How the West will be Won:
Using Monte Carlo Simulations to Estimate
the Effects of NHL Realignment

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Abstract

The NHL has realigned its conferences and divisions, and starting with the 2013-2014 season the Eastern Conference features 16 teams and the Western Conference features 14. Yet because there are 8 playoff spots available in both conferences, teams in the West have a 57% probability of making the playoffs, compared to just 50% for teams in the East. As a result we should expect that, on average, the last team to make the playoffs in the West will have a worse record than the last playoff team in the East. We call the difference in points earned by the 8th seed in each conference the “conference gap.” The purpose of this paper is to figure out how big to expect the conference gap to be under the new alignment. Using tens of thousands of simulated seasons, we demonstrate that the conference gap will be, on average, 2.79 points, meaning that Eastern Conference teams hoping to make the playoffs will have to win 1 to 2 games more than Western Conference playoff-hopefuls. We also show the 9th place team in the Eastern Conference has a better record than the 8th place Western team twice as often as the 9th best Western team has a better record than the East’s 8th best. Our findings have tremendous implications on ensuring that the NHL operates under rules that are fair and equitable for all teams.
1 Introduction

When the Atlanta Thrashers relocated to Winnipeg following the 2010-2011 season, a realignment of the division structure in the NHL became a foregone conclusion. For reasons of competitive equity, Winnipeg could not remain in the Southeast Division indefinitely. Thus, on March 14, 2013, the NHL Board of Governors approved a plan for restructuring the league’s conferences and divisions. Beginning with the 2013-2014 season, the NHL was reorganized into an Eastern Conference featuring 16 teams and a Western Conference featuring just 14 (Hiebert, 2013). Despite the imbalance in the size of the conferences, eight teams from the East and eight teams from the West qualify for the playoffs.

Journalists have noted that such a system makes it more difficult for a team to make the playoffs in the Eastern Conference than in the Western Conference, since 50% of Eastern teams qualify each year while 57% of Western teams qualify (McCurdy, 2013). The main question this imbalance raises is how much more difficult will it be to make the playoffs in the East than in the West. Specifically, how many more points, on average, will the East’s 8th seed earn than the West’s 8th seed? If this difference, which we refer to as the “conference gap,” is zero then we can conclude that no team is receiving an unfair advantage when it comes to getting into the playoffs simply because of that team’s geographic location. If, however, the conference gap is not zero, we might question whether

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1The NHL determines regular season standings based on “points”. A team receives two points for a win, one point for an overtime or shootout loss, and zero points for a loss in regulation. A team with 40 wins and 0 OT/SO losses will finish in the standings behind a team with 39 wins and 3 OT/SO losses, since the former team has 80 points and the latter has 81.
the system is inherently fair.

This paper provides an answer to this question, even before we have data from enough seasons to make an empirical assessment. The paper begins by detailing the structural changes that have accompanied the realignment, specifically change to scheduling and qualifying for the postseason. Next, we apply the new conference alignment to recent seasons and explore how this would have altered the set of teams which qualified for the playoffs.

We then present a Monte Carlo model which accounts for the new scheduling matrix and alignment. Monte Carlo methods have been applied to many applications in sports. Rump (2006) shows that the Stanley Cup playoffs can be simulated as a Markov chain. Rump (2008), Rudelius (2012), and Beaudoin (2013) each simulate sets of individual baseball games. Newton and Aslam (2009) simulate professional tennis tournaments. Pasteur and Janning (2011) use Monte Carlo methods to predict high school football seedings by simulating the regular season. To our knowledge this paper is the first time Monte Carlo methods have been used to assess the effect of a structural change in a professional sports league.

The results from our 10,000 simulated NHL seasons indicate that, when team talent is roughly evenly distributed between the two conferences, it will require about 2.79 more points to make the playoffs in the East than in the West. In other words, on average an Eastern Conference playoff-hopeful team will need to win about one or two more games than a Western Conference playoff-hopeful team. This finding has tremendous implications on competitive balance in the NHL. Previous scholarship has explored the effect of rule changes in professional sports on competitive balance. Quinn and Burisk (2007) show
that MLB expansion and team relocation affects competitive equity in the short run, but that any imbalances resolve themselves quickly. Horowitz (1997) and Lee and Fort (2005) find similar short-term effects, but both show that the growth of TV revenue in baseball has had different long-term effects on teams depending on media market size.

