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Is prioritisation of funding in elite sport effective? An analysis of the investment strategies in 16 countries

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16 countries

Abstract

Research question: This paper explores the extent to which nations prioritise elite sport funding; whether such nations are more successful than those whose funding is more diversified; and, if the sports that receive the most funding are also the most successful.

Research methods: Data on public expenditure for elite sport programmes (2011/2012) were collected on a sport-specific basis in 16 nations (n=445 funded sports). The Herfindahl index and concentration ratios of the four/eight most funded sports (CR4/CR8) are used as proxies for prioritization. Success was measured using top 3 and top 8 places during the Olympic Games and World Championships. Descriptive analysis and linear regression are applied to identify the relationship between the distribution of funding and success.

Results and findings: Generally, all sample nations are prioritisers. Nations with smaller total elite sport budgets tended to prioritise more. There is a slight negative association between the distribution of funding within a country and subsequent success, indicating that the sample countries that prioritise more tended to be less successful. Sample nations that diversify their funding more, are found to be successful in a wider range of sports. In addition, the data illustrated only low allocative efficiency for some nations.

Implications: The study produced ambiguous conclusions that prioritisation as a deliberate strategic choice is an efficient way to invest funding. The findings have important implications for high performance managers and suggests that a more diverse resource allocation policy may help to avoid unintended negative consequences.

Keywords: Targeted funding; elite sport policy; allocative efficiency; prioritisation; SPLISS

Introduction

Rivalry between nations for success in international sport events has resulted in increased competition (Houlihan & Zheng, 2013) and escalating investment in elite sport from public sources. Because the demand for success has risen and the supply of medals remains approximately fixed (Shibli & Bingham, 2007), there are diminishing returns on investment. Consequently, it is necessary for nations to continue investing heavily in elite sport simply to maintain existing performance levels. There is evidence of nations which have almost doubled their elite sport expenditure over the past decade, yet subsequent success in elite sport has decreased markedly (De Bosscher, Shibli, Westerbeek, & van Bottenburg, 2015). This phenomenon of reduced returns to scale, has put increasing pressure on governments to optimise the return on their investments, and one way to achieve this is by improving efficiency. The notion of "targeting the resources on only relatively small number of sports through identifying those that have a real chance of success at world level" (Green & Oakley, 2001, p. 91), as used in the early 1990s by some countries, is now applied more globally. Hence, many nations take strategic decisions to maximise the number of medals they can win, by concentrating on the sports in which rivalry is low, competitive balance is high (Zheng, Oh, Kim, Dickson, & De Bosscher, 2017) and in which they consider themselves to have competitive advantage (Du Bois & Heyndels, 2007; Tcha & Pershin, 2003). For example, in a simple two-factor model, a relatively wealthy country with sufficient water surface but a small population, might specialise in capital-intensive sports, such as sailing; whereas a less developed country might specialise in sports where capital is relatively less important, such as combat sports.

In addition, countries seem to invest in sports in which they have built a tradition of success or are culturally important, such as ice skating in the Netherlands, or judo in Japan. Consequently, the process by which nations prioritise sports can be geographical, political, cultural, or determined by the dynamics of an increasing rivalry in international competitions. Due to the continued intensification of international competition (De Bosscher et al., 2015), the strategy of focussing elite sport funding on a minority of sports in which nations perform well has become increasingly

prevalent (Bostock, Crowther, Ridley-Duff, & Breese, 2017; Sam, 2012). These sports receive enhanced funding, often at the expense of other sports, as often policymakers adopt a 'no compromise' approach. Targeted approaches to funding decisions are advocated as a more effective means of translating strategy into action (Robinson & Brumby, 2005; Sam, 2012; Van Thiel & Leeuw, 2002), with a shift in accountability from process to results. In the strategic management and marketing literature, this is similar to firms that position themselves within an industry by targeting markets (Hooley, Greenley, Fahy, & Cadogan, 2001). The governance of elite sport lends itself particularly well to performance targeting because of the unambiguous measurable outputs such as medals. However, to date the extent to which targeted funding for only a few sports (i.e. prioritisation) is more effective (i.e. in terms of success) than broader funding approaches (i.e. diversification) is untested empirically. While the phenomenon of targeting, or prioritisation of elite sport expenditures is highly prominent in policy debates, it has received little attention in the sport management literature (e.g. Bostock et al., 2017; Houlihan & Zheng, 2013; Sam, 2012; Weber, De Bosscher, & Kempf, 2018) and there is little evidence on the extent to which prioritisation exists, and whether a more targeted sports funding approach is associated with success.

The purpose of this paper is to explore the phenomenon of prioritisation and to identify:

(1) if and to what extent nations prioritise funding;

(2) if nations that prioritise more are also more successful in overall terms;

(3) if nations with a diverse funding policy are successful in a wider range of sports; and

(4) if nations perform best in those sports that they prioritise the most.

The research is conducted on a sport-specific basis using national funding data and output measures from 16 nations (n=445) that collaborated in the international comparative SPLISS 2.0 (Sports Policy factors Leading to International Sporting Success) project. The nature of output measures in elite sport, allied with the efforts that were made to enable like for like comparisons with the financial inputs, results in a first exploration of prioritisation for a specific sample of nations on both a national and a sport-specific basis, that enables the relationship between the

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prioritisation of funding and success to be quantified. The findings presented in this paper do not attempt to capture the full complexity of prioritisation, rather they allow greater understanding of targeted funding approaches in elite sport and provide fertile ground for further research. As other researchers have noted, there are possible unintended side effects of prioritisation over the longer term, not only for those sports that lose funding, but also for the highly funded sports that fail to achieve expectations (Bostock et al., 2017; Sam, 2012). The current study provides direction for the decision-making process of policymakers and high performance directors by examining return on investment with regard to funding allocation efficiency.

Rationale behind prioritisation, specialisation and positioning: allocation efficiency

The concept of prioritisation was discussed in the beginning of the 19th century in the economics of international trade, where it was shown that it may be beneficial for countries to specialise (and trade) even if those countries are able to produce every item more cheaply than any other country (Du Bois & Heyndels, 2007). As a rule, a country is expected to *specialise* in the production of those items where its cost advantage is largest in comparative terms (Tcha & Pershin, 2003). The range of targeted markets has been described as the *portfolio* of the firm (Porter, 2008), where firms can create a *competitive position*, by linking resources, strategies and implementation to performance (Hooley et al., 2001). Targeting identified markets and aligning resources accordingly, is useful, particularly in dynamic environments characterised by market growth or changing competitors.

In the public sector, this notion of *targeting resources*, *specialisation* or *prioritisation* has been adopted in relation to the New Public Management (NPM) reforms since the 1980s, when the public sector was perceived to be ineffective and underperforming (Robinson & Brumby, 2005). The vogue for NPM had the twin objectives of cutting budgets, and improving the efficiency and effectiveness of government bureaucracy (Van Thiel & Leeuw, 2002). The principal rationale for performance budgeting is that it improves '*allocative efficiency*' in decisions about how resources are distributed (Hawkesworth & Klepsvik, 2013; Robinson & Brumby, 2005). Essentially,

efficiency can be achieved by maximising the results of an intervention relative to the resources used (Herman & Renz, 2008; Pollitt & Bouckaert, 2004). Thus, there is agreement among scholars (e.g. De Peuter, De Smedt, & Bouckaert, 2007; Mihaiu, Opreana, & Cristescu, 2010) that measuring allocative efficiency requires:

> a) estimating the resources consumed in delivering the intervention (input);
>
> b) estimating the results, or the outputs; and
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> c) comparing the two to derive a ratio of inputs to outputs.

