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Positioning in Olympic Winter sports: analysing national prioritisation of funding and success in eight nations

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ABSTRACT

Research question: Despite the attention the Olympic Winter Games has received by scholars, there has been little theoretically informed analysis on the positioning of nations in a dynamic environment. The purpose of this paper is to analyse how nations position themselves in the Winter Games by comparing national funding prioritisations of Olympic Winter sports.

Research methods: The distribution of funding in 2010/2011 is used as a proxy to examine how eight nations prioritise among seven sports. National policies are analysed at two levels: (a) the concentration of funding among the supported sports is measured using the Hirschman-Herfindahl Index (HHI) and (b) the Spearman's rho coefficient is used to examine the correlations between the distribution of funding (2010/2011) and success per sport in the past (1992–2006), recent past (2010) and future (2014).

Results and findings: All nations show some prioritisation, but the resulting distribution of funding differs. For example, South Korea diversifies its funding most equally (HHI = 0.18), while Switzerland's funding is more concentrated (HHI = 0.46). Furthermore, positioning differs depending on the type of sport most prioritised, be it skiing (Australia, Canada, Finland and Switzerland), skating (Japan and the Netherlands), both (South Korea) or bobsleigh/skeleton (Great Britain). Meanwhile, high correlation values were found for Australia, Great Britain, Finland and Japan in all periods, while the Netherlands, Canada, South Korea and Switzerland show high values in specific periods only. The results provide empirical evidence on different positioning strategies regarding the investment in either a focused or a diversified portfolio of targeted sports.

Implications: Using a management perspective derived from economics, this study supports national decision-makers to compare prioritisation policies in their own national context.

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Introduction

The Olympic Winter Games offer a dynamic, competitive environment for nations (Chaplet, 2014). The increase in the number of events began with the separation of the Olympic four-year cycle in 1992, where the Winter Games started alternating with the Summer Games every two years. Following this separation, the International Olympic

Committee (IOC) increased the number of events at the Winter Games by 72% between 1992 and 2014, from 57 to 98. Contemporaneously, the number of competing nations also increased remarkably by 42%, from 62 nations competing at the 1992 Games in Albertville to 88 at the 2014 Games in Sochi. Even though there are more medals and diplomas available per nation participating, the actual number of medal-winning nations has remained relatively constant between 24 and 26 since 1998 (Weber, Kempf, Shibli, & De Bosscher, 2016). Nations aiming to increase their success are challenged in this dynamic environment of growing medal-winning opportunities to manage their elite sport system and target Olympic Winter sports in which to invest.

Some researchers have stated that nations position themselves by targeting their funding at Olympic sports in which they have identified a medal-winning potential (e.g. De Bosscher, Shibli, Westerbeek, & van Bottenburg, 2015; Green & Oakley, 2001; Houlihan & Zheng, 2013). Meanwhile, the SPLISS-studies (Sports Policy factors Leading to International Sporting Success) have shown evidence of an escalating global sporting arms race over the past decades (De Bosscher, Bingham, Shibli, van Bottenburg, & De Knop, 2008; De Bosscher et al., 2015). Strong sports nations such as Australia (+58%), Canada (+67%), France (+101%) and the Netherlands (+36%), as well as emerging nations like Brazil (+210) and South Korea (+143), increased their national elite sports funding considerably between 2001 and 2012 (De Bosscher et al., 2015). Given that competition at the Games has increased and the price of success is rising (e.g. De Bosscher, Bingham, et al., 2008; Digel, Burk, & Fahrner, 2006; Houlihan & Green, 2008), nations aiming to increase (or at least stabilise) their medal success are challenged to invest their limited financial resources more efficiently. This applies particularly when hosting the Games leads to an increase in public funding, for example, in Canada for the 2010 Winter Games, or in the UK for the 2012 Summer Games. Nevertheless, there has been little empirical evidence thus far with which to compare nations' positioning strategies or prioritisation policies in elite sports. Despite attempts by governments to rationalise elite sports and prioritise elite sport funding, only a few studies have discussed prioritisation at an overall, national sports level in summer sports (e.g. De Bosscher et al., 2015; Houlihan & Zheng, 2013), and no studies have analysed winter sports. In particular, there has been little theoretically informed analysis at a sport-specific level about how prioritisation relates to success per sport (e.g. Sam, 2012; Zheng & Chen, 2016).

The aim of this paper is to compare how nations position themselves in the Winter Games by comparing national funding prioritisations of Olympic Winter sports. Data on the allocation of national elite sport funding in eight countries are examined at two levels: (a) the distribution of funding among the seven Olympic Winter sports, and (b) how this funding is related to Olympic medal success. The first level objectifies prioritisation in national funding policies, while the second level tests its correlation with success in each respective sport. The latter level refers to the argument that National Sports Agencies prioritise financial resources based on the evaluation of performance (e.g. Sam, 2012; Zheng & Chen, 2016), while the former level reflects the literature on the positioning of firms that identify a portfolio of markets to be targeted by either focusing or diversifying their financial resources (Boone, Wezel, & van Witteloostuijn, 2013).