Our research is one of the only studies to find long-term competitive balance effects of a structural change imposed by a professional sports league. Prior to 2013 the MLB had a similar imbalance in the division makeup of the AL and NL. Its main motivation for restructuring the league in that year was to eliminate this imbalance (Rosenthal, 2010). Blatt (2010) quantifies the effect of this division imbalance in terms of the probability that teams make the playoffs, but does not estimate the disparity in wins required to make the playoffs in a small division versus a large division. Our paper is the first attempt to quantitatively estimate the size of such a disparity in terms of wins and losses.

2 Realignment and Structural Changes

On May 31, 2011 it was announced that the Atlanta Thrashers had been sold to a group of Canadian investors who intended to move the team to Winnipeg, Manitoba. During the following season, the team remained in the Southeast Division, with divisional opponents located in Washington, Raleigh, Tampa Bay, and Miami. As a result, the Winnipeg Jets traveled an average of 1500 miles to each of their twelve divisional road games. This geographic imbalance prompted realignment to became a key topic of discussion in NHL circles.

On March 14, 2013 the NHL Board of Governors gave the final approval to a re-
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Table 1: Changes resulting from realignment

<table>
<thead>
<tr>
<th></th>
<th>Eastern Conference</th>
<th>Western Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>New teams</td>
<td>Columbus Blue Jackets</td>
<td>Winnipeg Jets</td>
</tr>
<tr>
<td></td>
<td>Detroit Red Wings</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Number of divisions</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Teams per division</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Playoff teams</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Division schedule</td>
<td>5 games x 2 teams</td>
<td>5 games x 5 teams</td>
</tr>
<tr>
<td></td>
<td>4 games x 5 teams</td>
<td>4 games x 1 team</td>
</tr>
<tr>
<td></td>
<td>30 games</td>
<td>29 games</td>
</tr>
<tr>
<td>Conference schedule</td>
<td>3 games x 8 teams</td>
<td>3 games x 7 games</td>
</tr>
<tr>
<td></td>
<td>24 games</td>
<td>21 games</td>
</tr>
<tr>
<td>Non-conference schedule</td>
<td>2 games x 14 teams</td>
<td>2 games x 16 teams</td>
</tr>
<tr>
<td></td>
<td>28 games</td>
<td>32 games</td>
</tr>
</tbody>
</table>

alignment plan intended to alleviate geographic imbalances. The Winnipeg Jets switched to the Western Conference, and the Detroit Red Wings and Columbus Blue Jackets switched to the Eastern Conference. As a result, the two Western Conference divisions now feature seven franchises each, while the two Eastern Conference divisions feature eight. Additionally, the scheduling matrix, which dictates the number of times each team plays the 29 others, has been altered in several ways. The bottom half of Table 1 shows these changes. Most notably, teams in the East and West will have about the same numbers of games against divisional opponents, but Eastern teams will have slightly fewer games against any particular divisional opponent (4.2) than Western teams (4.8).[^3]

The other major change is the way in which teams qualify for the playoffs. In each of the four divisions, the three teams with the most points at the end of the season

[^2]: Under the old alignment, each conference had three divisions of five teams each.
[^3]: Note that in the Western Conference, one team from each division will play an extra game against each other and one fewer game against one divisional opponent.
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make the playoffs. The remaining two playoff teams in each conference, which can be considered wildcard teams, are the two remaining teams with the most points. Thus, it will be possible to have five teams qualify for the playoffs from one Eastern (or Western) division, and only three qualify from the other Eastern (Western) division.