Targeted allocations are a valued form of organisational control, intended to recognise successful organisations and also to highlight the 'underperformers' in need of reform (Bevan & Hood, 2006; Sam, 2012). The principle of allocative efficiency as a rationale to prioritise is clear in elite sport policy development where the emphasis on targets, outputs and benchmarks marks a significant change in how state agencies deal with legitimising the efficient use of public funding (Houlihan & Zheng, 2013). Another rationale for targeted investments is that it holds organisations to account through performance management (Sam, 2012). Sam (2012) also argues that performance targeting serves other purposes such as providing transparency around funding decisions to build legitimacy and validate success in the eyes of political authorisers; or to stimulate learning among recipient organisations.

However, the concept of performance based management is also contested and evaluation studies show that some attempts to introduce results-based management are unsuccessful (Bevan & Hood, 2006; Moynihan, 2006). There have been numerous critiques, related to: incorrect assumptions underlying what is measured; measurement errors; and, problems concerning the content, position, and amount of measures. There is also increasing evidence of unintended and even undesirable side effects, such as: tunnel vision (i.e. emphasis on quantified phenomena at the expense of unquantified aspects of performance); suboptimisation (i.e. narrow local objectives by managers, at the expense of the objectives of the organisation as a whole); and measure fixation (i.e.

an emphasis on [single] measures of success rather than [on] the underlying objective) (see Van Thiel & Leeuw, 2002 for a review), which can impact negatively on policy implementation.

Targeting performance in elite sport

The notion of specialising, positioning and targeting resources in elite sport has Eastern Bloc antecedents and is now replicated to varying extents globally. Sports were targeted based on analysis of relevant international data, medal potential and external competition; as well as focussing on arguably 'softer' medals in events for women; sports in which nations consider themselves to be traditionally strong; or conversely, in which rivals are weak (Houlihan & Zheng, 2013; Weber et al., 2018). While targeting is not necessarily the result of a rational decision-making process, as it sometimes simply reinforces relatively well established historical advantage or dominance, a prioritisation strategy to increase competitive advantage and optimise allocative efficiency has become an ingredient of strategic decision making behind many elite sport systems. However, little research has been conducted about prioritisation strategies and its effectiveness in the sports literature. For example, Zheng and Chen (2016) identified how prioritisation in China has increased the country's success at the Summer Games since the 1980s. They demonstrated that strategic prioritisation in China is supported by the theory of cluster-based sports training and the five-word principle (small, fast, women, water and agile). Drawing on strategic management literature Weber et al. (2018) analysed how nations position themselves in the Olympic Winter Games through funding prioritisation. Their findings suggest a diversified portfolio of targeted sports among nations and a high correlation with past and present success. Two recent studies identify the (unintended) effects of prioritisation in New Zealand (Sam, 2012) and the United Kingdom (Bostock et al., 2017). Both studies concluded that the target-based budgeting may ultimately affect strategic thinking required to optimise long-term prospects. Intense prioritisation impacts on organisational learning and innovation and entails a political risk (Sam, 2012). It can also destabilise stakeholder relationships when NGBs focus overwhelmingly on operations and survival with no alternative plan to develop long-term high performance (Bostock et al., 2017). This

limited amount of evidence-based research in sport management, questions the efficiency of funding allocations and opens a dialogue on the long-term impact of prioritisation policies.

Theoretical framework

This paper starts from the assumption that nations prioritise funding to improve allocative efficiency. The theoretical framework, is thus based on a simple input-output funding allocation model as described above and as commonly used in strategic management/marketing and policy literature (De Peuter et al., 2007; Hooley et al., 2001; Weber et al., 2018) and which has previously been applied to evaluate the effectiveness of elite sports policy (De Bosscher, Shilbury, Theeboom, Van Hoecke, & De Knop, 2011). The 'input' is the flow of financial resources into the 'system' that enables the policy support and processes to be implemented. It is assumed that to target funding (i.e. input) on only a relatively small number of sports (i.e. prioritisation) is a deliberate strategic choice (i.e. a form of throughput) that is made to increase a nation's overall chances of success (i.e. outputs, see Figure 1). To investigate this notion empirically, four hypotheses are proposed and tested in this paper.

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As this paper focusses on the search of evidence for a global existence of a phenomenon, the first hypothesis relates to the first research aim, to identify whether nations prioritise funding for elite sport, and the extent to which they do so. To frame these aims within the context of nations, Tcha and Pershin (2003) found that middle and higher income countries specialise less than low income countries and win medals in a more diversified range of sports. Low income countries concentrated on selected sports. Their diagnosis is based on many empirical works which assert that consumers spend their budget on more diversified goods as their income increases (Chen, 2000, cited by Tcha & Perchin). However, interestingly, the SPLISS 2.0 study (De Bosscher et al., 2015) revealed that the wealth of the 15 countries in their sample (GDP/CAP) was not related to total elite

sport expenditures. It is likely that absolute elite sport expenditure is a better lens through which to look at the prioritisation of funding. As such a first hypothesis was formulated as:

Hypothesis 1: The lower total elite sport expenditures, the higher the levels of prioritisation; and nations with higher elite sport expenditures are characterised by having a more diversified approach to funding.

As the literature and theoretical framework described above argue that nations can increase success by prioritising resources, which leads to allocative efficiency, the following hypothese is proposed:

Hypothesis 2: Nations with a prioritisation approach, are more successful than nations with a diversification approach;

Alternatively, as some authors have been critical and argue that prioritisation may lead to suboptimisation (Sam, 2012), it might also be assumed that nations which invest more widely, have a broader range of opportunities for success. Therefore, the following hypothesis also proposes that:

Hypothesis 3: Nations with a diversification approach win medals in more sports than nations with a prioritisation approach;

As a logic consequence of the above arguments:

Hypothesis 4: Nations with a priority approach, *are more successful in those sports that they prioritis*e; and are less successful in sports that receive relatively less funding.

Methods

Data collection

This paper focusses on one of the 96 critical success factors (CSF) of the nine-pillar SPLISS model developed by De Bosscher, De Knop, Van Bottenburg, and Shibli (2006): 'Resources are targeted at relatively few sports through identifying those that have a real chance of success at world level (Oakley & Green, 2001, p. 91)' (CSF 2.18). Data were collected by a local researcher in each of the 16 'national sport systems' involved in this study.

Comparability of data and the reliability of the comparison was a major concern of the research group. All contributors received a research inventory and protocol that provided guidance on the process of data collection, to standardise the approach to data collation. A fuller description of the process can be found in De Bosscher et al (2015, op. cit.)

