Journal of Physical Education and Sport ® (JPES), Vol.20 (6), Art 462, pp. 3420 – 3427, 2020
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Success factors and revealed comparative advantage in the NBA

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Published online: December 30, 2020
(Accepted for publication: December 15, 2020)
DOI:10.7752/jpes.2020.06462

Abstract
In this paper, we used the Balassa index, which measures the revealed comparative advantage (RCA), to analyze the specialization patterns of National Basketball Association (NBA) teams. Through the Balassa index, we examined how basketball has changed in the last 10 years, which part of the game has become more important, and how stronger teams compare to weaker teams. We found that RCA in two-point shots is a more important determinant of success than RCA in three-point shots. We conclude that it is equally important to improve the RCA index in both offensive and defensive play
Keywords: basketball, offence, defence, two-point shot, three-point shot, RCA

Introduction

Since ancient Roman times, sports havebeen part of everyday life. *Panem et circenses* (bread and circuses), a phrase coined by the Roman poet Juvenal in the 2nd century AD, means that as long as people are distracted from their everyday problems—through forms of entertainment such as sports—and their basic needs are met, they will be content. Sports havefrequently been used to wage political battles. George Orwelleven described sports as war minus the shooting.

Although the format of modern sports has changed, its role remains the sameSports haveoften been used as a way of showing that a group or team is better than their opponents. With the increase of sports on TV and the growth of sports revenues, sports have become the centre of attention like never before. The greater the interest in a sport, the more money it brings in; this has led tosportsteamstrying to find ways to win against their opponents. The most successful teams in today's sports have the biggest financial benefits. They receive the best sponsorship deals and sell most merchandise than teams who have less success.

The use of comparative advantage has been touted in sports analysis. Sports researchers generally focus on performance indicators and analyse team work, finances and salary. This study concentrates on the revealed comparative advantage (RCA) in offensive and defensive play and the impact of these indices on winning games. The subjects of analysis are the individual elements of both offensive and defensive patterns during the game.

Analyses of why some countries are better at specific sports are methodologically similar to trade analyses, which determinethe comparative advantage of countries in producing specific products and analysethe role of specialisation in international trade. In the same manner, specialisation in sports should be prioritised to help teams achieve their goals, particularly to increase their share of games won. In a broad sense, specialisation means that the team masters some tactics of a play in which they can outperform their opponents, and they continue exploring this advantage to achieve success.

Sports economists have documented what affects countries' specialisation and success in specific sports;the common factors identified are the economic, sociological and political contexts(Bernard & Busse, 2000;Bosscher et al., 2009; Johnson & Ali, 2004.The concept of comparative advantage in sports is similar to that in trade;although a team might be better in both defensive and offensive play tactics, specialising in the area where they have a comparative advantage maylead to a higher probability of winning.

National Basketball Association (NBA) teams donot work with unlimited resources, and they face different restrictions. Theyoperate under a salary cap rule, which limits the amount of money that can be spent in total as well as per player. Teams donot operate with the same financial opportunities, since there are always more attractive markets that offer morefinancial opportunities outside basketball.The taxation system in US states is not unified, so playing for one club can be financially more beneficial than in other states. Players for teams that are stated in Texas (San Antonio, Dallas, and Houston) receive higher net salary because they play more games in the state.. The tax laws in the United States differ across states, so playing for one team can be more lucrative than playing for another even if the basic salary remains on the same level. Additionally there are cities who are more attractive for living, and this also impacts decisions.

Another issue is the measurement of success. Not all teams have the same goals. In general, NBA teams can be classified into several levels: 1)those competing for the championship, 2) those competing for a better

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playoff position, 3)those competing to enter theplayoffs and4)those that want a better draft position to acquire more talented players. This paperaims toanalyse,through the Balassa index, the performance of NBA teams in two-point and three-pointoffensive and defensive play. The paper also aims to analysehow gametactics have changed over the past 10 years. The concept of specialisation is closely linked to a country's wealth generation and improvement of trade opportunities.

Basketball is constantly changing, andthe past decade has seen an overuse of three pointers. As teamshave improved, they have tried different ways to remain competitive and to achieve their goals (Schneider, 2018). With the increased use of statistics in modern sports, teams have been trying to improve their efficiency in shot selection Arthuret al., 2018; Pelechrinis, 2019.

This study concentrates on the revealed comparative advantage (RCA) in offensive and defensive play and the impact of these indices on winning games. We used regression analysis to examine how these team-level endogenous factors affect the probability of winning. The success rate of shots that are taken outside the paint—which include two-point and three-point shots—is between 35% and 45%. This shows how the game has changed over the years, especially in shot selection and defending opponents' shots (Goldsberry, 2019).