3 Applying the New Rules to Recent Seasons

Table 2: Changes to playoff picture if new conference structure were in place

<table>
<thead>
<tr>
<th>Season</th>
<th>Removed from Playoffs</th>
<th>Added to Playoffs</th>
<th>Diff. In:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Team</td>
<td>Points</td>
<td>Wins</td>
</tr>
<tr>
<td>'12-'13</td>
<td>Islanders</td>
<td>55</td>
<td>24</td>
</tr>
<tr>
<td>'11-'12</td>
<td>Senators</td>
<td>92</td>
<td>41</td>
</tr>
<tr>
<td>'10-'11</td>
<td>Rangers</td>
<td>93</td>
<td>44</td>
</tr>
<tr>
<td>'09-'10</td>
<td>Canadiens</td>
<td>88</td>
<td>39</td>
</tr>
<tr>
<td>'08-'09</td>
<td>Rangers</td>
<td>95</td>
<td>43</td>
</tr>
<tr>
<td>'08-'09</td>
<td>Blue Jackets</td>
<td>92</td>
<td>41</td>
</tr>
<tr>
<td>'07-'08</td>
<td>Bruins</td>
<td>94</td>
<td>41</td>
</tr>
<tr>
<td>'05-'06</td>
<td>Lightning</td>
<td>92</td>
<td>43</td>
</tr>
</tbody>
</table>

\(^a\) Season shortened to 48 games by a lockout.

If half of the Eastern Conference teams (8 out of 16) make the playoffs in any particular season, while more than half of the Western Conference teams (8 out of 14) qualify, it stands to reason that the 8th seed in the East will be a better quality team than the 8th seed in the West. As a first test of this reasoning, we apply the rule changes to the seven NHL seasons that have occurred since the 2004-2005 lockout\(^4\). To do this, we imagine

\(^4\)We restrict the analysis to these seasons because significant rule changes were made following the '04-'05 lockout. Chief among these changes was the introduction of the shootout, which has inflated win and
that Winnipeg, Detroit, and Columbus have been moved to their new conferences, and the league has been reorganized into the new four-division structure. We then apply the new playoff qualification rule to the final standings. The results of this thought experiment can be found in Table 2. The Removed from Playoffs block of the table provides details about the teams that made the playoffs in real life, but would not have qualified under the new rules. The Added to Playoffs block provides details about the teams that did not qualify, but would have made the playoffs if the new rules had been in place.

Several things stand out from this table. Most importantly, in every season except 2007-2008 the new alignment would have resulted in a different set of 16 teams qualifying for the playoffs than occurred in reality. The playoff wins column shows that most of the “removed” teams did not make it out of the first round of the playoffs. The major exception is the 2009-2010 Montreal Canadiens, who advanced to the Eastern Conference Finals, battling back from a 3-1 series deficit against the Washington Capitals and a 3-2 deficit against the Pittsburgh Penguins.

The other important takeaway from the table is that every team removed from the playoff picture comes from the new Eastern Conference, and every team that added to the playoff picture comes from the new Western Conference. This provides some evidence that it will be easier to qualify for the playoffs in the West than in the East under the new rules. Additionally, the Diff. In block shows that in seven of eight instances, the team added to the playoffs had fewer wins than the team they would have replaced, and in six instances they had fewer points.

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5 This approach does not take into account the new scheduling matrix, nor the almost inevitable changes to total points earned by each team. This section is merely a thought experiment which sets up the remainder of the paper, which account for changes to the scheduling matrix.
Table 2 is not conclusive evidence that the new realignment rules will unfairly favor Western teams’ playoff chances over Eastern teams’, but there are a couple takeaway points that ought to be emphasized. The empirical evidence indicates that application of the new playoff qualification rules would have benefited a team in the Western Conference and hurt a team in the Eastern Conference. Additionally, in most cases, the new rules resulted in giving a playoff spot to a team with a worse regular season record than the team they were replacing. Certainly few years of data is not enough to make any broad conclusions about the fairness or unfairness of the new system, and statistical theory tells us that even a century’s worth of data may not even be enough to draw such a conclusion, depending on the size of the gap. Therefore the remainder of the paper uses Monte Carlo simulations to more effectively get at the answer of whether the conference gap exists, and how big it is.