Funding data

Transnational comparisons of expenditure on sport are notoriously difficult exercises as expenditure definitions and sport delivery mechanisms vary considerably. Issues raised include: the source of funding; overlaps in funding streams; and inclusion and exclusion criteria. This was difficult at an aggregate level and particularly so at a sport-specific level. As a result, fine-tuning was required to compile measures that were fit for purpose and which enabled meaningful like for like comparisons. Therefore, an important point to note is that the study did not attempt to capture the full picture of financial inputs in elite sport or prioritisation and focused only on resources that are coordinated at a national level and that are specifically used to invest in elite sport development. As such, the national funding was defined as the 'public expenditure on elite sport distributed to specific elite sport development programmes at a nationally coordinated level, and included, where relevant, net expenditure by central government, national lotteries and/or National Olympic Committee funding. These data were collected overall and on a sport-specific basis. To ensure data comparability and to avoid duplication in quantifying expenditure, the inventory collected details on the source and distribution of funding. These inclusion criteria can understate the overall picture of elite sport spending in each country, as they exclude for example investments by municipalities, the police, the military, state companies, and private donors.

The inventory contained a precoded list of all Summer and Winter Olympic sports and disciplines. In addition, researchers were asked to specify whether non-Olympic sports were funded, and if so, to state the amount of funding allocated to them. Data were cleaned and several personal contacts with the local researcher were often necessary to ensure comparability

Because detailed data per 'discipline' were not available in all nations, this paper focuses on 'sports'. To illustrate the difference, the International Olympic Committee defines the sport of 'aquatics' as the disciplines of swimming, diving, water polo, and synchronised swimming. All inputs (funding) and outputs (medals) are viewed from the perspective of 'aquatics' and not its disciplines. Most importantly, within the aim of this paper to identify which sports are prioritised *within a country*, we have therefore chosen to calculate *relative funding by sport* instead of using absolute values. The *relative distribution of funding* (%) by sport within a country was used as a proxy for prioritisation, by calculating the funding allocated to a sport as a proportion of the total funding for all sports separately for summer and winter sports. For example, in the case of Australia, aquatics received 14.9% of the total funding allocated to all sports. A methodological conundrum arises as some nations invest considerable amounts in certain sports through their national training centres, for which sport-specific data were not available. The absolute expenditures reported, therefore are an under-estimation of the full picture in these nations.

Success data

Success measures were based on the sport-specific market share of nations during the Olympic Games and World Championships over the four-year period 1st January 2009 to 31st December 2012. Market share is a standardised measure of total achievement in an event whereby total medals won or top eight ranks are converted into 'points' and the points won by a given nation are subsequently expressed as a percentage of the total points awarded (Shibli, 2003). The data were derived from an online database maintained by Gracenote Sports. As such, in line with economic measures of prioritisation or specialisation of firms or nations (Du Bois & Heyndels, 2007; Weber et al., 2018), the output data is also based on *relative* figures (i.e. the share within each country). The *relative distribution of success* (%) within a nation was thus subsequently measured as the proportion of success (i.e. the percentage of the market share) achieved as a function of that nation's total success (i.e. what percentage of the total market share is contributed by each sport in the

sample nations). To continue our example using Australia, the country won 24.8% of its medal market share and 30.5% of its top eight market share in aquatics.

Data analysis

In economic research, concentration ratios are used to quantify the market control of an industry's largest firms and to illustrate the degree to which an industry is oligopolistic. It is standard practice to focus on the market shares of the four and eight largest suppliers, or in this case the amount of funding allocated to 'sports' as an indication of prioritisation (Clarke & Davies, 1983). The concentration ratio CR4 signifies therefore the share of funding allocated to the four highest funded sports where a lower concentration ratio reflects a more modest concentration (or greater diversification) of funding. When the maximum value equals 100%, it means that all funding is allocated to four sports.

In addition, the Hirschman-Herfindahl Index (*HHI*) was applied as a proxy for each nation's prioritisation policy. In contrast to the previously described concentration ratios (CR4 and CR8), the *HHI* includes all data on funded sports and not only the top four and eight sports and therefore provides a different perspective (Sutton, 2001). Hence, the HHI combines two related determinants: the number of sports funded and the share of funding per sport. 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 sports that are funded. If national funding is equally distributed among for example 20 sports, i.e., every sport receives 1/20 of the funding (i.e., no prioritisation), then the HHI value would be 0.05.

In the second phase, and because of the small sample of nations (n=16), a bivariate linear regression analysis was conducted to analyse the influence of the relative distribution of funding for each sport per country (as the independent variable) on the relative distribution of success (as the dependent variable) (n=445). The latter made the distinction between the two performance indicators (i.e., percentages of top eight places and medals (top three places) won per sport within each country). Because the data were not normally distributed in most countries, and because too

much information would be lost if non-parametric statistics are used, bootstrapping was applied on the linear regression. Bootstrapping is a method for deriving robust estimates of standard errors and confidence intervals for estimates such as correlation or regression coefficients as an alternative to parametric estimates when the assumptions of those methods are in doubt, or where parametric inference is not possible or requires overly complex adjustments (Field, 2013; IBM, 2017). Initial analysis examined the fitting of the model described by the equation that is estimated as follows:

$$\text{Success}_{\text{country X for (a) Top 3 share and (b) Top 8 share}} = \beta_0 + \beta_1 \text{ (funding Share)} + \varepsilon \text{ (bootstrapped).}$$

The 95% confidence interval of the effect was estimated with 1000 bootstrap resamples (Field, 2013).

Results

The first aim was to measure if and the extent to which the sample nations prioritise their elite sport funding in general. Because of the explorative nature of this study, we start with an overall descriptive analysis of the distribution of national (governmental) funding, to define a standardised criterion for prioritisation.

1A) Do countries prioritise and to what extent?

Prioritisation, can be examined by analysing how the proportion of funding is allocated over a portfolio of sports as shown by the HHI-index and the concentration ratios CR4 and CR 8 in Figure 2 and Appendix 1.

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One observation about Figure 2 is that all countries in the sample are prioritisers. If an absolute threshold for the HHI-index is taken whereby funding is distributed evenly over all sports, then the HHI-index value is higher than the threshold in all countries (Appendix 1). A more specific view is given by the CR4 and CR8 values, which show that all nations spend more than their threshold for the four and eight most funded sports. If funding was divided equally over all sports, the maximum thresholds would be 15.4% (i.e. 100*4/28 sports) for CR4 and 30.8% for CR8.

For a more granular comparison within the sample, we take the median score as a threshold (Appendix 1). Four countries stand out as clearly diversifying their funding more than average: South Korea, Spain, the Netherlands and France, which all fund more than 50 sports and have HHI-indices of 0.40 or lower (median HHI = 0.62). The CR4 and CR8 values in these nations show that less than 30% of funding is allocated to four sports and less than 40% to eight sports (Figure 2), which is below the median scores of 38% (CR4) and 58% (CR8). A pragmatic definition of prioritisation such as 'prioritisation of funding means that the majority of a nation's funding is allocated to a minority of the sports contested', reveals that most sample nations are categorised as prioritisers, with more than 58% of their funding being spent on eight sports. In addition, it needs to be noted that not all nations fund medal-rich sports and there is considerable variation between nations as to which sports they prioritise and the extent of any such prioritisation. This is illustrated in Appendix 2.

1B) Is prioritisation related to the total elite sport expenditures of nations?