Drawing on the mainstream management literature, where the analysis of how firms position themselves in a dynamic industry is a well-established research field (e.g. Hedley, 1977; Hooley, Piercy, & Nicloud, 2008), this paper will adapt the portfolio perspective to illustrate

the positioning of nations in the Winter Games (i.e. industry), with a particular focus on the national investment in seven winter sports (i.e. markets). Accordingly, this study contributes to the broader understanding of prioritisation policies by segmenting the Winter Games into sports to be targeted and provides a fertile ground for further research on the positioning of nations in elite sports. Finally, this research allows national decision-makers to compare their policies and possibly target their funding more strategically.

Literature review

Positioning of nations in Olympic sports

In the literature on elite sport policies and systems, Green and Oakley (2001, p. 256) were among the first to highlight that nations position themselves by ‘targeting of resources on a relatively small number of sports through identifying those that have a real chance of success’. Little is known in the academic literature about what drives a nation’s decision to concentrate its resources and if or how this strategy relates to success. More recently, some researchers have descriptively analysed the prioritisation policy of a given nation such as New Zealand (Sam, 2012) and China (Zheng & Chen, 2016), while others have compared national policies towards prioritisation strategies using the distribution of funding as a proxy (De Bosscher et al., 2015; Houlihan & Zheng, 2013).

Sam’s (2012) study focused on the decision-making processes of Sport and Recreation New Zealand (SPARC¹) to target sports, discussing their prioritisation policy from a return on investment point of view. The author also discussed how SPARC (i.e. the National Sports Agency (NSA) of New Zealand) closely monitors the success of each sport separately when implementing their national funding strategy. To measure the return on investment in a sport, the key performance indicators used by SPARC are the number of medals (i.e. top 3) and diplomas (i.e. top 8) won at the Olympic Games (Sam, 2012). Besides these sports performance-based investment criteria, SPARC also evaluates the economic and social return on investment in a sport. The author argued that certainly, other nations, such as Great Britain and Australia, apply similar performance-based funding policies.

Zheng and Chen (2016) analysed the prioritisation of sports or disciplines in China, which has notably increased the country’s success at the Summer Games since the 1980s. Conducting interviews and analysing policy documents, they found evidence that strategic prioritisation in China is supported by the theory of cluster-based sports training developed by Tian (1998) and the five-word principle (i.e. small, fast, women, water and agile) (Zheng & Chen, 2016). The Chinese government identified sports or disciplines to be targeted by analysing endogenous factors, such as a long-standing tradition and world leading position, as well as exogenous factors, such as globally less popular sports where competition is weaker and thereby allows the identification of niche sports and disciplines (Zheng & Chen, 2016). As a consequence, individual sports and disciplines that need low investment and can cause a prompt return have been prioritised, while funding for football, basketball and volleyball has been reduced (Zheng & Chen, 2016). The rationale of Chinese decision-makers is that the latter sports require heavy investment, have a limited number of Olympic medals to contest, and take a very long time to achieve success. Comparably, Houlihan and Zheng (2013) argued that nations target sports or disciplines that they consider themselves

to be traditionally strong in or, conversely, rival nations to be weak in. For example, Cuba is traditionally strong in boxing, South Korea in archery, Australia in swimming and China in table tennis. Additionally, China has targeted diving and Great Britain has prioritised cycling because these were identified as sports in which competition is weak. The authors used a business metaphor to explain the success of the top 10 nations at the Summer Games, reasoning that these nations 'have the resources to spread risk across a wide portfolio of investments' (Houlihan & Zheng, 2013, p. 346).

Finally, De Bosscher et al. (2015) studied the prioritisation of sports in 15 nations by analysing the distribution of national elite sport funding. There are a number of reasons why an NSA decides to allocate funding, such as past performance, potential future performance, the popularity of a sport and the organisational capacity of a national governing body (De Bosscher et al., 2015). The authors applied a concentration ratio measure of top four (CR 4, i.e. the funding distributed to four sports) and top eight (CR 8) sports to identify those nations that have a more focused or diversified funding approach. In contrast to Green and Oakley's (2001) position, De Bosscher et al. (2015) found no clear evidence that nations which concentrate their financial resources on fewer sports are also more successful in international sporting competitions. Furthermore, the authors found some evidence that nations, which diversify their funding among many sports, also win medals in more sports.

Summarising the sport policy literature, the scholarship on the positioning of nations in sports is scarce and there is little evidence about how nations prioritise and how this relates to success. Analogous to positioning strategies of firms, understanding how nations position themselves in a sport by prioritisation can contribute to efficient policy development and can guide the decision-making process. In this paper, the terms *prioritisation*, *positioning* and *targeting*, which are commonly used interchangeably in the sports management literature, are regarded as distinct.

Positioning of firms in an industry

Similar to the positioning of nations in sports, firms position themselves within an industry by targeting markets. Reflecting on the long tradition of research related to the positioning of firms, it is interesting to identify how firms target high potential markets in the industry in which they compete (e.g. Hooley, Broderick, & Möller, 1998; Hooley, Greenley, Fahy, & Cadogan, 2001), often because of financial constraints (Hedley, 1977). When targeting markets, strategists have argued that a firm should search for a position within the industry that is unique compared to their rival competitors (e.g. Barney, 2007; Hooley et al., 2008; Porter, 1998). This refers to the economic standpoint of firms looking for a so-called competitive advantage. Firms can thus conquer this position by differentiating the targeted markets from other firms competing in the same industry. Since an industry normally consists of several markets (Chen, 1996), firms competing in the same industry can target different markets. According to Porter (1998, 2008b), generic strategies to strengthen such a position include either strongly focusing on one or a few markets or diversifying among several markets. Being *stuck in the middle* between these two strategies is a rather unfavourable position for a firm (Porter, 1998). Since Hedley's (1977) seminal article, the range of targeted markets has been described in the literature as the portfolio of the firm (e.g. Boone et al., 2013). A firm can manage its portfolio by targeting identified markets and