4 Simulation of Full NHL Seasons

In order to take into account all the aspects of the new NHL realignment and rule changes, we use the following Monte Carlo (Pinsky and Karlin, 2010) simulation strategy:

1. Construct schedule matrices for the new and old scheduling rules.
2. Choose a value for the probability that the worst team in the league beats the best team in the league on a random night. Use this value to calculate \( \sigma \), such that the best and worst teams come from the top and bottom \( \frac{1}{30} \) of a Normal(0,\( \sigma \)) distribution, respectively.
3. Draw 30 “team quality” values, \( \mu_i : i \in [1, 30] \), from N(0,\( \sigma \)).
4. For all 1,230 games, \( j \), in the season:
   - Draw a “game performance” value for the home team, \( \gamma_{j,\text{home}} \), from N(\( \mu_{i=\text{hometeam},1} \)).
   - Draw a “game performance” value for the away team, \( \gamma_{j,\text{away}} \), from N(\( \mu_{i=\text{awayteam},1} \)).

\( ^6 \)Making other distributional assumptions here, such as using a skew normal or a truncated normal distribution, doesn’t affect the conclusions drawn.
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5. Calculate the “tie threshold,” $\alpha$, such that $\Pr(\gamma_{j,home} - \gamma_{j,away} < \alpha) = 22.4\%$.

6. For all games above the tie threshold, $|\gamma_{j,home} - \gamma_{j,away}| > \alpha$, award two points in the standings to the team with the higher value of $\gamma_j$.

7. For all games below the tie threshold, $|\gamma_{j,home} - \gamma_{j,away}| < \alpha$:
   - Linearly rescale the $|\gamma_{j,home} - \gamma_{j,away}|$’s so that they range from 0 to 1. Call this $\tau_j$.
   - Award one point in the standings to both teams.
   - Draw an “overtime result,” $\omega_j$, from Bernoulli($\tau_j$).
   - Award 1 extra point to the home team if $\omega_j = 1$.
   - Award 1 extra point to the away team if $\omega_j = 0$.

8. Apply the new playoff qualification rules and calculate the conference gap.

9. Repeat steps 3 through 8 using the old schedule matrix and old playoff qualification rules.

10. Repeat steps 3 through 9 10,000 times.

The basic intuition behind the model is that each of the 30 teams has an underlying level of talent or ability, which is reflected numerically by $\mu_i$. On any given night, a team might play slightly better or worse than their talent would suggest. These game performance levels are reflected in the $\gamma_j$’s. For most games, the team that plays better (i.e. has a higher game performance level) wins the game. For a small subset of games, the teams’ performances are so similar that the game goes into overtime. Overtime games are resolved by a weighted coin-flip, where the probability of the home team winning is proportional to the difference between the home and away teams’ game performances.

There are several aspects of the simulation strategy which merit further elaboration. In step 2 we choose a value for the probability that the league’s worst team beats the league’s best team on a random night. In the initial simulations presented in the following

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7 Over the last 15 seasons, about 22.4% of NHL games went into overtime. Calculating an $\alpha$ this way guarantees that the total number of points earned by all teams in each simulated season is approximately equal to the total points earned in real NHL seasons.

8 Since $\gamma_j$ is drawn from $\text{Norm}(\mu_i,1)$, the average of one team’s 82 game-performance levels should be approximately equal to that team’s talent, $\mu_i$.

9 Buttrey, Washburn, and Price (2011) simulate outcomes of NHL games as a function of independent Poisson processes of goal scoring because they are interested in studying the arrival rate of goals in hockey. Since we are only concerned with winner and loser of each game, we opt for a simpler algorithm which requires fewer modeling assumptions and decisions.
section, this probability is set to be 35%. We will show, however, that it does not matter where this probability is set. The simulations yield similar results if this probability is fixed anywhere between 0% and 50%.

Also, when drawing game performance values in step 4, we fix the standard deviation of the normal distribution at 1. This standard deviation can be thought of as how consistently good, bad, or average a team plays from game-to-game. It would have been possible for me to vary the team consistencies, but doing so would only serve to increase the variance of the conference gap from season to season. It would make little difference on the average conference gap, which is the value that we are most interested in.

