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National Diversity and NHL Team Performance, 2007-2011

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Abstract

The effects of team diversity on work performance have been extensively studied both in general and sport-specific context, often yielding mixed results. However, little research exists on the impact of that diversity in the context of ice hockey. Though the sport is not as diverse as others, such as football, it has greatly increased its global footprint over the last 20 years. This paper looks at the impact of national diversity on overall team performance. Using data from NHL teams between 2007 and 2011, national diversity on each squad is calculated in three ways: Richness, the Gini-Simpson Index and Shannon's Entropy. Controlling for team payroll and strength of schedule, we run correlations, linear regressions, logistic regressions and ordinal regressions to assess the effect of diversity on both regular season and playoff performance. Ultimately, we find that national diversity has no significant impact on team performance. We conclude by discussing potential explanations for this finding and propose further avenues of research.

Keywords: *Ice hockey, Diversity, Team performance*

Introduction

Though ice hockey does not enjoy the widespread international popularity of football, the game has increasingly internationalised both at the elite and grassroots levels. In 2014-15, players from 19 different countries competed in the National Hockey League (NHL) (QuantHockey, 2015) and at the 2015 NHL Draft, the first ever Dutch and Chinese players were selected (Brown, 2015). At the national level, ice hockey associations exist in 74 countries, including places as far flung as Kyrgyzstan, Qatar, South Africa and Australia (IIHF, 2015). Given the ever expanding base of member associations, along with the additional exposure the sport will receive through the 2018 Pyeongchang and 2022 Beijing Winter Olympics, the sport is likely to globalize further. What is less clear is the impact, if any, this increasing diversity has on on-ice team performance. Here, the term diversity refers to the "distribution of personal attributes among interdependent members of a work unit" (Jackson, Joshi, & Erhardt, 2003). This diversity can be assessed by various metrics such as age, gender, ethnicity, language or nationality.

Researchers and practitioners posit that diversity may have either negative or positive effects on team performance. For example, Social Categorization theory suggests that people would form negative stereotypes of dissimilar teammates or form distinct groups with individuals more similar to themselves, hence fostering polarization and conflict (Bodenhausen, Kang, & Peery, 2011; Stura & Lepadatu, 2014; Timmerman, 2000). Others argue that diverse teams provide better, more creative solutions, that they are more productive or even that the presence of new and different individuals may energize older group members (Phillips, Liljenquist, & Neale, 2009). The first two arguments, that diversity breeds creativity and productivity, is especially prominent in the business press (Abreu, 2014; Green, López, Wysocki, & Kepner, 2012; Kerby & Burns, 2012; Morgan, n.d.). Stura and Lepadatu (2014) provide a good overview of the potential positive and negative effects of group diversity with a specific focus on sports.

Some studies investigate the impact of diversity on team sport performance. Timmerman (2000) looks at the impact of ethnic and age diversity on the performance of 871 professional basketball teams and 1,082 professional baseball teams from 1950 to 1997. Controlling for team ability, he finds that age diversity and racial diversity are negatively associated with basketball team performance and unrelated to baseball team performance. He argues that these results are due to the relatively high task interdependence of basketball when compared to baseball, though he also recognizes that the larger size of a baseball team may moderate the effects seen in basketball (Timmerman, 2000). Brandes, Franck and Theiler (2009) analyze how the number of nations on a squad impacts the performance of German Bundesliga teams. However, they do not find any significant influence

of the number of nationalities within the "core team" on team success. Rather, echoing previous literature, they find that financial resources are the main driver of sporting success (Brandes et al., 2009). Having said that, the use of number of nationalities is somewhat limiting, as that only reflects the richness of the different nations, but not the evenness of their distribution. Ingersoll, Malesky and Saiegh (2013) use data from UEFA Champions League teams from 2003 to 2013 and, using linguistic distance as the main measure of diversity and controlling for team salaries, find that more diverse teams outperform less diverse ones, seeing a 0.33 rise in per-game goal differential. Bogar (2014) finds that, between 2005 and 2009, ethnic diversity positively impacts team performance for ACC men's and women's college basketball. However, the value of this finding is mitigated by the lack of any control variables such as school financial resources or reputation.

Other studies look at the impact of team diversity within the context of the broader workforce. Similar to above, the results tend to be mixed. Townsend and Scott (2001) find that teams composed primarily of whites, as opposed to a mix of African-Americans and Whites, perform better in a sample of 1200 sewing machine operators. Looking at both face-to-face and virtual teams, Staples and Zhao (2006) find that heterogeneous teams face more internal conflict, but that there is no statistically significant difference in performance when compared to homogeneous teams. Using a sample of Midwestern U.S. fraternities and sororities, Philips et al. (2009) find that more heterogeneous teams outperformed more homogeneous teams on a 'murder mystery' type task. The few samples above show the wide variety in the types of groups, work environments and tasks measured. For a good overview the literature on the topic between 1996 and 2002, see Jackson et al (2003).