Therest of this paper is organised as follows: First, we review theliterature on team performance, the overall role of specialisation and related issues. Second, we present the econometric model used. Finally, we present the empirical findings and conclusion.

Literature Review

To explain the need for specialisation in international trade, David Ricardo introduced the theory of comparative advantage. This theory has influenced international trade (Costinot & Davidson, 2012) and has been improved and analysed through several approaches. The theory states that different factors of production specialise in different economic activities based on their relative productivity differences.Research has typically focused onwhat comparative advantage is and how to create it. Beaudreau (2016) usedthe vision-augmented value chain to explain how comparative advantage is created. With the ever-growing need for money in the modern business world,researchers have looked at how access to finance creates an endogenous comparative advantage. Egger and Keushnigg (2017)analysed credit availability as a source of comparative advantage. Theyconcluded that a larger equity ratio of companies and tougher governance standards can lead to the entry of companies and create a comparative advantage in production segments where companies are clustered.Balassa's (1965) RCA is a narrower concept based on Ricardo's comparative advantage.Balassafocused on specialisation as a way of improving limited resources. The basic idea is to determine 'strong' sectors.In the context of world trade patterns, countries have a comparative advantage when they use limited resources better and produce more than other countries.

Using a modified Balassa index, Fronczek (2018) concluded that the United States has an RCA in the trade of agricultural products while China and Germany have an RCA in manufacturing products. Different countries have different specialisations. Consistent with the theory of comparative advantage, distributions of RCA between countries differ (Brakman & Van Marrewijk, 2017; Brakman et al., 2013).

Sports leagues function differently. Compared to the European sports system, the American league system is closed andconsidered more balanced, since the leagues are constantly trying to improve (through higher draft picks) the worst-performing teams in the league (Buzzachi et al., 2003;Szymanski, 2012)(Price, et al, 2010).The final standings of the teams affect their brand value, generated income and team investments (Georgievski, 2015; Rohde & Breuer, 2016). The NBA has the fourth highest TV contract, of all sports leagues, from which each team receives $200 million per year.

Teams that focus on their comparative advantage and patterns, whether defensive or offensive, have more success than teamsthat avoid specialisation (Georgievski et al., 2019).In a similar article that is focused on the NFL were analyzing the importance of offense and defense (Robst, et al, 2011). Following Ricardo's theory of comparative advantage, sports teams need to specialise in a certain type of play (offensive or defensive) to be more successful. In economic terms, teamsneed to make a trade-off to compete better with other teams. The gains from specialization were analyzed in the NFL (national football league), where the main finding was that there are pronounced gains to specialization for runningbacks, particularly at the top end of the salary distribution. (Simmons & Berri, 2009).

The concepts of trade-offs and specialisation have been used to analyse trade and production; likewise,researchers have used these concepts to analyse comparative advantage in sports. Using the concept of RCA and the Balassa index,Tcha and Pershin (2003)examined specialisation in sports during the OlympicGames. Bois and Heyndels (2012) also used RCA and the Balassa index in the field of athletics; theyconcluded that a country's level of success depends on its population and wealth and thathigh-income countries have a lower need for specialisation.

To our knowledge, RCA has not yet been used in research on basketball;most authors have focused on performance indicators and performance indices. Authors focus on performance indicies from two perspectives, team performance and success and individual performance from players. Individual performance of players generally focuses on the economic impact of the players (Humphreys & Johnson, 2020)(Wen-Jhan, 2016) through attendance demand and the effect that certain players have (Berri & Schmidt, 2006), and individual

analysis of certain aspects of the game. So authors such as (Dehesa, et al., 2019) were analyzing on individual game indicators and concluded that five types of individual performance exist during regular season and four types during play- offs.

Also authors were analysing the impact that players have at defining moments of the game. (Deshpande & Jensen, 2016), were using a Bayesian linear regression of player effects to estimate the impact that a player has on chance of winning. Similar analysis can be found on the performance in the last minutes of the game. (Cao, et al, 2011) (Lorenzo, et al, 2019) who were analyzing game related statystics and conclude that the players who are better performers in so called pressure moment have an increase in assist and free throw performance. Perez-Toledano et al. (2019)analysed suitable player selection. Using an evolutionaryalgorithm, they tried to objectively select players for a basketball team. Hughes and Bartlett (2002)differentiatedbetween types of games and their appropriate performance indicators. They classified appropriate indicators into technical, tactical and biomechanical. Garcíaet al.(2013)analysed performance in theSpanishBasketball League and found that duringthe regular season, winning teams outperform losing teams in assists, defensive rebounds and successfultwo-and three-point field goals. In the playoffs, the only category that matters is defensive rebounding. In Olympic basketball,teams with the highest probability of winning outperformed other teams in field goal percentage and defensive rebounds (Leicht et al., 2017).