Another point to clarify in step 4 is that the decision to draw the two game performance values for each game independently of each other. This may seem like a flaw in the model, given that most NHL and sports fans have a notion that teams tend to play better at home and worse on the road. The reason for making these random draws independent is a technical, statistical one. In step 3 team qualities, $\mu_i$’s, are drawn from a normal distribution whose variance is calculated (in step 2) based on the probability that the worst team beats the best team. This means that we have already implicitly taken into account the fact that a bad team may play worse when they are matched against a very good team.

In step 7 we make the assumption that, even in an overtime period or shootout, a team that is playing better hockey (i.e. the one with the higher “game performance” value for that game) is more likely to win the game. Alternatively, we could have assumed that because of the sudden-death nature of overtime, each team enters the period with a 50-50 chance of winning. Rosenfeld, et. al (2000) show that in the NBA overtimes tend to be won by the team performing better overall, while NFL overtimes tend to be more random.
Unfortunately their research does not comment on the tendency in the NHL. Later in the paper, we show that this modeling assumption does not affect the substantive takeaways from this simulations.

It is also crucial to emphasize that none of the simulations take into account which teams are good or bad in real life. There are no New Jersey Devils or Vancouver Canucks in the simulations; there’s just team 1 and team 30. Team 5 does not have Sidney Crosby as its captain. The team numbers are thus arbitrary placeholders. This approach sets aside any subjective concerns about one conference having more historically successful teams than the other conference. The question we are trying to answer is whether the new NHL alignment would be a fair setup if all 30 teams had an equal chance of being very good or very bad. Put another way, if the NHL ignored geography and randomly placed teams into four divisions, would the teams in the 7-team divisions have an advantage over the teams in the 8-team divisions?

5  The Conference Gap in 10,000 Simulated Seasons

The results of the Monte Carlo simulations of 10,000 full NHL seasons are presented in Figure[1] The red lines and text correspond with the old alignment and rules; the blue lines and text correspond with the new alignment and rules. As the graph shows, the conference gap under the old alignment is not statistically significantly different from zero (mean: -0.0036; SE: 0.08), while the conference gap under the new alignment is 2.79 points (SE: 0.07), which is statistically significant ($p < 0.05$). Also, the old alignment does not seem to favor one conference over the other in terms of the percentage of time
that one conference’s eighth seed has more points than the other conference’s eighth seed. This is not the case, however, with the new alignment in which the East’s 8th seed has more points than the West’s 8th seed 62.4% of the time.

The simulation strategy allows for the calculation of other interesting quantities. Table 3 presents the proportion of the simulations in which certain non-playoff teams would have made the playoffs if they had been in the other conference. In other words, in what proportion of simulated seasons did the West’s 9th place team have enough points to make the playoffs if they were in the East? This is perhaps the most relevant statistic of all, since the conference gap between 8th seeds is irrelevant if there is not a strong 9th seed to replace a weaker 8th. Under equitable playoff rules, the 9th best team in one
Table 3: Percentage of time non-playoff teams would have made playoffs in other conference

<table>
<thead>
<tr>
<th>Seed</th>
<th>New Alignment</th>
<th>Old Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>9th</td>
<td>38.9%</td>
<td>29.1%</td>
</tr>
<tr>
<td></td>
<td>21.4%</td>
<td>29.3%</td>
</tr>
<tr>
<td>10th</td>
<td>21.6%</td>
<td>15.4%</td>
</tr>
<tr>
<td></td>
<td>8.7%</td>
<td>15.7%</td>
</tr>
<tr>
<td>11th</td>
<td>9.9%</td>
<td>6.7%</td>
</tr>
<tr>
<td></td>
<td>2.6%</td>
<td>6.4%</td>
</tr>
</tbody>
</table>

conference will have a better record than the 8th best in the other conference some of the time. If the league is structured fairly, this unlucky 9th place team should be equally likely to come from the Eastern or Western Conference.

