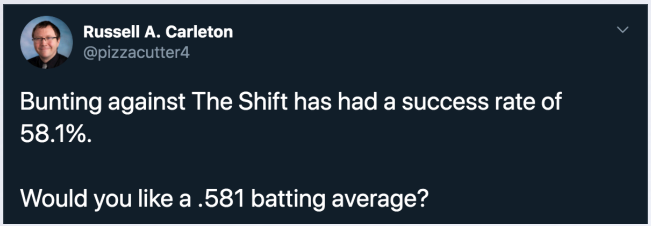
					Shifts			Non-Shifts		
Year	Batter	Team	Bat Side	Total PA	PA	%	wOBA	PA	%	wOBA
2019	Gallo, Joey	TEX	L	293	281	95.9	.390	12	4.1	.644
2019	Davis, Chris	BAL	L	335	305	91.0	.257	30	9.0	.215
2019	Carpenter, Matt	STL	L	471	417	88.5	.315	54	11.5	.294
2019	Bruce, Jay	PHI	L	319	280	87.8	.319	39	12.2	.363
2019	Olson, Matt	OAK	L	533	463	86.9	.358	70	13.1	.419
2019	Granderson, Curtis	NYM	L	362	305	84.3	.262	57	15.7	.347
2019	Moreland, Mitch	BOS	L	331	274	82.8	.347	57	17.2	.336
2019	Calhoun, Kole	ANA	L	617	498	80.7	.347	119	19.3	.256
2019	Belt, Brandon	SFG	L	613	493	80.4	.335	120	19.6	.253
2019	Bellinger, Cody	LAD	L	640	513	80.2	.410	127	19.8	.433

					Shifts			Non-Shifts		
Year	Batter	Team	Bat Side	Total PA	PA	%	wOBA	PA	%	wOBA
2019	Hoskins, Rhys	PHI	R	699	493	70.5	.352	206	29.5	.335
2019	Renfroe, Hunter	SDP	R	493	340	69.0	.317	153	31.0	.327
2019	Sanchez, Gary	NYY	R	432	285	66.0	.406	147	34.0	.241
2019	Zunino, Mike	TBR	R	289	187	64.7	.206	102	35.3	.289
2019	Frazier, Todd	NYM	R	498	287	57.6	.321	211	42.4	.337
2019	Dozier, Brian	WSN	R	480	255	53.1	.334	225	46.9	.324
2019	Bryant, Kris	COL	R	628	318	50.6	.388	310	49.4	.374
2019	Grichuk, Randal	TOR	R	626	311	49.7	.333	315	50.3	.276
2019	Voit, Luke	NYY	R	504	239	47.4	.319	265	52.6	.385
2019	Sano, Miguel	MIN	R	439	207	47.2	.359	232	52.8	.396

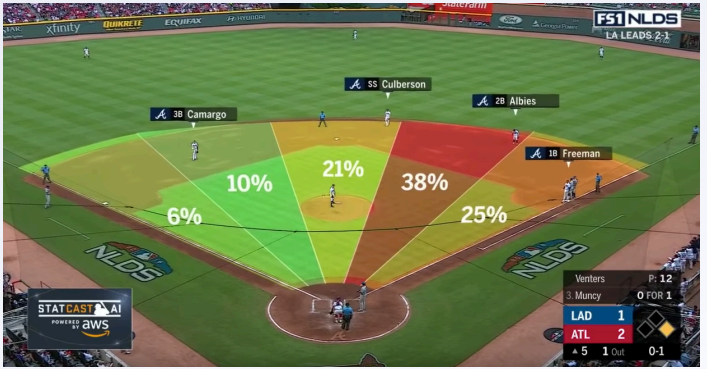
EDA dataset of the top-10 most shifted RHH and LHH from 2019 (Baseball Savant/Baseball Reference)

Challenges

- With a runner on 3rd, defenses will often go away from the shift
  - For this project, I disregarded base-out situations involving a runner on 3rd
- Individual hitter bunting sample sizes are very small, especially after isolating for bunts versus the shift
  - To combat this, I created the "league average bunter versus the shift"



The right idea, but it's not that simple (Russell A. Carleton on Twitter)



An example of a defensive pull-side shift versus Dodgers 1B Max Muncy, with directional ball-in-play probabilities (MLB/ Statcast)

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Methodology

Expected Runs Swinging **= ((Player BB% + HBP% + 1b%) * xRuns(1)) + (Player 2b% * xRuns(2)) + (Player 3b% * xRuns(3)) + (Player HR% * (1 + xRuns(0))) + (1 - Player OBP * xRuns(0 + 1 OUT))**

Runners	0 Outs	1 Out	2 Outs
Empty	0.461	0.243	0.095
1 _ _	0.831	0.489	0.214
_ 2 _	1.068	0.644	0.305
1 2 _	1.373	0.908	0.343
_ _ 3	1.426	0.865	0.413
1 _ 3	1.798	1.140	0.471
_ 2 3	1.920	1.352	0.570
1 2 3	2.282	1.520	0.736