Mikołajec et al(2013), were analyzing 52 performance variables. They conclude that mostly offensive factos are determinign sports performance in the NBA. Most critical indicators are winning percentafe, offensive efficeincy, third quarter points per game average faula and average steals. To differentiate between winning and losing teams and to identifythe factors influencing basketball games, Sampaio and Janeira (2017) analysed the discriminatory power of game statistics between winning and losing teams in the PortugueseBasketball League. Gómez et al.(2017) used classification and regression tree (CRT)analysis to identify the predictors of winning and losing in basketball games. They differentiated between slow-paced and fast-paced games andfound that defensive rebounds, made free throws, assists and fouls committed influenced both types of games, while successfultwo-point and three-point field goals influenced fast-paced games.

In a similar analysis, Baghal (2012)used data on the "Four Factors" (effective field goal percentage, free throw rate, turnovers per possession, and offensive rebounding percentage to examine offensive and defensive quality. Using structural equation modelling, he concluded that improving offensive quality increases the chances of winning much more than improving defensive quality does.Courel-Ibáñez et al. (2018) analysed offensive and defensive effectiveness and identified players' dynamics that increased game performance.

Research on basketball has typically focused on how advantage is created when teams play in front of a home crowd. Ribeiro et al. (2016) analysed play-by-play events over a span of 13 seasons. They concluded that scoring rates increase when teams play at home. The home advantage is created by a number of factors: crowd familiarity, travel, rules and territoriality (Legaz-Arrese et al., 2013). Familiarity is not a new concept; Berman et al. (2002) found a positive relationship between shared team experience and team performance, indicating that playing together for a certain period can create an advantage for clubs.

Several authors have focused on the individual aspects of the game, such asshot frequency, shot efficiency and shot success(Erčulj & Štrumbelj, 2015). Some limited their analysis to just one aspect; for instance, Pulgar et al. (2017) measured efficiency through a net scoring efficiency credibility formula.

The next section discusses the data and empirical methodology employed by this study.

Data and Results

Ballasa's RCA index was successfully used by researchers to calculate RCA at the Summer Olympics (Celik, 2014; Tcha, 2003). We used the same method with a slightly adjusted formula to rank NBA teams' RCA in two- and three-point shots:

$$R_i = \frac{M_{si}/M_i}{T_{si}/T} \quad (1)$$

where M_{si} is the average number of successful shots per game during the season (66 games played in 2012 and 82 games played in each of the other seasons from 2010 to 2019) by team i, M_i is the average number of attempts per game by team i, T_s is the average number of successful shots by all teams, and T is the average number of attempts by all teams.The numerator shows team i's success rate for two-point and three-point shots during the season, while the denominator shows the corresponding average shot success rate in a given season.

We calculated the RCA index (R_i) scores separately for two-point and three-point shots for each team in each season from 2000 to 2019. We also used offensive and defensive data to calculate two RCA indices for each team in each season.

For example, in the 2019 season, the Houston Rockets had an average of 42 two-point attempts and succeeded on 23.1; thus, their two-point success rate was 55%. In the same season, the average success rate on two-point shots for all teams was about 52%; thus, the offensive two-point shot RCA for the Houston Rockets was 0.55/0.52 = 1.059. This means that the team performed better than all other teams on average. Using the same method, we calculated the Houston Rockets' offensive three-point shot RCA at 0.999, which means that the team's performance was almost equal to the average of all teams. Figure 1 shows the 2019 season RCA of the 30 participating teams. Values above 1 indicate better-than-average performance in that season. The higher the value, the better the performance in offense.