aligning its resources accordingly. Active portfolio management can lead to increased success, particularly in dynamic environments characterised by, for example, market growth or changing competitors (Shimizu & Hitt, 2004). A systematic analysis of this growth, the competitors and the performance of the firm in each targeted market enhances the manager's ability to make strategic choices (e.g. Petit, 2012; Purnus & Bodea, 2014). Accordingly, the strategic management literature suggests defining common key performance indicators, applicable to all targeted markets, as an instrument to plan, steer and control the decision-making process (Krause & Arora, 2008).

Reflecting the positioning of firms in an industry by targeting identified markets, the funding prioritisation of Olympic sports to increase a nation's success at the Games shows some similarities. In this paper, the industry is referred to as the Olympic Winter Games, and the markets of an industry are the seven Olympic sports. The competitors in the markets are the nations represented by their National Olympic Committee (NOC) at the Games (IOC, 2015). Most studies analysed the nations' performance at the Games drawing up the overall medal table, while the input standard is national elite sport funding (e.g. De Bosscher, Bingham, et al., 2008; Green & Oakley, 2001; Johnson & Ali, 2004). In the context of managing the prioritisation of elite sports, performance is commonly measured in every targeted sport (i.e. portfolio) using Olympic medals and diplomas as key performance indicators, while the input standard is national elite sport funding per sport (e.g. De Bosscher et al., 2015; Sam, 2012).

Comparable to a firm that manages its portfolio to increase its financial success within the industry, an NSA is challenged to prioritise national funding among the winter sports and thus possibly increase its nation's success in the overall medal table of the Winter Games. An NSA is defined as the leading decision-making organisation on the national level of sports, 'or elite sport in particular' (Sotiriadou & De Bosscher, 2013, p. xxix). Working together with other organisations, these governmental, quasi-governmental or non-governmental organisations are responsible for, among other things, the distribution of financial resources to the different sports supported on the national level. An NSA identifies and targets sports with medal-winning potential and prioritises national elite sport funding accordingly. Thereby, each NSA supports the positioning of its nation at the Games in the respective sports.

Method

Funding data

The elite sport funding data on Olympic Winter sports were collected as part of a broader study on the Sports Policy factors Leading to International Sporting Success (SPLISS 2.0) (De Bosscher et al., 2015). National funding in 2010/2011 is defined as the public expenditure on elite sports distributed to the Olympic Winter sports at the national level, from national governments, national lotteries and, for some nations, nationally coordinated (by their NSAs) sponsorship. The 2010/2011 funding marks a new funding cycle after the 2010 Vancouver Games. The funding data are available from eight nations that won medals in the period between 1992 and 2014: Australia, Canada, Finland, Great Britain, Japan, South Korea, the Netherlands and Switzerland. The seven Olympic Winter sports that were contested in the researched period were skiing, skating, biathlon, bobsleigh/skeleton, luge, ice

hockey and curling. Because detailed data per discipline (e.g. skiing involves six disciplines: alpine skiing, cross-country skiing, Nordic combined, ski jumping, freestyle skiing and snowboarding) were not available in Australia, Finland, Great Britain, Japan and Korea, this paper focuses on the sport level.

Success measures

Success measures based on medals awarded for the top three places are commonly used in the literature to analyse the performance of nations (e.g. De Bosscher, Heyndels, De Knop, van Bottenburg, & Shibli, 2008; Madella, Bayle, & Tome, 2005). While winning medals is the ambition of many nations when they invest in elite sports, diplomas are a more inclusive data set than medals when analysing success (Shibli, De Bosscher, van Bottenburg, & Westerbeek, 2013). Furthermore, research indicates that some NSAs use diplomas as performance indicators for making funding decisions (e.g. Sam, 2012). Hence, both measures are used in this paper to extend the data set. The data for diplomas and medals between 1992 and 2014 from the eight selected nations are derived from an online database managed by Gracenote Sports,² which SPLISS had access to as part of an agreement. The diplomas and medals were clustered according to the funding by sport and nation.

The distribution of success within a country was measured by the number of diplomas/medals won in a sport relative to the total number of diplomas/medals won in all sports in the corresponding time period in that country. This measure identifies the competitive sport(s) that contribute most to a nation's success at the Games in terms of the number of medals/diplomas. For example, Canada won 72 diplomas at the 2010 Vancouver Games (i.e. 100%), of which skating accounted for 29 diplomas (40%), skiing 28 diplomas (39%), bobsleigh/skeleton 8 diplomas (11%), curling (3%), ice hockey (3%) and luge (3%) two diplomas each, and biathlon one diploma (1%).

Concentration analysis

The distribution of funding was analysed by applying a concentration index. According to Coulter (1989) and Sutton (2001), the Hirschman-Herfindahl Index (HHI) is commonly used in different research areas to analyse the concentration of units among components. In this paper, the HHI is used as a proxy for each nation's prioritisation policy to measure the concentration of funding (i.e. units) among the seven winter sports (i.e. components). In contrast to the previously described concentration ratios (CR4 and CR8) applied by De Bosscher et al. (2015), the HHI includes all data on funded sports and not only the top four and eight sports. Furthermore, the upper and lower bound of the HHI can be fixed, and thus enhances the interpretation of the results and eases the comparisons between the nations.