Following Tcha and Pershin (2003), hypothesis 1 proposed that nations with lower total elite sport expenditures (i.e. absolute amount of national funding from central government, national lotteries and/or National Olympic Committee funding) have higher levels of prioritisation; whereas nations with high elite sport expenditures have a more *diversified* approach. A negative Spearman's rho correlation (r_s = -.563, ρ<.05) between elite sport expenditure and CR8 supports this argument as shown in Figure 3. The figure shows that the nations with the lowest expenditures (i.e. Denmark, Belgium (both Flanders and Wallonia), Estonia and Portugal, with budgets of less than 35 million euros in 2012) all have CR8 values above 58%. Among the countries with expenditures above 67 million euros (i.e. the median), Korea, France, Japan, Brazil and Spain spend their funding more diversely, with CR8 values all below 50%. Australia, Canada and Great Britain by contrast are relative prioritisers with CR8 scores at or above the median (58%). We therefore conclude that sample nations with lower elite sport expenditures tend to prioritise more, but those with higher expenditures do not necessarily prioritise less.

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2) Are nations with a priority approach more successful than nations with a more diversified approach?

Hypothesis 2 proposes that 'nations with a priority approach, are more successful than nations with a diversity approach'. In this section, data for non-Olympic sports are excluded, because of the lack of comparable input and output data for these sports. Consequently, CR4 and CR8 funding values are recalculated specifically for Olympic sports to obtain the precise relationship with success in those competitions.

The overall results of the Spearman's rho coefficients between the CR4 or CR8 values (Figure 2) and the total market share figures tend to be negative, but not significant, for summer sports (r_sCR4 = -.392, ρ=.134; r_sCR8 = -.284, ρ=.284, n=16 nations). In Winter sports the relationship is arguably stronger, with a significant negative correlation for CR4 (r_sCR4 = -.713*, ρ<0.01). These correlations reveal a modest (negative) association suggesting that sample nations which prioritise more, tend to be *less* successful than those with a diversification approach (or *vice versa*).

These points are demonstrated in the scatter plots of Figures 4A and 4B. Taking CR8 as a proxy for prioritisation in summer sports, Great Britain, France, Australia and Japan, are the four most successful countries in the sample and are also on opposite ends of the concentration ratio spectrum. Australia and Great Britain have a highly-targeted funding approach while France prioritises the least. Japan is located between the extremes, as a successful nation with average CR8 figures compared with the sample overall. South Korea, Brazil and Spain are all countries that have diverse funding models and average performance. Denmark (5.6m)) and the Netherlands (16.9m) are examples of less populated nations within the sample that are relatively successful in summer sports and are also positioned at opposite ends of the prioritisation-diversification continuum. In

winter sports, using CR4 (as there are only seven sports), Canada was the most successful country and used a prioritised approach, spending 87% of its relevant funding on four sports (Figure 4B).

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3) Are nations with a diversity approach successful in a wider range of sports than nations with a priority approach?

Hypothesis 3 proposes that countries which allocate funding over more sports, are also successful in a wider number of sports. Table 1 provides an overview of the number of sports in which nations won medals. France, Japan and Spain won medals in the highest number of summer sports; Canada and Switzerland in the highest number of winter sports. To test our hypothesis further, we added to Table 1 a concentration value that represents the number of sports in which nations invested a specified share of funding, for summer and winter sports combined. This value was arbitrarily taken at 75% (concentration number Cn). For example, in Switzerland, 75% of the funding is allocated to 24 sports (relatively diversified), compared with 11 sports in Australia and Flanders (relatively prioritised). Generally, the data show that nations which spread their *funding more widely*, *win medals in more sports*. The Spearman's rho coefficients between the total number of sports funded and the number of sports in which nations win medals, is significant ($r_s = .557$, $\rho<.05$; n=16). For example, France spent 75% of its funding on 20 sports and won medals in the highest number of sports (32). There are notable exceptions such as Canada and Japan. This finding indicates that more analysis by sport and country is necessary to be more conclusive.

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4) Are nations with a priority approach more successful in those sports that they prioritise?

The fourth research question is concerned with sport and country specific analyses to identify whether nations are more successful in the sports they prioritise, and are less successful in sports

that receive relatively less funding (hypothesis 4). This analysis helps to diagnose whether the prioritisation/diversification approach taken by each country is efficient. . This section focuses on Olympic Summer sports only to illustrate the basic concept. It is important to reiterate that the analysis focuses on the *relative* values within each country; thus, the relative distribution of funding (%) to a sport, is compared with the relative share of success (%) in that sport for each nation.

Table 2 illustrates the bootstrapped linear regression parameters with the share of funding as the predictor for the (weighted share of) top 3 and top 8 performances, on a sport-specific basis for each nation. In addition, Table 3 displays descriptive data with the share of funding provided to the top four and top eight funded sports and the top four and top eight most successful sports within a country.

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The overall regression analysis (for all sports in 16 nations, n=445), after bootstrapping, demonstrates a significant relationship between the share of funding distributed to sports and the share of success achieved by these sports. The variance of the extent to which the distribution of top three performances can be explained by the distribution of funding in the same sports over all nations ($R^2_{(adjusted)}$) is 23.6% ($\rho<.01$). The variation explained by top eight performances is higher, with an $R^2_{(adjusted)}$ score of 36.0% ($\rho<.01$) (Table 2). This finding is reinforced by the descriptive concentration ratio data in Table 3, showing that for most nations, the share of medal performances in the four/eight most successful sports is generally higher than the share of the funding they received. While from the overall data there seems to be a general pattern whereby countries perform best in the sports which they prioritise the most. However, half of the countries appear to be less efficient in their funding distribution; notably Wallonia, Finland, South-Korea, Flanders and Denmark, in which the relationship between funding and top 3 places is very low ($R^2_{(adjusted)} <0.1$). As Table 3 also reveals, the funding distribution to the CR4 sports is higher than the share of success in these countries. By contrast, the funding distribution in some countries, Flanders and

Spain in particular, is more efficient for winning top eight places than medals, and accounts for 56.9% (ρ<.01) and 31.9% (ρ<.01) of the variation in these nations respectively.

We illustrate these findings further with a few selected examples. Australia and Great Britain, are countries with a relatively highly prioritised funding approach, and both have a strong relationship between the distribution of funding to specific sports and the amount of success achieved by these sports (Table 2). In Great Britain, the four sports that receive 44.2% of the funding account for 59% of the nation's success (Table 3). In Australia 65.9% of all top 3 performances are achieved by the four sports that receive 44.6% of the funding; and 89.6% of success is achieved by the eight sports that receive 74.6% of the funding. In summary, these countries seem to have an efficient funding-success relationship for key sports. Furthermore, the most efficient sports in Australia are cycling (26.6% of the funding and 30.7% of top 3 success), sailing (6.9% vs 10.7%) and aquatics (swimming) (17.5% vs 24.8%); whereas the three team sports of football (8.9% vs 0.0%), hockey (7.6% vs 1.5%) and basketball (6.8% vs 0.4%) are the least efficient. In Great Britain cycling is the most efficient (10.0% vs 23.7%) and aquatics (14.3% vs 7.5%) and hockey (0.4% vs 5.7%) the least efficient sports.