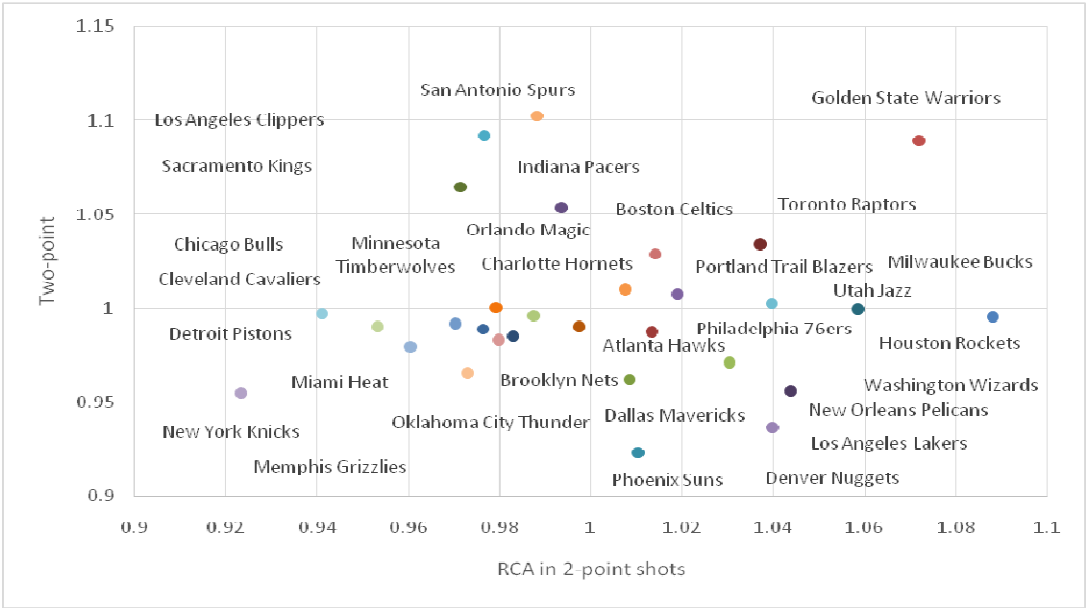

Figure 1. Offensive RCA, 2019

Formula 1 was used to calculate the RCA in defence against opponents' two-point and three-point shots. For example, in the 2019 season, the Houston Rockets' opponents had an average of 56.9 two-point shot attempts, of which 30.3 were successful; thus, their opponents' success rate was 53.25%. The lower the value, the better the performance of the Houston Rockets in defence. All teams in the 2019 season had close to a 52% average success rate, so the RCA index for the Houston Rockets was about 1.025. This coefficient means that the team's defence rate was 2% worse than that of all teams on average. Using the same method, we calculated the defensive RCA for three-point shots at 0.955. Figure 2 shows the defensive RCA for both two- and three-point shots in 2019.

The correlation between offensive two- and three-point RCA indices is weakly positive. In some years, the correlation was not even statistically significant, which means that being good at two-point shots does not guarantee that the team will be good at three-point shots. For example, in the 2019 season, the Los Angeles Lakers performed better than average on two-point shots but worse than average on three-point shots. The same is true for defence RCA; some teams are good at defence against two-point shots only or against three-point shots only, while others are good at both or neither.

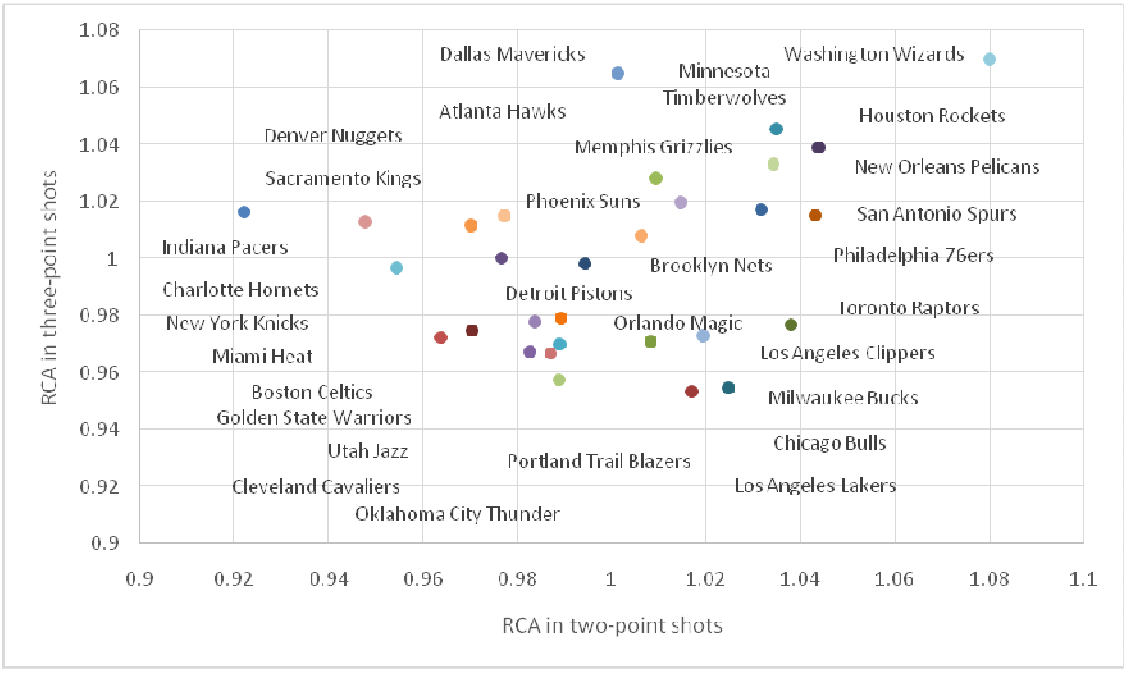

Figure 2. Defensive RCA, 2019

To check which type of RCA plays a more important role in winning, we ran the following regression model:

$$win\ share = \beta_0 + \beta_1 Offensive_{RCA_2} + \beta_2 offensive_{RCA_3} + \beta_3 Defensive_{RCA_2} + \beta_4 Defensive_{RCA_3}$$

where win share is calculated as the number of games won over the total number of games played during the season. A random-effects generalized least square (GLS) regression model was applied to estimate the parameters.

Table 1. Impact of revealed comparative advantage on winning (GLS regression model estimates)

Explanatory variables	Random-effects GLS estimates	95% confidence interval
Offensive two-point RCA index	1.67*	[1.42; 1.92]
Offensive three-point RCA index	0.66*	[0.47; 0.86]
Defensive two-point RCA index	-1.68*	[-1.99; -1.38]
Defensive three-point RCA index	-0.86*	[-1.11; -0.60]
cons	0.71*	[0.23; 1.18]

Note. Wald chi-square(4) = 871.06; R^2 within = 0.7474; R^2 between = 0.1430; R^2 overall = 0.7470.
*p<0.01.

Holding all other factors constant, a 0.1-point increase in the two-point shot offensive RCA index results in an average increase of 0.167 in the share of games won. Conversely, a 0.1-point increase in the defensive RCA index reduces the win share by 0.168. Note that higher offensive index indicated better offensive play, while higher defensive index indicates weaker defensive play. Thus, the offensive and defensive two-point RCA indices have similar impacts on success. A 0.1-point increase in the three-point offensive RCA index raises the share of games won by about 0.066, whereas a 0.1-point increase in the three-point defensive RCA reduces the win share by 0.086. Thus, although the three-point defensive and offensive RCA indices have similar effects on the success rate, defence is slightly more important in this case. Overall, in both defence and offence, the two-point RCA has a higher impact on the share of games won than the three-point RCA index does. The results did not change significantly over the years, which means that the year was not a significant explanatory variable.

Table 2. OLS regression results by year

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Offensive two-point RCA index	1.19**	2.18*	1.61*	1.61*	1.57*	2.33*	1.46*	1.31*	1.82*	1.31*
Offensive three-point RCA index	0.34	0.46	0.52	0.56	0.59**	0.45	0.82	0.74**	1.38**	1.24*
Defensive two-point RCA index	-1.60*	-1.89*	-2.20*	-1.76*	-2.19*	-1.63*	-2.22*	-1.23**	-0.72	-1.44*
Defensive three-point RCA index	-1.61*	-0.65	0.08	-0.61	-1.05	-1.15*	-0.48	-1.26*	-1.23*	-1.33*
cons	2.18*	0.40	0.49	0.69	1.58	0.50	0.92	0.94	-0.75	0.72

Note: dependent variable is share of won games)
*p<0.01. **p<0.0.5

Table 2 demonstrates that in the last three years, the three-point shot RCA (in both defence and offence) became a significant explanatory variable for the share of games won.

Table 3. Average win share and offensive RCA

Average win share	Two-point offensive RCA > 1	Two-point offensive RCA < 1
Three-point offensive RCA > 1	0.627	0.501
Three-point offensive RCA < 1	0.526	0.396

Table 3 demonstrates how important offensive RCA is in winning the game. For example, teams that were better than average on both two-point and three-point shots (offensive RCA > 1) won almost 63% of their games on average. Teams that performed worse than average (RCA < 1) won about 40% of their games on average.

Table 4. Average win share and defensive RCA

Average win share	Two-point defensive RCA > 1	Two-point defensive RCA < 1
Three-point defensive RCA > 1	0.394	0.545
Three-point defensive RCA < 1	0.479	0.613

Table 4 demonstrates how important defensive RCA is in winning the game. For instance, teams that were better than average on both two-point and three-point shots (defensive RCA < 1) won about 61% of their games on average. Teams that performed worse than average (RCA > 1) won about 39% of their games on average. Tables 3 and 4 show that it is equally important for teams to work on offensive and defensive RCA.