In this paper, the index is based on the funding share per winter sport at a given time. The HHI of funding distribution in 2010/2011 for a given nation is defined as:

$$\text{HHI}_{2010/2011} = \sum_{i=1}^S p_i^2$$

where S is the number of funded winter sports in 2010/2011 and p_i is the share of funding of sport $i = 1, \dots, S$. The share of diplomas is defined as $p_i = F_i/F$, where F_i is the funding of sport i and $F = \sum_i F_i$ is the national funding of all winter sports in 2010/2011. Hence, the index

combines two related determinants: the number of sports funded and the share of funding per sport. The resulting HHI value allows comparisons of the concentration of winter sports funding between the selected nations. If only one sport is funded in a nation, the index reaches its upper bound of 1.0. The lower bound depends on the maximum number of Olympic Winter sports to be funded, that is, seven. If national funding is equally distributed among all seven sports, that is, every sport receives 1/7 of the funding (i.e. no prioritisation), then HHI takes the value of 0.14. In other words, an HHI value above 0.14 empirically confirms some level of prioritisation in the distribution of funding.

Correlation analysis

This study applies the Spearman's rho coefficient two-sided to test the correlation between the distribution of funding and the distribution of success measured by the two performance indicators (i.e. percentages of diplomas and medals won per sport). The Spearman's rho test is a non-parametric test based on ranks. It is applied in small, non-normally distributed data sets because it is more robust compared to the commonly applied Pearson's test (e.g. Hauke & Kossowski, 2011; Yue, Pilon, & Cavadias, 2002).

As the funding per sport can potentially be related to past success or potential success in the future, the correlation was tested in three different periods: *past success* (1992–2006) and *recent success* (2010) at the previous Games relative to the 2010/2011 funding data, and *future success* (2014) at the upcoming Games (at the time of research). The first period identifies traditionally strong national sports, while the latter two periods highlight the well-performing sports at the Games before and after the 2010/2011 funding decision. The correlations were tested including all eight nations first, followed by testing for each nation separately.

Results

Concentration analysis

In this section, the distribution of funding is presented for each nation to analyse whether or not nations take a prioritisation approach towards funding among the seven sports. In [Table 1](#), the nations are presented according to their relative concentration of funding among the winter sports, as measured by the HHI. The sports are ranked according to the number of medal events³ at the 2010 Vancouver Games. At the 2010 Games, skiing consisted of 40 events (49%), skating of 24 (28%), biathlon of 10 (11%), bobsleigh/skeleton of 5 (6%), luge of 3 (3%), and ice hockey (2%) and curling (2%) of two each.

The dotted line divides [Table 1](#) to show the proportion of national elite sport funding allocated to winter sports in 2010/2011. The table reveals that traditionally successful and established winter nations like Switzerland and Canada invest 33% and 31%, respectively, of their overall national funding in winter sports. This is much lower in Japan (13%), Finland (12%), the Netherlands (8%) and South Korea (8%). Some nations, like Great Britain (5%) and Australia (3%), clearly do not prioritise winter sports.

[Table 1](#) further shows how winter sports funding is distributed by sport. Switzerland and Canada fund all seven winter sports, with a particular focus on skiing, which receives 63% and 44% of the total funding attributed to winter sports, respectively. Both nations

Table 1. Number of medal-events at the 2010 Games per sport and the distribution of national elite sport funding per nation in 2010/2011.

Sports	Medal events at 2010 Games		Winter sports funding in % of overall national funding	AUS	SUI	FIN	NED	GBR	CAN	JAP	KOR
	Games	%		3	33	12	8	5	31	13	8
Skiing	40	49	Portfolio of targeted	92	65	60	31	11	44	21	25
Skating	24	28	winter sports in %	8	3	14	50	23	20	37	25
Biathlon	10	11	of winter sports	–	3	5	1	–	3	6	13
Bobsleigh/Skeleton	5	6	funding	–	6	–	11	50	10 ^a	6	8
Luge	3	3		–	1	–	–	–	–	–	5
Ice Hockey	2	2		–	14	20	5	–	12	20	14
Curling	2	2		–	8	2	2	15	10	9	9
Total	86	100		100	100	100	100	100	100	100	100
			Concentration of winter sports funding (HHI)	0.85	0.46	0.42	0.36	0.34	0.27	0.24	0.18

^aCanada funds bobsleigh/skeleton and luge through the same national governing body.

focus mainly on one skiing discipline, that is, alpine skiing. Finland allocates funding to only five out of seven sports and also strongly prioritises skiing (60% of winter sports funding). Australia directly funds two sports, of which most of the funding (92%) is allocated to skiing (mainly snowboarding). It needs to be noted that some other sports in Australia receive some non-direct financial support through the Olympic Winter Institute. The Netherlands and Japan prioritise ice skating, investing 50% and 37% of funding, respectively. The Netherlands focuses on two skating disciplines (i.e. speed skating and short track); while for Japan, discipline-specific details were not available. South Korea shows the most diversified funding distribution, as unlike other nations, it does not prioritise any sport in particular. Skiing and skating each receive the highest proportion (25%) of winter sports funding. It is noteworthy that Great Britain prioritises neither skiing nor skating, but bobsleigh/skeleton (mainly skeleton) instead, allocating to the sport 50% of national winter sports funding.