By contrast, while France is a successful nation with a relatively highly diversified approach to its funding distribution, tables 2 and 3 illustrate that its investments are also efficient. The four sports that received 25.5% of the funding overall, won 65.9% of the top 3 points and the eight sports to which 47.8% of the funding was distributed, won 89.6% of the top 8 points.

In conclusion, the results in these examples illustrate that the share of funding accounts for a high share in the variation of the dependent variable (success) ($R^2_{(adjusted)}$ >0.45, p<.05) for the nations with a high prioritisation approach (e.g. Australia, Great Britain), as well as nations with a high diversification (e.g. France, the Netherlands); and also nations with a medium prioritisation approach (e.g. Japan, Canada). By contrast, South Korea and Wallonia, both performed relatively poorly in sports compared with the relative investment made in them and have weak Spearman's

rho correlations. The correlations in Finland and Estonia are weak with the relative share of funding in both the top four and top eight funded sports being higher than the relative share of success.

Discussion

This paper is the first that explores objectively the phenomenon of prioritisation of elite sport expenditure on a transnational scale. The study applied recognised economic techniques (HHI and CR) to assess whether and to what extent prioritisation takes place and to assess if prioritisation is more effective than the broader funding approach of diversification. The rationale behind these measurements, adopted in strategic management to position firms or nations in an industry and to identify a portfolio of targeted markets (Hooley et al., 2001; Porter, 2008), and latterly in policy studies (De Peuter et al., 2007), is the concept of allocative efficiency: to achieve maximum utility (success) from a given level of investment.

Our analysis of 16 nations illustrated that all nations are prioritisers in the sense that a disproportionately high level of funding is allocated to a minority of sports. France, South Korea, Brazil, Spain and the Netherlands are the countries that concentrate their funding the least on eight sports (CR8). Consistent with Tcha and Pershin (2003) which related the income of countries (GDP per capita) to success, this research demonstrated that sample nations with smaller total elite sport expenditures tend to prioritise more, but among nations with higher elite sport expenditures there are both prioritisers and diversifiers. We can therefore only partly confirm hypothesis 1 for smaller nations.

Countries exhibiting highly prioritised or highly diversified funding strategies could both be successful. As such, hypothesis 2 is not proven. The findings were not conclusive in showing that nations with a prioritisation approach are more successful than nations with a diversification approach (i.e. hypothesis 2). On the contrary, the correlations with 16 nations revealed a slight negative association indicating that sample countries that prioritise more were generally less successful.

The third hypothesis proposed that nations with a diversification approach would win medals in a wider range of sports than nations with a prioritisation approach. The data showed that those nations that spread their funding more widely, win medals in more sports, with a significant Spearman's rho coefficient. As such, the hypothesis can be confirmed in general terms. However, the data showed exceptions for Canada and Japan, which are both medium to high funding prioritisers who also achieved success across a wide portfolio of sports.

The fourth hypothesis was concerned with the efficiency of prioritisation, analysing the data at a sport-specific level for each country in summer sports only. It showed that generally most nations perform better in the sports in which they invest most: their share of medal performances in the four/eight most successful sports is higher than the share of funding allocated to these sports. This finding was confirmed by significant correlation coefficients in most nations. However, there is considerable variation in the efficiency ratios of investment to success. In Denmark, Finland, Flanders, South Korea and Wallonia, investments are higher than the return in terms of medals and top eight places of the four most funded sports. Estonia, South-Korea, Flanders and Wallonia are exceptions at CR8 level. Among the more 'efficient' nations, were both prioritisers (e.g. Australia) and diversifiers (e.g. France). The presence of seemingly contradictory evidence lends weight to the argument that different approaches along the prioritisation/diversification continuum can be efficient. As such, the fourth hypothesis is neither confirmed nor refuted, as the efficiency of success in specific sports does not seem to be related to whether nations adopt a priority approach.

These findings imply that caution is needed when examining the concept of allocative efficiency, or positioning, in the context of prioritisation in elite sport. Although in the existing literature, competitive positioning is seen to be positively related to performance (Hooley et al., 2001), in this study, there is sufficient evidence to suggest that prioritisation *per se* is not necessarily a driver of absolute success and that a diversification approach enables medals to be won across a greater number of sports, especially in nations with higher total elite sport expenditures. Comparing these findings with mainstream literature, it is likely that the elite sport

market is distinctive because other factors that influence the competitive environment are at play, such as IOC quotas or the popularity of different sports. Therefore, elite sport funding is not simply the outcome of a rational decision-making process such as all nations investing heavily in medal rich sports like athletics and swimming. Indeed, some of the evidence points to seemingly irrational behaviour such as investing in team sports with high costs and limited medal winning opportunities. If we take the case of hockey (e.g. 7.6% of funding for Australia, 5.7% for Great Britain) there is a maximum of two medals available to be won at the Summer Olympics. By contrast Great Britain and Australia invest less than 1% of their funding in weightlifting, in which 10 medals can be contested. This also explains Denmark's relatively average efficiency rate, as a result of high investments made in medal-poor sports, like football and handball. These examples reinforce the argument that nations balance their investments between the number of medal winning opportunities on the one hand and 'culturally significant sports' on the other.

In addition, nations tend to invest in those sports that have been successful in the past. This approach is a paradox, as today's funding can only influence future success. As developing elite athletes requires 15 years and success depends on many extraneous factors (De Bosscher et al., 2015), the risk of prioritisation strategies is that there is no alternative plan if targeted sports fail in the future. This point brings up a second paradox in applying allocative efficiency to elite sport, because the targeted funding may be determined by the spending patterns of other countries. As argued by De Bosscher, Bingham, Shibli, Van Bottenburg, and De Knop (2008) 'the rules of the game are dictated by what rival nations are doing, not on the basis of what an individual nation is doing now compared with what it did in the past (p. 134)'. Thus, what appears to be a high amount of funding in a prioritised sport in one country, may be underfunding compared with investment levels in other countries. In addition, for nations aiming to develop sustained success in elite sport, investing in long-term elite sport policies is a necessary prerequisite. Excluding sports that fail to perform to the expected standards, may eventually yield diminishing returns (Shibli & Bingham, 2008) and nations become path dependent: there is no way back for these sports. The findings are

thus consistent with authors who have been critical of output-based targeted funding in the public sector as it can lead to unintended consequences (e.g. ossification of sport organisations; impedance of innovation; measure fixation; tunnel vision; and sub-optimisation) (Bevan & Hood, 2006; Mihaiu et al., 2010; Sam, 2012; Van Thiel & Leeuw, 2002). In the longer term, these unintended effects can jeopardise the effectiveness and efficiency of policy implementation. Analysis of long-term consequences of highly targeted funding approaches is recommended for exploration in future research.