The “Old Alignment” column of Table 3 indicates that with the old rules lower seeds in both the East or West would have benefited from being in the other conference at similar rates. About 29% of the time, the best non-playoff team would have made the playoffs if they were in the other conference. This number is about 15% for the second best non-playoff teams. The “New Alignment” column suggests that such balance will not occur with the new rules. Eastern Conference 9th seeds would have made the playoffs 38.9% of the time if they were in the West. That is almost twice as often that of Western Conference 9th seeds, who would make the playoffs only 21.4% of the time if they were in the East. For 10th seeds, this percentage is more than double in the East as in the West. For 11th seeds, it is almost four times as much.

Another way to conceptualize this result is by imagining that we choose five random seasons played under the new alignment. The Monte Carlo results presented here

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10The differences in this column are due to random variation and do not provide evidence for any underlying trends under the old alignment.
suggest that in two of those seasons the 16 best teams will make the playoffs. In another two of those seasons, a team in the West will make the playoffs with a worse record than a non-playoff team in the East. The reverse will be true in just one of the five seasons.

6 Validity and Robustness of Simulation Results

In this section we explore how close the simulated seasons match real-world data, and demonstrate the robustness of the results to modeling assumptions. Figure 2 compares simulation distributions of points to data from real NHL seasons. The figure sorts the 30 point totals from smallest to largest within each season, and plots the the density of the number of points earned by the best team each year under the new rules (blue curves) and the old rules (red curves). This graph for the points by the best team each season is at the top left of the figure. The results for the second best teams, third best teams, etc. are presented from left to right, top to bottom.

Each graph also includes black vertical bars which represent the highest (second highest, etc.) point totals from the 2005-2006 through 2011-2012 NHL seasons. Ideally, these vertical bars should be located in the middle of each of these thirty graphs. This is case for most of the graphs in the middle of the figure. These are the teams for whom it is most important to simulate realistic point totals, since they are the ones right at the margin of making or not making the playoffs and are used for calculating the conference gap. The simulated distributions for teams at the top and bottom of the figure are also similar to the real world data, although not to the same extent as the teams in the middle. Being slightly off at the margins of the simulation is not a concern, since the records of the best and worst
teams do not influence the estimation of the conference gap.

The results from the simulations are also robust to the initial assumption of a 35% probability that the worst team beats the best team. All possible values of this probability yield the same substantive result. Figure 3 shows the mean conference gap and a 95% confidence interval for all values of this probability. Figure 3 does not include points for when the probability equals zero and fifty percent. Assuming these probabilities would result in calculating a standard deviations of infinity and zero, respectively, for the average team quality distribution. There are two key takeaways from this graph. First is that the results in the previous section are not a result of the decision to choose 35% as this probability. The conclusions would be virtually identical conclusions if we had assumed any other initial parameter.  

The second key takeaway is perhaps more concerning. We can think of the probability of the worst team beating the best as a measure of the degree of parity in the NHL. If the best team beats the worst team every time they play, then there is very little parity in the league. Likewise, if the best and worst teams have a 50/50 chance of beating one another, then all teams in the league have very similar skill levels and parity is high. Figure 3 indicates that regardless of which of these two cases is true in the NHL, high parity or low parity, the new alignment of the conferences and the rules for playoff qualification will benefit the Western Conference over the Eastern Conference. For numerous reasons, the

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11 The possible values only range from 0% to 50%, because having the worst team beat the best team 51% of the time would have the consequence of statistically inverting the interpretation of my model. Somewhat paradoxically, the worst team would essentially become the best team in the simulations.

12 The main reason for this is that, regardless of where this probability is set, there is a substantial amount of variance that enters the model when the game performance values are drawn. is largest when the assumed probability is low. If we assume a 1% chance that the worst team beats the best, then = 0.897. This is still smaller than the standard deviation (1) of the distribution from which game performance values are drawn.
NHL should value parity among its teams. Yet if we had a circumstance in which all thirty teams had virtually identical levels of skill and talent, the teams in the West would have a much higher probability of making the playoffs. In fact, when you simulate the model, giving all 30 teams the exact same level of average team quality, the 8th seeded Eastern Conference team has roughly 2.9 more points than the 8th seeded Western Conference team, on average.