The HHI was applied to compare the distribution of funding in Table 1 among the eight nations. The index shows no direct relation between the traditionally successful and established winter nations, as discussed in the previous section, and the height of the HHI value. The HHI values of Switzerland (HHI = 0.43) and Finland (HHI = 0.42) are high, showing that their distribution among funded sports is more concentrated compared to other examined nations. For example, Canada's value (HHI = 0.27) is similar to Japan's (HHI = 0.24) and South Korea's (HHI = 0.18). The concentration values of Great Britain (HHI = 0.34) and the Netherlands (HHI = 0.36) are somewhere between concentrating and diversifying the funding. Finally, the high HHI in a summer sports nation like Australia (HHI = 0.85) should be expected, with only two out of the seven sports receiving funding. However, within these two sports, the distribution of Australia is focused, with 92% of the funding invested only in skiing and 8% in skating. This is different from Great Britain (HHI = 0.34), in which UK Sport allocates its funding more equally among the four targeted sports: bobsleigh/skeleton (50%), skating (23%), curling (15%) and skiing (11%). Hence, Great Britain's distribution of funding can be described as more diversified compared to Australia's in terms of the number of targeted sports and the concentration of funding among sports, quantified by a remarkably lower HHI value.

In summary, the HHI confirms that all selected nations prioritised their national funding among the seven Olympic Winter sports in 2010/2011. It is notable that the value of South Korea is close to the lower bond of the index (i.e. ≈ 0.14), indicating almost no existing prioritisation policy. Finally, prioritisation within each nation's portfolio of targeted sports differed in terms of the number of funded sports and the concentration of funding per sport.

Correlation analysis

In this section, the prioritisation of sports, measured by the percentage of funding per sport within a country (in 2010/2011), is related to past, recent and future performance. Appendix provides an overview of the overall performance of the eight nations measured in medals and diplomas. Given that Australia, Finland, Great Britain and Japan did not win many medals in 2010 and 2014, diplomas are a more robust performance indicator for the correlation analysis. Table 2 shows that the overall correlation between the percentages of diplomas won and the distribution of funding of all nations and sports together is strong and significant in all three time periods ($r_{\text{dpast}} = 0.702^{**}$, $r_{\text{dpresent}} = 0.766^{**}$, $r_{\text{dfuture}} = 0.727^{**}$, $^{**}p < .01$).

Table 3 details the Spearman's rho correlations for each nation separately. The results reveal that all sample nations have rather high values ($^{**}p < .01$ and $^{*}p < .05$), except for South Korea, for both diplomas and medals. The correlation values for diplomas (and medals) are high in Australia ($r_{\text{dpast}} = 0.885^{**}$, $r_{\text{dpresent}} = 1.000^{**}$, $r_{\text{dfuture}} = 0.764^{*}$), Finland ($r_{\text{dpast}} = 0.862^{*}$, $r_{\text{dpresent}} = 0.875^{**}$, $r_{\text{dfuture}} = 0.815^{*}$), Great Britain ($r_{\text{dpast}} = 0.930^{**}$, $r_{\text{dpresent}} = 0.990^{**}$, $r_{\text{dfuture}} = 0.777^{*}$) and Japan ($r_{\text{dpast}} = 0.889^{*}$, $r_{\text{dpresent}} = 0.808^{*}$, $r_{\text{dfuture}} = 0.917^{**}$) in all researched time periods. In Switzerland, there are significant correlations between funding and success as measured by diplomas only prior to the 2010/2011 funding decision ($r_{\text{dpast}} = 0.800^{*}$, $r_{\text{dpresent}} = 0.898^{**}$, $r_{\text{dfuture}} = 0.600$); while for the Netherlands, a significant correlation between distribution of funding and diplomas/medals could only be identified for the 2010 Games ($r_{\text{dpresent}} = 0.896^{**}/r_{\text{mpresent}} = 0.802^{*}$). In the case of Canada, no significant correlation was found with diplomas, only with medals. It is noteworthy that Canada's distribution of funding in 2010/2011 highly correlates to medal success in the past and the future, but not when hosting the 2010 Vancouver Games ($r_{\text{mpast}} = 0.928^{**}$, $r_{\text{mpresent}} = 0.754$, $r_{\text{mfuture}} = 0.986^{**}$). In contrast to Canada, South Korea shows a significant correlation between the distribution of funding and success only when measured by diplomas won in the past ($r_{\text{dpast}} = 0.757^{*}$).

Comparing the results of the concentration and correlation analysis, it is noteworthy that no common pattern could be identified in the eight nations except in 2010. Generally,

Table 2. Correlation of distribution of 2010/2011 funding per sport and past, recent and future success per sport between 1992 and 2014.

	Diplomas			Medals		
	Past (1992–2006)	Recent (2010)	Future (2014)	Past (1992–2006)	Recent (2010)	Future (2014)
2010/11 Funding	0.702 ^{**}	0.766 ^{**}	0.727 ^{**}	0.648 ^{**}	0.668 ^{**}	0.673 ^{**}

Note: $n = 56$ (seven sports for each of the eight nations) per period.

^{**} $p < .01$, three time periods for diplomas (r_{dpast} , r_{dpresent} , r_{dfuture}) and medals (r_{mpast} , r_{mpresent} , r_{mfuture}).