Methodological considerations

The nature of the data in terms of the sample nations, the sports represented and the funding distribution suggests that our analysis has limitations. One limitation of the data is that it is based on a point in time and not longitudinal funding data. However, using a pioneering approach to evaluate and objectify prioritisation and diversification, our primary aim was to demonstrate the existence, or otherwise, of the phenomenon of prioritisation and not the dynamic of the phenomenon, which is a recommendation for future research. Similarly, as there are other variables that may impact on success such as media exposure, testing the robustness of the basic concept demonstrated here by more highly refined regressions is a challenge for future research. Another limitation is that the data measure the total number of medals/top eight places instead of 'contestable' medals. It therefore does not account for variances in the medals available by sport. For example in athletics there are 47 events and 133 contestable medals; whereas in a team sport like hockey there are only two events and only one contestable medal per event. Future iterations of this research could be enhanced by using contestable medals as the basis for the success calculations. Another methodological issue relates to the distinction between 'sports' and 'disciplines'. For example, whilst the sport of 'aquatics' is seen by the International Olympic Committee and this study as one sport, in practice it has four disciplines. This issue means that it is difficult to define what a sport is when trying to analyse prioritisation and diversification of funding. As this study was explorative, we recommend analysing funding and success on the basis

of disciplines rather than sports as there are wide variations between medal winning opportunities and funding by discipline.

The results of this paper relate to a small sample of 16 nations and are not generalisable. The sample nations represent 8.5% of the world's population and 10% of global wealth. By contrast, they won 23% of the total medals in London 2012, produced a quarter of the London 2012 Olympians (26%) and won 37% of the total medals in Vancouver 2010. All countries won at least one medal during the period under review. The results may well differ in less successful nations and it is likely that prioritisation strategies are a necessity in poorer countries with less developed sport systems. In addition, the issue of prioritisation is context-related and culturally embedded. Targeted funding approaches may be less acceptable in sport systems that aim to produce socially desired results, as a result of investing in certain sports. A critical reflection on our findings is that even if countries prioritise their elite sport funding it cannot be assumed to be a deliberate strategy.

Conclusion

This study confirms the conclusions of previous sport management literature, in which attention is drawn to the long-term risks of prioritisation (Bostock et al., 2017; Sam, 2012). We have shown for the first time that while all countries prioritise their elite sport investments, the findings did not confirm that prioritisation is an efficient funding strategy, as among the successful nations we found both prioritisers and diversifiers. In addition, the allocative efficiency was medium to low in some nations. Moreover, nations with a diversification approach appeared to be more likely to win medals in a wider range of sports. This paper is further confirmation of De Bosscher et al. (2015) that there is no established blueprint by which nations can develop elite sport success. There is evidence of nations within the sample being placed at various points along a prioritisation and diversification continuum and still achieving success to a greater or lesser extent. Despite the use of seemingly rational measures in elite sport policy influenced by New Public Management, the funding of elite sport does not always appear to be rational. Relatively large sums of money are invested in

culturally significant sports such as football which have few medal winning opportunities. Similarly, despite the high number of medals available in athletics, not all nations prioritise it. These findings suggest that to different nations medals in different sports have different values. Furthermore, the time taken to develop a competitive elite sport system is such that nations are wedded to a path dependency (Hooley et al., 2001; Houlihan, 2009) from which short-term deviation is difficult. People making policy decisions now will probably not be around to see the consequences of their actions and there is of course no guarantee of success regardless of investment levels or quality of decisions. Decision making therefore tends to be conservative and protects the *status quo* particularly whilst the success achieved is within reasonable bounds. It is perhaps only when what Chalip (1995) calls a 'focusing event' and success falls outside acceptable limits that a more radical shake up of elite sport systems occurs. The use of seemingly rational methods drawn from mainstream economics and applied to elite sport, results in hypotheses that are rejected, or only partially accepted. Although we find that the 'black box' of elite sport policy is confounding, the search for the keys to unlock it continues.

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Table 1: *Number of Olympic summer and winter sports in which nations won medals during the 2012 Olympic cycle and the number of sports receiving 75% of the funding*

	AUS	BRA	CAN	DEN	ESP	EST	FIN	FLA	FRA	GBR	JPN	KOR	NED	POR	SUI	WAL
Number of SUMMER sports medalled in	16	10	17	9	19	4	5	5	25	16	18	14	13	3	9	4
Number of WINTER sports medalled in	2	0	12	1	0	1	8	1	7	4	7	3	3	0	8	0
TOTAL number of sports medalled in	18	10	29	10	19	5	13	6	32	20	25	17	16	3	17	4
CN75: # sports with 75% of the funding	11	16	14	10	20	12	14	11	20	12	16	27	18	12	24	12

Table 2: Bivariate linear regression (bootstrapped) of the share of funding (independent variable) and relative performances (share of market shares of top 3 and 8 points) (dependent variable), by country – in summer sports

country	TOP 3 (bootstrapped)				TOP 8 (bootstrapped)			
	Adjusted R²	Unstandar-dized coefficients	Std. Error	p	Adjusted R²	Unstandar-dized coefficients	Std. Error	p
Canada (n=28)	0.621	1.083	0.219	.004**	0.679	1.095	0.183	.001**
Great Britain (n=26)	0.613	1.257	0.352	.017**	0.834	1.339	0.162	.001**
Japan (n=27)	0.552	1.761	0.694	.081	0.55	1.407	0.528	.042*
Australia (n=28)	0.551	1.33	0.358	.027*	0.627	1.350	0.332	.022*
Netherlands (n=28)	0.508	1.553	0.428	.01**	0.589	1.635	0.26	.000**
France (n=28)	0.479	1.953	0.432	.01**	0.534	1.804	0.372	.006**
Portugal (n=28)	0.408	2.105	0.729	.046*	0.346	1.419	0.535	.064
Brazil (n=28)	0.379	1.973	0.571	.016**	0.385	1.772	0.547	.029*
Denmark (n=28)	0.371	0.961	0.402	.089	0.341	0.835	0.402	.088
Estonia (n=28)	0.301	1.329	0.639	.099	0.423	1.447	0.582	.06
Spain (n=28)	0.223	1.029	0.482	.051	0.319	1.031	0.4	.016**
Switzerland (n=28)	0.078	0.997	0.907	.398	0.087	0.278	0.235	.38
Flanders (n=25)	0.054	0.785	0.323	.070	0.569	1.464	0.348	.007**
South Korea (n=28)	0.017	0.573	0.418	.207	-0.007	0.367	0.397	.366
Finland (n=28)	0.003	0.69	0.698	.424	0.112	0.929	0.455	.15
Wallonia (n=30)	-0.015	0.287	0.339	.398	0.073	0.649	0.619	.41
TOTAL (n=445)	0.236	1.136	0.135	.001	0.36	1.123	0.071	.000

* significant at the .05 level; ** .01 level.