Methodology

NHL team data from 2007 to 2011 is used, for a total of 120 unique samples. Regular season performance is measured by regular season wins and regular season points (teams receive a point when they lose in overtime), goals for and goals against. Playoff performance is measured by playoff participation, playoff wins as well as playoff progress, from not making the playoffs (0) to winning the Stanley Cup (5). Team payroll and strength of opponents are used as control variables though the strength of opponents is only applicable in the regular season. All performance statistics are from ESPN's website and team payroll data is from USA Today. A count of player nationalities on each team is done based on the information listed on EliteProspects.com. If a player possesses dual nationalities, his national team affiliation at the time is used. All players who played a minimum of one game with the team are counted. No games-played thresholds

are introduced as we wish to focus on the broader social nature of a team and mitigate many hockey-specific realities — such as backup goaltenders, injuries, injury replacements, younger players and trades — that would needlessly exclude players if a threshold were imposed.

Diversity is measured in three ways. Richness, or number of nationalities on a team, the Gini-Simpson Index and Shannon's Entropy are used. Specifically, the Gini-Simpson Index measures the probability that two entities picked at random are of different types while Shannon's Entropy quantifies the degree of uncertainty in predicting an entity's type (Jost, 2006). We then run correlations, linear regressions, logistic regressions and ordinal regressions to explore the impact of team diversity on both regular season and playoff performance.

Table 1
List of Variables

Variable	Descriptions
RSW	Regular Season Wins
RSPTS	Regular Season Points
RSGF	Regular Season Goals For
RSGA	Regular Season Goals Against
POW	Playoff Wins
POBIN	Playoff participation (binary)
PORDS	Playoff rounds played in, from none (0) to Stanley Cup Champion (5)
PAY_TOT	Total team payroll
PAY_MIL	Total team payroll, in millions of USD
SOS	Strength of Schedule (i.e. strength of opponents)
RICH	Richness (number of nationalities on a team)
D_MINUS	Gini-Simpson Index
H	Shannon's Entropy

We then run correlations, linear regressions, logistic regressions and ordinal regressions to explore the impact of team diversity on both regular season and playoff performance.

Results

Table 2 shows partial correlations, controlling for total team payroll, between our three diversity measures — the Gini-Simpson Index, Shannon's Entropy and Richness — on various measures of team performance, including regular season wins, regular season points, regular season goals for, regular season goals against, playoff wins and playoff rounds. There is no significant correlation between the three diversity measures and any of the performance measures. Further, no significant correlations are found using strength of opponents as a control variable, both payroll and strength of opponents as a control variable or no control variable at all. Payroll, however, is significantly positively correlated with team performance, both without a control variable and when controlling for strength of opponents.

Table 2

Correlations, controlling for Team Payroll

Control Variable / Variables			**RS_W**	**RS_ PTS**	**RS_ GF**	**RS_ GA**	**PO_W**	**PO_ RDS**
PAY_TOT	RICH	Correlation	-.095	-.065	-.009	.083	-.029	-.032
		Significance (2-tailed)	.305	.483	.919	.371	.757	.733
		df	117	117	117	117	117	117
	H	Correlation	.040	.094	.001	-.056	-.026	-.025
		Significance (2-tailed)	.668	.311	.990	.547	.780	.784
		df	117	117	117	117	117	117
	D_MINUS	Correlation	.101	.129	.022	-.107	-.006	-.010
		Significance (2-tailed)	.274	.162	.815	.245	.945	.913
		df	117	117	117	117	117	117

Table 3 shows a simple linear regression measuring the effect of diversity, as measured by the Gini-Simpson Index, payroll in millions and strength of opponents on regular season wins. Diversity has no significant effect on regular season wins. Total team payroll (B=.391, SE=.055) has a significant, positive effect on regular

season wins. When other dependent variables are used — namely regular season points or playoff wins — payroll continues to have a significant positive effect on team performance. Diversity, however, remains statistically insignificant. When Shannon's Entropy or Richness are used, the effect of diversity also remains statistically insignificant.