Table 3. Correlation of distribution of 2010/2011 funding per sport and past, recent and future success per sport and per nation between 1992 and 2014.

		AUS	SUI	FIN	NED	GBR	CAN	JAP	KOR
Diplomas	Past (1992–2006)	0.885**	0.800*	0.862*	0.668	0.930**	0.771	0.889**	0.757*
	Recent (2010)	1.000**	0.898**	0.875**	0.896**	0.990**	0.757	0.808*	0.408
	Future (2014)	0.764*	0.600	0.815*	0.668	0.777*	0.522	0.917**	0.223
Medals	Past (1992–2006)	1.000**	0.593	0.785*	0.612	0.941**	0.928**	0.802*	0.408
	Recent (2010)	0.764*	0.668	0.809*	0.802*	0.635	0.754	0.612	0.408
	Future (2014)	0.764*	0.579	0.809*	0.612	0.558	0.986**	0.757*	0.408

Note: $n = 7$ sports per period and nation.

** $p < .01$ and * $p < .05$, three time periods for diplomas (r_{dpast} , $r_{dpresent}$, $r_{dfuture}$) and medals (r_{mpast} , $r_{mpresent}$, $r_{mfuture}$).

nations characterised by either high concentration values (i.e. strongly prioritising), such as Australia, Switzerland and Finland, or low concentration levels, like Canada, Japan and South Korea, show no common pattern regarding the correlation values with success.

Discussion

This paper contributes to the research on the positioning of nations using the allocation of elite sport funding in 2010/2011 as a proxy to examine the prioritisation policy of Olympic Winter sports. Researchers have stated that nations prioritise their funding and position themselves in certain sports by targeting their funding towards identified medal-winning sports (e.g. De Bosscher et al., 2015; Houlihan & Zheng, 2013; Sam, 2012).

The results reveal that in all eight nations, nationally coordinated funding among the seven sports is prioritised to some extent. This finding is in accordance with the literature on summer sports (Houlihan & Zheng, 2013). Because there are fewer sports and fewer events at the Winter Games compared to the Summer Games, reliance on a minority of sports for the majority of success is more prevalent, with the top two sports delivering over 75% of all medals in 2010 (i.e. 40 skiing events and 24 skating events out of 86 events at the 2010 Games). Hence, it is hardly surprising that most nations target one of these two sports, played on either snow or ice. As such, Australia, Switzerland, Finland and Canada prioritise snow skiing sports, the Netherlands and Japan prioritise ice skating sports, and South Korea prioritises both to some extent.

However, the findings also show that some nations with a diversified approach (i.e. investing equally in all seven sports), such as Canada, can be very successful. Canada is a good example of a nation that has developed medal-winning capability in a broad range of winter sports supported by their NSA. This is demonstrated by diversified funding among the seven sports (HHI = 0.27) and high correlation values with success. By contrast, other nations tend to be more specialised. Switzerland's strength lies in the traditional alpine events, supported by more focused funding by its NSA (HHI = 0.46); Finland derives much of its success from cross-country skiing (HHI = 0.42); Japan seems to specialise in figure skating and speed skating as well as ski jumping and snowboarding, all supported by diversified funding (HHI = 0.24). While for the Netherlands, long track speed skating delivers virtually all of the nation's winter sports success. Notably, the Dutch NSA applied a rather diversified funding approach in 2010/2011 (HHI = 0.36). Generally, these findings are consistent with mainstream strategic management literature, where firms have a portfolio of targeted markets (e.g. Hedley, 1977; Petit, 2012); similarly, NSAs have a *portfolio* of targeted sports to invest in.

However, the allocation of funding by NSAs also results in different positioning strategies, depending on the winter sports context, that is, having a winter climate and mountains, or the number of winter sports resorts (i.e. Andreff & Andreff, 2011; Johnson & Ali, 2004) and the tradition of success in the nation. Looking at the number of funded sports only, the NSAs of Switzerland and Canada show a comparable policy, funding all seven sports, while Great Britain (HHI = 0.34) and Australia (HHI = 0.85) only focus on two and four sports, respectively. Generally, these latter nations, which have a relatively poor natural *wintersportscape* (few mountains or a warm climate), do not perform well in winter sports relative to their performance in summer sports. Although they are among the biggest spenders on elite sports in general, less than 5% of their funding is invested in winter sports (De Bosscher et al., 2015). Both nations do, however, have different prioritisation policies in winter sports, with Australia strongly focusing on skiing (92% of funding mainly to the snowboarding discipline) and Great Britain targeting highly technical sports, such as bobsleigh/skeleton (50% of funding mainly to skeleton). Australia's policy is somewhat similar to the generic strategy of the firm focusing its resources (e.g. Porter, 1998), while Great Britain's is comparable to a firm searching for a unique position different from rival competitors in the same industry (e.g. Barney, 2007; Hooley et al., 2008). Great Britain's policy is interesting because bobsleigh/skeleton accounts for only 6% of medal events at the 2010 Games. Referring to Houlihan and Zheng (2013), bobsleigh/skeleton is seen as a niche sport at the Winter Games, which none of the other sample nations have prioritised. Furthermore, it is noteworthy that according to UK Sport (2007), in bobsleigh/skeleton, a talent transfer from athletics or rugby (which are strong British summer sports) can be successful, particularly for bobsleigh pushers and brakemen. In these sports, the physical attributes required, such as 'power' and 'speed', are similar (Andersen, Houlihan, & Ronglan, 2015, p. 41). Hence, strong summer sports nations possibly search for synergies and talent transfer when prioritising their winter sports.