The other important assumption embedded in the model is how we treat overtime outcomes. The results presented so far make the assumption that teams’ performances in overtime will be similar to their performances in regulation. In other words, two teams with game performance values, $\gamma_j$’s, that are nearly identical to each other will each have a 50% chance of winning in overtime. Alternatively, if two teams have $\gamma_j$’s that put them just inside the tie threshold, $\alpha$, the team with the higher $\gamma_j$ is very likely to win in overtime.

It is possible that once a game goes to overtime each team’s winning probability is about 50%. This belief can be incorporated into the Monte Carlo model by drawing overtime results from a Bernoulli(0.5) distribution instead of a Bernoulli($\tau_j$) one. Changing this assumption has no affect on the substantive takeaways from the simulation model. Under the Bern($\tau_j$) assumption, the average conference gap in the new alignment is 2.79; with an assumption of Bern(0.5) the conference gap is estimated to be 2.81 (SE: 0.07). It is not surprising that this assumption does not affect the conference gap, since affecting it would require making an assumption that overtimes occur differently in the Western Conference than in the Eastern.

13 Where $\tau_j$ is the rescaled value of $|\gamma_{j,home} - \gamma_{j,away}|$ (step 7 in the algorithm).
7 Discussion

In this paper, we have brought to light potential unintended consequences of NHL realignment and changes to the rules for playoff qualification. Using tens of thousands simulated entire seasons, we have found robust evidence that the NHL’s new structure will unfairly benefit teams in the Western Conference over teams in the Eastern Conference. We should expect that on average the threshold for reaching the playoffs in the East will be 2.79 points (±0.14) higher than the threshold for reaching the playoffs in the West. This difference is potentially huge. In the lockout-shortened 2013 season, only two points separated the East’s 5th seed from the 11th seed. In the 2010-2011 season, three extra points would have put Calgary in the playoffs. Instead they finished in 10th place. In 2008-2009, the 9th seeds in the East and West would have moved up to 7th and 6th place (respectively) with three extra points.

There are two important objections to these findings that might be raised, although neither lessens the implications of the results. First, one may point out that Western Conference teams have, in recent years, been of higher quality than Eastern Conference teams. The simulations are agnostic as to whether one conference has better teams than the other. While it may be true that today the Western Conference has more talented teams, on average, there is no reason to think that this will still be the case a few years from now. The Monte Carlo results show that if the conferences had equally talented teams, teams in the West would be better off in terms of reaching the playoffs. Also, the far right of Figure 3 suggests that if all thirty teams had exactly the same amount of underlying talent, the West would still have an advantage by virtue of the realignment changes.

The second common objection to my findings is that teams in the West are already
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at a disadvantage because of more grueling travel schedules and providing them with an advantage via the realignment is only fair (Smith, 2013). If there is indeed a travel effect, Western teams would tend to have worse road records and better home records, since their home opponents would be suffering from travel fatigue themselves. Because every team has an equal number of home and away games, a travel fatigue effect could not have as large a systematic effect as the conference gap.

The implications of these findings are far reaching. For owners and team executives, it means imbalances in the revenue earned from home playoff games. Western Conference teams will make the playoffs at higher rates than Eastern Conference teams, meaning at least two extra games’ worth of ticket and concession sales. For players, it means that playing for a Western Conference team gives them a better chance of winning the Stanley Cup in any given year, since just making it to the playoffs gives them a chance to win it all. For fans of Eastern Conference teams, it means a higher probability that their season will end too soon and less of a chance that in any given year his or her team will win the Stanley Cup.

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14 As the 8th seeded Los Angeles Kings demonstrated in the 2012 playoffs.
Figure 2: Point distributions from simulations versus real-life.
Figure 3: Conference gap (and 95% confidence intervals) when you vary the “worst over best” probability
8 Works Cited


Rump, Christopher. 2008. “Data Clustering for Fitting Parameters of a Markov Chain
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