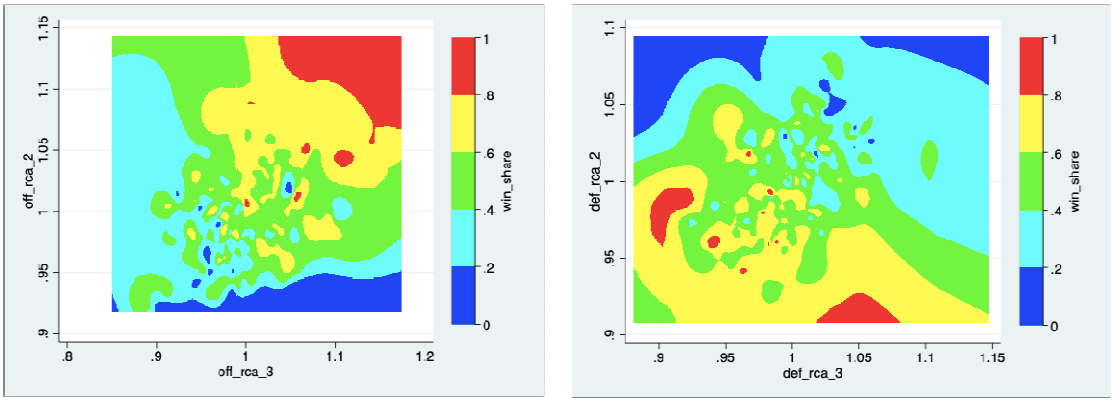

Figure 3. Contour plots of win share by RCA indices, 2010–2019

The contour plots in Figure 3 were constructed based on 2010–2019 pooled data to depict how RCA indices affect teams' win share. The interpolation method was used when the data did not fill a regular grid. Figure 3 shows three important points: First, teams with the highest offensive RCA indices had the highest win share (in red). Second, teams with the lowest two-point offensive RCA were the least successful regardless of their three-point offensive RCA. Third, regardless of the team's defensive RCA against three-point shots, teams with below-average two-point defensive RCA (> 1) had the lowest win share.

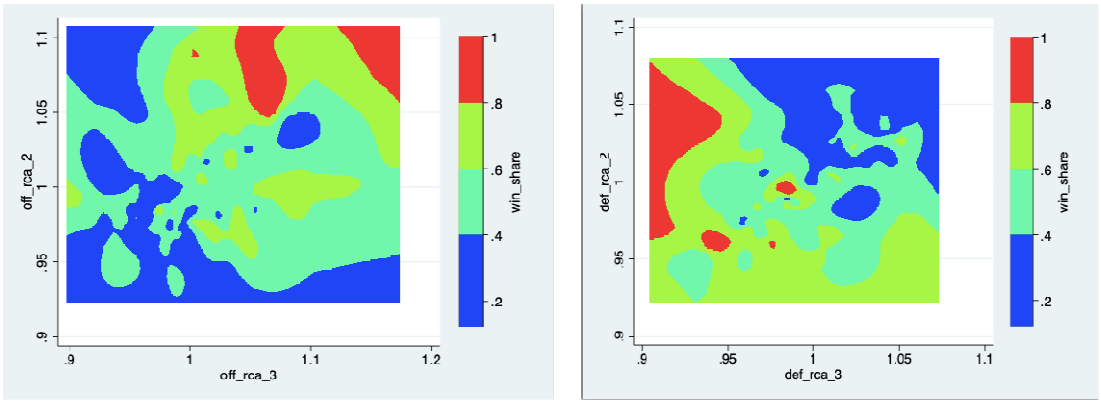

Figure 4. Contour plots of win share by RCA indices, 2016–2019

The regression analysis by year shows that play patterns are changing, as is the importance of RCA indices. Thus, we constructed contour plots for the last three years only (2016–2019). The contour plots in Figure 4 confirm that: three-point defensive RCA is more important than two-point defensive RCA. Teams with above-average three-point defensive RCA (< 1) and below-average two-point defensive RCA (> 1) still have a high win share. An example of this is the Houston Rockets in 2018, who were better than average in defence against three-point shots but worse than average in defence against two-point shots; the team won about 80% of their games that season.

Conclusion

Success in sports is a relative term that depends on many factors. By analysing the most important aspects of the game, we found that teams with better offensive and defensive two-point and three-point RCA have higher win shares. Although offensive RCA is more important in two-point shots than in three-point shots, the gap has been shrinking over the last few years as offensive three-point RCA has gained importance. Both defensive and offensivethree-point RCA have become statistically significant over the past three years (2016–2019) in determining the share of won games. With the increasing usage of the three-point play, the game has shifted its focal point from inside the paint to a wider area and outside the three-point line.

Defensive RCA against two-point shots had a greater impact on win share than that against three-point shots, but the pattern has changed over the last three years. Defence against two-point shots is slowly losing significance as a determinant of win share but remains quite important for the time being. Defence against three-point shots did not play an important role until 2016, but since then, it has become a more significant determinant of win share than two-point defensive RCA. With the growing importance of three-point shots, the nature of basketball is changing, and this will require a change in player profiles and player selection in the future.