The results of the Spearman's rho correlation analysis in winter sports confirm the finding that the distribution of funding (measured by percentages of winter sports funding) is generally related to past success (e.g. De Bosscher et al., 2015; Sam, 2012). The high correlation values of countries that were consecutively successful between 1992 and 2014 (e.g. Finland, Japan, Australia and Great Britain) strengthen Sam's (2012) result that nations apply a strong performance-based prioritisation policy (measured by Olympic medals and diplomas). This finding indicates a strong positioning of these nations in the sports in which they are traditionally most competitive, which is supported by the funding policy of their NSAs. UKSport (2016), for example, is well known for its adoption of no compromise funding, that is, only funding success. The lower correlation values of the Netherlands, Canada and South Korea indicate that prioritisation occurs differently (e.g. De Bosscher et al., 2015).

Discussing the case of the Netherlands in more detail, their success relies heavily on speed skating, in which the country won 98% of its medals and diplomas between 1992 and 2014. Meanwhile, the rather diversified portfolio of supported sports by the Dutch NSA in 2010/2011 is significantly correlated with success only in 2010, and not with long-term success in the past (1992–2006) or future (2014). Winning a medal in snowboarding⁴ and one diploma in bobsleigh⁵ at the 2010 Games characterised the most diversified pattern of successful sports for the Netherlands at every Games researched. In other

words, the Dutch NSA's (i.e. Nederlands Olympisch Comité*Nederlandse Sport Federatie NOC*NSF) prioritisation policy, which invests 50% of winter sports funding in the skating disciplines, reflects only moderately the nation's strong positioning in speed skating. In fact, De Bosscher et al. (2015) argued that the success of the Netherlands in speed skating is not solely the result of a national policy, but also of substantial investment by the commercial sector and the nation's speed skating culture.

Since Canada hosted the 2010 Vancouver Games, it is worthwhile to discuss their case in more detail, as the country has the highest level of diversification of all countries. Canada increased its governmental funding significantly in the run up to the Games (De Bosscher et al., 2015), which offered new possibilities to diversify their allocation of funding. Meanwhile, the IOC and the International Federations also provide incentives to diversify funding by offering quota places to participate at the Games in every sport and discipline exclusively for athletes of the home nation (e.g. FIS, 2012; ISU, 2012). After Canada won the bid for the Games in 2003, the Own the Podium programme (OTP) was introduced in 2004, with a strong focus on winning medals (OTP, 2016). This programme provides a possible explanation for the high correlation values between the distribution of funding and performance measured only with medals. This finding may imply that Canada's funding policy is medal-oriented, which can be distinct from a diploma-oriented funded policy of a weaker nation investing also in a diversified sports portfolio (e.g. South Korea). Meanwhile, it is notable that the OTP's distribution of funding was not significantly correlated with winning medals in 2010. The exceptional success of Canada in the 2010 Vancouver Games due to the home nation effect possibly explains the rather low correlation values when hosting the Games (see [Appendix](#)). It is well documented that countries hosting the Olympic Games have a home advantage and tend to win more medals than they would do ordinarily. Nations like Australia (Sydney 2000), Greece (Athens 2004), China (Beijing 2008) and Great Britain (London 2012) all performed better during their home Summer Games (Shibli & Bingham, 2008; Shibli, Gratton, & Bingham, 2012). This effect is partly caused by higher investments and support for a broader portfolio of sports (De Bosscher et al., 2015), but is also due to other factors that are outside the management control of the NSA. Among those factors identified in the literature are the familiarity of athletes with the competition venues and the support of spectators for their athletes (e.g. Balmer, Nevill, & Williams, 2001; Johnson & Ali, 2004; Shibli et al., 2012). Hence, hosting the Games influences national elite sport funding and success in various ways to be further researched. For example, an emerging sports power like South Korea might have been motivated to invest across a broad range of winter sports to demonstrate its commitment to the Olympic movement in 2009 when PyeongChang was announced an Applicant City for the 2018 Winter Games. Alternatively, Japan offers fertile ground for a long-term study of the influence of hosting the 1998 Nagano Games on the elite sport funding policy and the nation's performance in the various winter sports. Summarising the findings, NSAs use different strategies for allocating national funding by investing in a sport's portfolio (i.e. markets) and thereby supporting the positioning of their nations at the Winter Games (i.e. industry). The different strategies resulting from their prioritisation policies are comparable to firms competing and positioning themselves in an industry's markets by focusing on a few markets or diversifying, investing in a portfolio different from their competitors, and identifying and targeting niche markets (e.g. Barney, 2007;

Hooley et al., 2008; Porter, 2008b). However, the available data do not allow for any further interpretation of the decision-making processes of the NSAs, which lead to their divergent positioning strategies in winter sports. Further research is needed to evaluate to what extent these strategies are the result of a strategic decision-making process comparable to that of firms and non-profit organisations (e.g. Bryson, 1988; Kong, 2008; Moore, 2000; Wheelen & Hunger, 2010). Meanwhile, this research presents some limitations that drive ideas for future research.