Table 3

Linear Regression with Gini-Simpson Index, Payroll and Strength of Opponents

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.843	48.877		.447	.656
	SOS	-9.229	85.776	-.009	-.108	.915
	PAY_MIL	.391	.055	.560	7.146	**.000**
	D_MINUS	.073	.069	.084	1.052	.295

a. Dependent Variable: RS_W

Table 4 shows the impact of strength of opponents, payroll in millions and diversity, as measured by the Gini-Simpson Index, on a team's odds of making the playoffs. Diversity does not have a statistically significant impact. Payroll has a highly significant, positive effect (B=.076, SE=.023) on the odds of making the playoffs. Strength of opponents (B=-61.486, SE=33.413) has a marginally significant, negative effect on the odds of making the playoffs. When Shannon's Entropy or Richness are used instead, the effect of diversity remains statistically insignificant.

Table 4

Logistic Regression predicting odds of participating in playoffs

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	SOS	-61.486	33.413	3.386	1	.066	.000
	PAY_MIL	.076	.023	10.751	1	**.001**	1.079
	D_MINUS	-.005	.028	.027	1	.870	.995
	Constant	31.401	19.019	2.726	1	.099	43359060240764.830

Table 5 illustrates the effect of team payroll in millions and diversity, as measured by the Gini-Simpson Index, on the underlying odds of progressing through the different rounds of the Stanley Cup Final. Team payroll has a highly significant, positive effect on the underlying odds of winning the championship. Diversity has no significant effect. When Shannon's Entropy or Richness are used, diversity remains statistically insignificant.

Table 5

Ordinal Logit regression on the odds of progressing through the playoffs

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
References	PAY_MIL	.077	.020	15.095	1	**.000**	.038	.115
		.002	.022	.006	1	.941	-.042	.046
Link function: Logit.								

Discussion and Conclusion

This study presents some limitations that should be mentioned before delving into our discussion. Our sample is limited only to NHL teams. Therefore, we can question if these findings are generalizable to other hockey leagues at other levels and in other countries. Furthermore, we only use nationality as a measure of

diversity. Metrics such as age or linguistic distance could provide different insights. Indeed, linguistic distance, as used by Ingersoll et al. (2013), could be particularly valuable, especially given the varied and sometimes shared linguistic backgrounds of many of the countries participating in the NHL. For example, French is spoken in Canada, Switzerland and France while other countries, such as Scandinavian nations or former Soviet Republics, also share common linguistic backgrounds. Other control variables, such as coaching or management experience, could also provide additional insights.

The results here go against some of the previous literature on team diversity and team performance. Though ice hockey is a high interdependency sport like basketball, we do not see the negative effects that Timmerman (2000) finds. We also do not see the positive effects that Ingersoll et al. (2013) or Bogar (2014) identify. Ultimately, our findings closely echo Brandes et al., who determine that financial resources, and not diversity, are one of the main drivers of team success. An interesting sub-finding is that strength of opponents does not seem to be a driver of overall regular season performance, but it does effect the odds of actually making the playoffs. This makes sense, as small variation in opponent's strength may not have a large impact on performance over a protracted 82 game schedule, but that could be enough to tip the odds in favour or against making the playoffs.

Ultimately, though, we cannot make an argument that diversity has an impact on team success, be it in the regular season or the playoffs. Hockey is reputed as a more conservative sport, sharing many values typically associated with rural or "frontier" Canada (Botteril, 2004; Earle, 2002). Discipline, conformity and cohesion are also integral parts of the sport's culture. A study of Junior Ice Hockey in Finland shows that group cohesion explains 29% of the variance in team success (Salminen & Luhtanen, 1998). Players who act in a manner perceived as too flamboyant are often singled out. In Russia, the sport is inextricably linked with the state and the army (Baumann, 1997). This background, which promotes high group cohesion, may, therefore, play a role in minimising creativity, conflict or dissent within a team, thus neutralising the effects of diversity.

Ice hockey is also a traditionally upper-class sport. Participation in the sport is expensive and restricts the amount of people who can afford to take part. Recent reports also suggest that the costs have increased dramatically over the last decade, further restricting access (MacGregor, 2012; Mirtle, 2013). Some estimates place the yearly participation in youth ice hockey at 10,000 USD per child (Kids Play Foundation USA, 2012). And, of all major professional sports in North America, ice hockey has the wealthiest fan base, with one-third of its viewers earning more than 100,000 USD a year (Thompson, 2014). Given these factors, one could expect that most players come from similar, higher social class backgrounds and that, regardless of nationality or language, this contributes to greater cohesion, as well as to minimising other effects typically associated with group diversity. No study

has been located dealing with class differences and team sport performance. This, however, could prove to be a fertile avenue for further research, especially since much literature points to social class as being a principal driver of inter-group conflict (Rummel, 2002).

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