Run Expectancy Matrix for the league average offense for each of the 24 base-out states (FanGraphs)

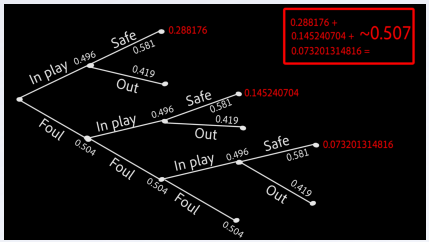
Platoon Splits Share & more ▾ Glossary

Phillies OF Bryce Harper's 2019 Platoon Splits (Baseball Reference)

Split	G	GS	PA	AB	R	H	2B	3B	HR	RBI	SB	CS	BB	SO	BA	OBP	SLG	OPS	TB	GDP	HBP	SH	SF	IBB
vs RHP	143		469	386	63	96	25	1	20	70	13	2	77	125	.249	.375	.474	.849	183	7	3	0	3	11
vs LHP	97		213	187	35	53	11	0	15	44	2	1	22	53	.283	.366	.583	.949	109	3	3	0	1	0

```r
bunt_and_shift_dat <- bunt_and_shift_dat %>%
  mutate(expected_runs_vs_r_basesempty_0out =
           ((bb_vs_r/(pa_vs_r - ibb_vs_r) + hbp_vs_r/(pa_vs_r - ibb_vs_r) +
           singles_vs_r/(pa_vs_r - ibb_vs_r)) * 0.831) +
           (doubles_vs_r/(pa_vs_r - ibb_vs_r) * 1.068) +
           (triples_vs_r/(pa_vs_r - ibb_vs_r) * 1.426) +
           (hr_vs_r/(pa_vs_r - ibb_vs_r) * 1.461) +
           ((1 - obp_vs_r) * 0.243)
         )
```

R code calculating expected runs swinging away given a RHP and the bases empty with no outs



Probability tree for the "League Average Bunter vs. Shift"

General prob. of bunt in-play: 49.6%,
Prob. of safe given bunt in-play vs shift: 58.1%

➡ Prob. of reaching base safely ≈ 50.7%

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Results and Conclusions

SPOTLIGHT:

Phillies OF Bryce Harper vs LHP

xRuns Added by Bunting vs. Swinging Away

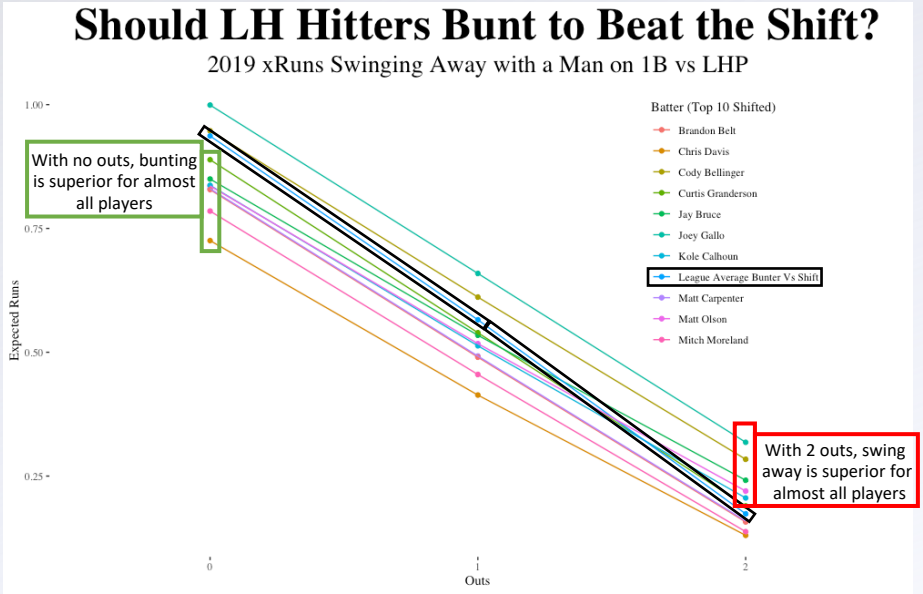
	Bases			
	___	1__	_2_	12_
0 OUTS	0.026	0.019	0.151	0.077
1 OUTS	(-)0.006	(-)0.020	0.041	0.001
2 OUTS	(-)0.037	(-)0.087	(-)0.076	(-)0.106

BUNT SUPERIOR

SWING SUPERIOR

% Increase in xRuns by Bunting vs. Swinging Away

	Bases			
	___	1__	_2_	12_
0 OUTS	5.03%	2.09%	14.03%	5.03%
1 OUTS	(-)1.97%	(-)3.45%	5.92%	0.10%
2 OUTS	(-)33.84%	(-)50.03%	(-)31.97%	(-)28.39%



Next Steps:

– Account for other variables, including live count, pitcher ability, on-deck and in-the-hole hitter ability, team win probability, probability of runner(s) on-base advancing extra bases over expected, other ball-in-play outcomes (e.g., GIDP, errors, sac flies), etc.

– Having more data on individual hitter bunting abilities would also be helpful.

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