As outlined, the prioritisation policy is related to more factors than just medal/diploma performance. Among those factors are the costs to develop a sport and the return on investment, the number of disciplines that can be put in context in each sport, the organisational capacity of a national governing body, the total amount of funding available, the investments by the commercial sector, or the nation's geographic wintersportscape. There is an implicit assumption of rationality in the decision-making by NSAs in this paper. While this has some justification, it is often mediated by other concerns that distort a purely rational process of optimising the investment to increase the number of medals. Such concerns are, for example, bidding for and hosting of the Games, which involve overarching political interests when funding decisions are made, the cultural importance and economic value of a sport (e.g. ice hockey in Canada or alpine skiing in Switzerland), or the need of a self-declared winter sports nation to be present in the showpiece events of the Winter Games (i.e. alpine skiing, cross-country skiing and ice hockey).

While this study introduced the portfolio perspective to segment the Games into sports to be targeted by NSAs and descriptively compares national funding prioritisations in proportional rather than absolute terms, the portfolio analysis commonly applied in economics provides fertile ground for further academic inquiry. Hedley (1977) applied the portfolio analysis to optimise a firm's input to target different markets, given its limited financial resources. Building on this argument, Hooley et al. (2008) combined the firm's internal analysis of resources and capabilities (i.e. resource-based view⁶) with the external analysis of the markets' competitive environment (i.e. market-based view⁷) to strategically position a firm within an industry and thereby gain a competitive advantage. Reflecting further on the strategies to increase Olympic success by either diversifying or focusing the resources (De Bosscher et al., 2015; Green & Oakley, 2001), the optimal portfolio mix of targeted sports could be evaluated for a selected NSA, given its limited resources and capabilities, to increase the medal return. The argument that the optimum portfolio of Canada in 2010/2011 differs with the one of Australia is straightforward, given that Canada invested in absolute terms 20.2 m € in winter sports, while Australia invested 0.8 m €. Such an analysis reflects the argument of Houlihan and Zheng (2013) that strong sports nations can invest in a wide portfolio of supported sports because of their superior resources. Such a case study, although certainly valid, is beyond the scope of this article.

Conclusion

This paper describes the positioning of successful nations at the Winter Games by prioritising sports and relating the distribution of funding to their success as measured in diplomas and medals. Introducing the perspective of a sport's portfolio to elite sports management, this research provides guidelines to examine and compare each nation's positioning as supported by the prioritisation policy of their respective NSA.

National policy-makers are challenged to optimally allocate their financial resources in the highly dynamic environment of the Olympic Winter Games. They are facing an inherent paradox in the decision-making process when investing their financial resources: Their decision is based on information from past success, yet they aim at sustainable success in the future. Providing empirical evidence and a management perspective derived from economics, comparable to studies benchmarking national elite sport policies (e.g. De Bosscher et al., 2015; Robinson & Böhlke, 2013), this research can thus support decision-makers in evaluating their prioritisation policies and making strategic decisions in their own national contexts.

While this research focuses on the prioritisation policies at a given point in time, there is scope to explore a range of other questions when extending the analysis to a time series: Are any trends in funding behaviour between strong and emerging winter sports nations discernible? Is there evidence of isomorphism in funding decisions? Is a raise in the volume of funding per sport correlated to increased medal success (or at least stability)? For example, Swiss Olympic (2014) and UKSport (2015) increased their respective funding per sport in 2014/2015, which indicates an ongoing global sporting arms race in winter sports. With countries increasing their funding in elite sports, there are diminishing returns on investments and it seems that successful countries need to continue investing simply to maintain their performance level (e.g. De Bosscher, Bingham, et al., 2008). In this context, it is reasonable to assume that Swiss Olympic aims to secure Switzerland's position in their traditionally strong sports; while UKSport, representing an emerging winter nation, relates their resources rather to the sport(s) they have identified to deliver in the future.

As a final point, this research does not distinguish between whether the quantified differences are the result of an active NSA decision-making process or are developed in an uncontrolled manner and driven by the success of the respective sport. Hence, this paper also points to an unsolved chicken-or-the-egg question: Does national funding influence international success, or does international success influence national funding? These limitations and evolving questions outline the academic void to be addressed in the future.

Notes

1. In February 2012, *Sport and Recreation New Zealand* became Sport New Zealand (SportNZ, 2016).
2. *Gracenote Sports* is a company that collects and edits sports performance data.
3. *Medal-events* are events in which a final rank is given to distribute medals, while qualification events for the final are excluded.
4. This medal in *snowboarding* was the only medal won by the Netherlands in a non-ice skating sport between 1992 and 2014.
5. This diploma in *bobsleigh* was the second out of three won by the Netherlands in non-ice skating sports between 1992 and 2014. The Netherlands also won a diploma in 2002 and 2014, both in bobsleigh.
6. For a fuller discussion of the *resource-based view*, see Barney (2001).
7. For a fuller discussion of the *market-based view*, see Porter (2008a).

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Appendix

Distribution of diplomas and medals success per nation at the Olympic Winter Games in three time periods (i.e. past, recent and future) between 1992 and 2014.

	Diplomas (top eight places)			Medals (top three places)		
	Past (1992–2006)	Recent (2010)	Future (2014)	Past (1992–2006)	Recent (2010)	Future (2014)
AUS	17	7	11	6	3	3
SUI	119	27	36	44	9	11
FIN	108	19	17	41	5	5
NED	97	23	38	36	8	24
GBR	26	9	13	6	1	4
CAN	189	72	57	76	26	25
JAP	118	27	28	25	5	8
KOR	55	26	16	31	14	8