References

Arthur, M., Johnson, C., Khan, A., Kumar, N., &Wide, R. (2018, December 19). *Insights from raw NBA shot log data and an exploration of the hot hand phenomenon*. https://towardsdatascience.com/insights-from-raw-nba-shot-log-data-and-an-exploration-of-the-hot-hand-phenomenon-1f1c6c63685a

Baghal, T. (2012). Are the "four factors" indicators of one factor? An application of structural equation modeling methodology to NBA data in prediction of winning percentage. *Journal of Quantitative Analysis in Sports8*(1), 1–14.

Balassa, B. (1965). Trade liberalization and revealed comparative advantage. *Manchester School of Economic and Social Studies 33*, 99–123.

Beaudreau, B. C. (2016). Competitive and comparative advantage: Towards a unified theory of international trade. *International Economic Journal*, *30*(1), 1–18.

Berman, S. L., Down, J., & Hill, C. W. (2002). Tacit knowledge as a source of competitive advantage in the National Basketball Association. *Academy of Management Journal*, *45*(1), 13–31.

Bernard, A. B., & Busse, M. R. (2000). *Who wins the Olympic Games: Economic development and medal totals*(NBER Working Paper 7998). National Bureau of Economic Research.

Berri, D. J., & Schmidt, M. (2006). On the Road With the National Basketball Association's Superstar Externality. *Journal of Sports Economics 7(4)* , 347-358.

Bois, C. D., & Heyndels, B. (2012). Revealed comparative advantage and specialisation in athletics. *Zur Ökonomik van Spitsenleistungen im internationalen Sport 3*, 25–47.

Bosscher, V. D., Knop, P. D., Bottenburg, M. V., & Shibli, S. (2009). Explaining international sporting success: An international comparison of elite sport systems and policies in six countries. *Sport Management Review*, *12*(3), 113–136.

Brakman, S., Inklaara, R., & Van Marrewijk, C. (2013). Structural change in OECD comparative advantage. *The Journal of International Trade & Economic Development*,*22*(6),817–838.

Brakman, S., & Van Marrewijk, C. (2017). A closer look at revealed comparative advantage: Gross-versus value-added trade flows. *Papers in Regional Science*, *96*(1), 61–92.

Buzzachi, L., Szymanski, S., & Valetti, T. M. (2003). Equality of opportunity and equality of outcome: Open leagues, closed leagues and competitive balance. *Journal of Industry, Competition and Trade 3*, 167–186.

Cao, Z., Price, J., & Stone, D. F. (2011). Performance Under Pressure in the NBA. *Journal of Sports Economics 12(3)*, 231-252.

Celik, O. B., & Gius, M. (2014). Estimating the determinants of summer olympic game performance. International Journal of Applied Economics, 11(1), 39-47.

Costinot, A., & Donaldson, A. (2012). Ricardo's theory of comparative advantage: Old idea, new evidence. *American Economic Review: Papers & Proceedings*, *102*(3), 453–458.

Courel-Ibáñez, J., McRobert, A. P., Toro, E. O., & Vélez, D. C. (2018). Inside game effectiveness in NBA basketball: Analysis of collective interactions.*Kinesiology*, *50*(2),218–227.

Dehesa, R., Vaquera, A., Goncalves, B., Mateus, N., Gomez-Ruano, M.-A., & Sampaio, J. (2019). Key game indicators in NBA players' performance profiles. *Kinesiology 51(1)* , 92-101.

Deshpande, S. K., & Jensen, S. T. (2016). Estimating an NBA Player's Impact on is Team's Chances of Winning. *Journal of Quantitative Analysis in Sports 12(2)* , 51-72.

Egger, P. H., & Keushnigg, C. (2017). Access to credit and comparative advantage. *Canadian Journal of Economics/Revue canadienne d'économique 50(2)*, 481–505.

Erčulj, F., & Štrumbelj, E. (2015). Basketball shot types and shot success in different levels of competitive basketball, 10(6). *PLOS ONE*, 1–14.

Fronczek, M. (2018). The structure of exports and revealed comparative advantage of the world largest exporters. *Research Papers of Wrocław University of Economics*, 128–137.

García, J., Sergio, I. J., Martinez De Santos, R., Leite, N., & Sampaio, J. (2013). Identifying basketball performance indicators in regular season and playoff games. *Journal of Human Kinetics*,*36*(1), 163–170.

Georgievski, B. (2015). Regional leagues as a model for success: The cost-benefit analysis of resurrecting the Yugoslavian Football League 12. *Journal of Tourism, Hospitality and Sports*, 7–11.