Table 3: comparing funding with success: overview of the CR4 and CR8 concentration ratios of funding and of top 3 and top 8 performances, by nation – summer sports only

	CR4&8 funding	CR4&8 top 3	CR4&8 top 8		CR4&8 funding	CR4&8 top 3	CR4&8 top 8
Great Britain				**Japan**			
- Aquatics				- Judo			
- Rowing	44.2%	59.3%	59.5%	- Football	43.1%	52.1%	47.6%
- Cycling				- Aquatics			
- Athletics				- Athletics			
- Sailing				- Wrestling			
- Canoe	69.7%	80.5%	80.7%	- Gymnastics	63.1%	88.8%	83.1%
- Hockey				- Volleyball			
- Equestrian				- Table tennis			
Australia				**Canada**			
- Aquatics				- Aquatics			
- Cycling	44.6%	65.9%	66.8%	- Rowing	47.2%	45.0%	45.3%
- Rowing				- Athletics			
- Football				- Basketball			
- Athletics				- Canoe			
- Hockey	74.6%	89.6%	84.4%	- Football	70.6%	79.0%	77.1%
- Sailing				- Cycling			
- Basketball				- Gymnastics			
France				**Spain**			
- Athletics				- Athletics			
- Handball	25.5%	45.4%	42.0%	- Basketball	35.3%	41.1%	42.9%
- Aquatics				- Aquatics			
- Cycling				- Canoe			
- Sailing				- Sailing			
- Judo	47.8%	82.4%	75.6%	- Cycling	55.5%	71.4%	68.1%
- Canoe				- Handball			
- Rowing				- Football			

Denmark				Switzerland			
. Handball				- Gymnastics			
. Rowing	*52.4%*	*33.3%*	*25.3%*	- Aquatics	42.3%	67.6%	59.8%
. Football				- Tennis			
. Sailing				- Cycling			
. Badminton							
. Aquatics				- Athletics			
. Cycling	*80.4%*	95.6%	85.7%	- Volleyball	67.3%	81.1%	75.7%
. Table				- Triathlon			
Tennis				- Football			
Netherlands				Brazil			
- Aquatics				- Athletics			
- Cycling	37.1%	56.8%	57.1%	- Gymnastics	28.7%	51.7%	45.6%
- Volleyball				- Sailing			
- Sailing				- Judo			
- Rowing				- Aquatics			
- Athletics	83.1%	86.0%	61.2%	- Handball	50.4%	87.6%	83.1%
- Judo				- Volleyball			
- Equestrian				- Canoe			
Portugal				Estonia			
- Athletics				- Athletics			
- Judo	39.3%	80.0%	47.1%	- Basketball	46.8%	50.0%	58.7%
- Handball				- Volleyball			
- Basketball				- Rowing			
- Aquatics				- Judo			
- Volleyball				- Cycling	*69.3%*	**50.0%**	**64.0%**
- Football	62.7%	100.0%	75.4%	- Aquatics			
- Canoe				- Tennis			
Finland				S-Korea			
- Athletics				- Shooting			
- Football	*45.0%*	**11.8%**	**29.2%**	- Athletics	*31.3%*	21.5%	19.8%
- Shooting				- Badminton			
- Gymnastics				- Aquatics			

- Volleyball				- Hockey			
- Wrestling	71.6%	94.1%	88.5%	- Judo	*50.8%*	**41.1%**	**40.3%**
- Sailing				- Cycling			
- Basketball				Gymnastics			
Flanders				**Wallonia**			
- Cycling				- Tennis			
- Athletics	*43.5%*	**30.8%**	56.4%	- Athletics	*45.7%*	**17.4%**	36.8%
- Gymnastics				- Rugby			
- Aquatics				- Basketball			
				- Table Tennis			
- Judo							
- Volleyball	*67.3%*	**46.2%**	75.6%	- Judo	*72.1%*	**26.1%**	**51.4%**
- Tennis				- Aquatics			
- Rowing				- Gymnastics			

Figures are in **bold** when the relative funding is higher than the relative success

Figure 1: Policy cycle of a prioritisation strategy (adapted from De Bosscher et al., 2011; De Peuter et al., 2007; Mihaiu et al., 2010)
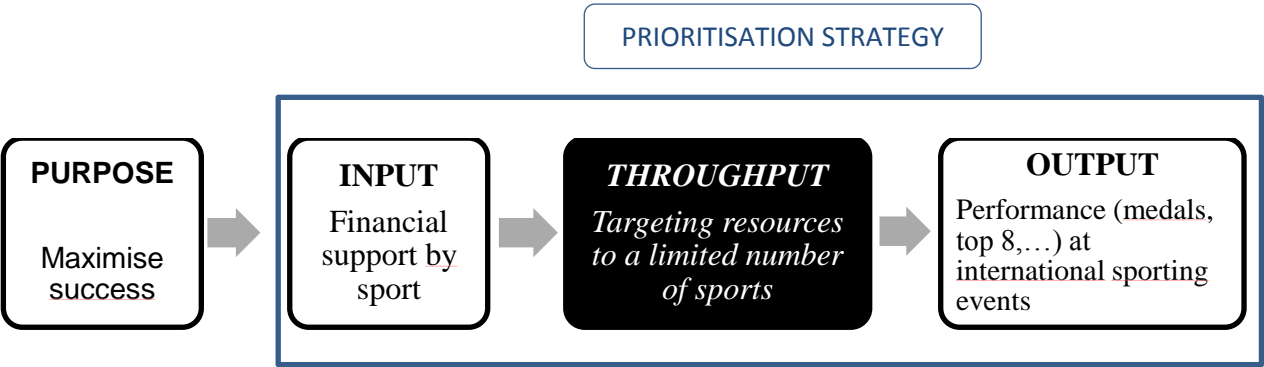
Figure 2: Concentration ratios CR4 and CR8 and Herfandihl index of the sports funded in the sample nations: Olympic and non-Olympic sports (ranked by CR8)

Figure 3: Scatterplot of the CR8 values against the total national elite sport expenditures (from government, national Olympic Committees and national coordinated sponsorship).

Figure 4A: Scatterplot of the CR8 values (as a proxy of prioritisation) against the outputs (market shares 2012 cycle) in summer sports

Figure 4B: Scatterplot of the CR4 values against the outputs (market shares 2012 cycle) in winter sports

Figure 1

PRIORITISATION STRATEGY

PURPOSE

Maximise success

INPUT
Financial support by sport

THROUGHPUT
Targeting resources to a limited number of sports

OUTPUT
Performance (medals, top 8,…) at international sporting events

Figure 2

Figure 3

Total National Expenditure on Elite Sport 2011/12 (€ millions)

Figure 4A

Success: Market Share % in Summer Sports (2012 Cycle) (y-axis)

Degree of Prioritisation as Measured by CR8 (x-axis)