Georgievski, B., Labadze, L., & Aboelsoud, M. M. (2019). Comparative advantage as a success factor in football clubs: Evidence from the English Premier League (EPL). *Journal of Human Sport and Exercise 14(2)*, 292–314.

Goldsberry, K. (2019). *SprawlBall: A visual tour of the new era of the NBA.* Houghton Mifflin Harcourt.

Gómez, M. A., Ibáñez, S. J., & Parejo, I. (2017). The use of classification and regression tree when classifying winning and losing basketball teams. *Kinesiology*, *49*(1), 47–56.

Hughes, M., & Bartlett, R. M. (2002). The use of performance indicators in performance analysis. *Journal of Sports Sciences*, *20*(10), 739–754.

Humphreys, B., & Johnson, C. (2020). The Effect of Superstar Players on Game Attendance: Evidence from the NBA. *Journal of Sports Economics*21(2), 152-175.

Johnson, D. K., & Ali, A. (2004). Tale of two seasons: Participation and medal counts at the Summer and Winter Olympic Games. *Social Science Quarterly*, *85*(4), 974–993.

Legaz-Arrese, A., Moliner-Urdiales, D., & Munguía-Izquierdo, D. (2013). Home advantage and sports performance: Evidence, causes and psychological implications. *Universitas Psychologica*, *12*(3), 1–23.

Leicht, A., Gómez, M. A., & Woods, C. T. (2017). Explaining match outcome during the men's basketball tournament at the Olympic Games. *Journal of Sports Science and Medicine*, *16*(4), 468–473.

Lorenzo, J., Lorenzo, A., Conte, D., & Gimenez, M. (2019). Long-Term Analysis of Elite Basketball Players' Game-Related Statistics Throughout Their Careers. *Frontiers inPsychology 10 421*, 1-6.

Mikołajec, K., Maszczyk, A., & Zając, T. (2013). Game Indicators Determining Sports Performance in the NBA. *Journal of Human Kinetics 37* , 145-151.

Pelechrinis, K. (2019, March 29). *Data reveals the value of an assist in basketball*. https://theconversation.com/data-reveals-the-value-of-an-assist-in-basketball-113893

Perez-Toledano, M. A., Francisco, F. J., Garcıa-Rubio, J., & Ibanez, S. J. (2019). Players' selection for basketball teams, through performance index rating, using multiobjective evolutionary algorithms. *PLOS ONE*, 1–20.

Price, J., Soebbing, B. P., Berri, D., & Humphreys, B. R. (2010). Tournament Incentives, League Policy, and NBA Team Performance Revisited. *Journal of Sports Economics*11(2), 117-135.

Pulgar, A. A., Arias-Nicolas, J. P., & Jimenez, J. V. (2017). On the credibility of basketball scoring efficiency. *Electronic Journal of Applied Statistical Analysis*, *10*(3), 666–676.

Ribeiro, H. V., Mukherjee, S., & Zeng, X. T. (2016). The advantage of playing home in NBA: Microscopic, team-specific and evolving features. *PLOS ONE 11(3)*, 1–18.

Robst, J., VanGilder, J., Berri, D. J., & Vance, C. (2011). Defense Wins Championships?The Answer from the Gridiron. *International Journal of Sport Finance* 6(1), 72-84.

Rohde, M., & Breuer, C. (2016). Europe's elite football: Financial growth, sporting success, transfer investment, and private majority investors. *International Journal of Financial Studies*, 1–20.

Sampaio, J., & Janeira, M. (2017). Statistical analyses of basketball team performance: Understanding teams' wins and losses according to a different index of ball possessions. *International Journal of Performance Analysis in Sport*, *3*(1), 40–49.

Schneider, T. W. (2018, April 2). *Assessing shooting performance in NBA and NCAA basketball*. https://toddwschneider.com/posts/nba-vs-ncaa-basketball-shooting-performance/

Simmons, R., & Berri, D. J. (2009). Gains from Specialization and Free Agency:The story from the Gridiron. *Review of Industrial Organization 34(1)* , 81-98.

Szymanski, S. (2012). Economics of league design: Open versus closed systems. In L. H. Kahane & S. Shmanske (Eds.), *The Oxford handbook of sports economics: The economics of sports* (Vol. 1, pp. 1–15). Oxford University Press.

Tcha, M., & Pershin, V. (2003). Reconsidering performance at the Summer Olympics and revealed comparative advantage. *Journal of Sports*, *4*(3), 216–239.

Wen-Jhan, J. (2016). The Effect of Star Quality on Attendance Demand: The Case of the National Basketball Association. *Journal of Sports Economics17*(4), 396–417..