Data points:
- GBR: ~70%, 6.8%
- FRA: ~48%, 4.3%
- AUS: ~74.5%, 4.1%
- JPN: ~63%, 3.9%
- KOR: ~51%, 2.4%
- NED: ~61%, 1.8%
- ESP: ~55.5%, 1.7%
- CAN: ~71%, 1.5%
- BRA: ~50%, 1.5%
- DEN: ~80.5%, 0.7%
- SUI: ~68%, 0.5%
- POR: ~61%, 0.2%
- FLA: ~65%, 0.2%
- EST: ~69.5%, 0.2%
- FIN: ~72%, 0.3%
- WAL: ~72%, 0.1%
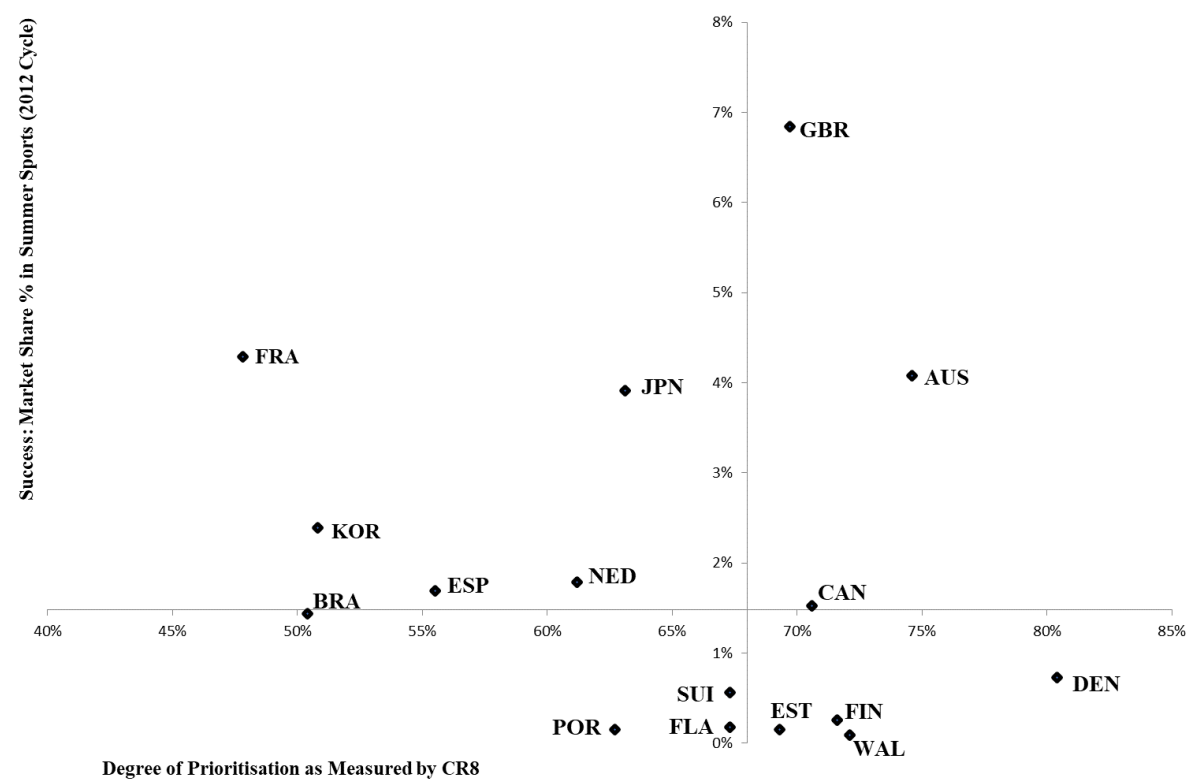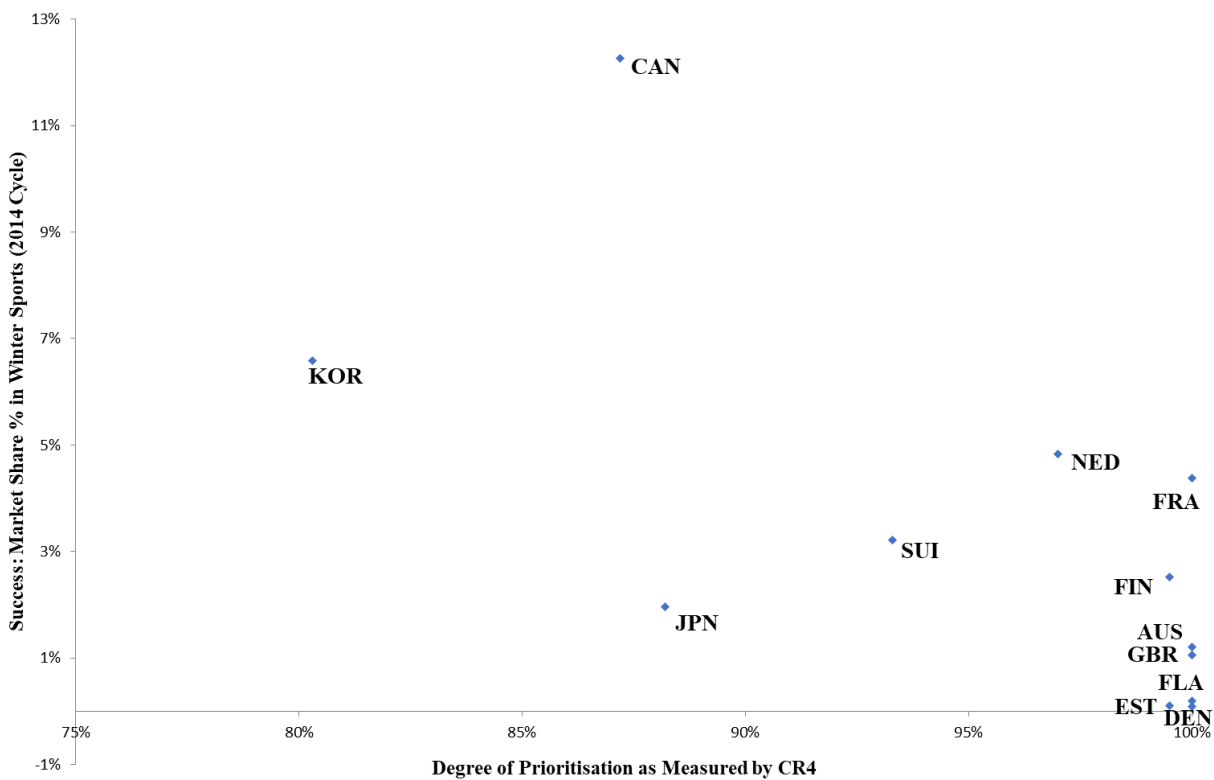
Figure 4B

APPENDIX 1: Herfindahl index, Concentration ratios and number of funded sports in each nation

Country	Herfindahl*10	CR1	CR4	CR8	Number of funded sports (nSport)	Threshold if all sports equally funded (1/nSport)
Denmark	0.733	13.95%	43.70%	71.20%	35	2.86%
Switzerland	0.723	20.80%	40.40%	56.10%	79	1.27%
Flanders	0.710	17.04%	41.10%	64.80%	35	2.86%
Estonia	0.686	15.91%	41.20%	62.10%	31	3.23%
Wallonia	0.645	13.42%	40.70%	64.10%	41	2.44%
Canada	0.641	14.20%	40.40%	58.10%	42	2.38%
Portugal	0.638	14.51%	37.50%	59.80%	27	3.70%
Australia	0.634	14.91%	37.90%	63.50%	48	2.08%
Finland	0.614	16.58%	38.10%	58.10%	76	1.32%
Japan	0.526	12.03%	35.60%	54.80%	65	1.54%
Brazil	0.462	9.05%	28.00%	49.10%	28	3.57%
Great Britain	0.440	14.36%	42.00%	66.30%	30	3.33%
France	0.418	5.96%	21.60%	39.60%	56	1.79%
the Netherlands	0.409	7.88%	29.10%	48.00%	56	1.79%
Spain	0.391	9.26%	28.70%	45.10%	59	1.69%
South Korea	0.302	6.74%	22.50%	36.60%	57	1.75%
MEDIAN	0.624	14.07%	38.00%	58.10%	45	2.23%

APPENDIX 2: Overview of sports that receive the highest share of funding (CR4) in each nation

Sport	AUS	BRA	CAN	DEN	ESP	EST	FIN	FLA	FRA	JPN	KOR	GBR	N-IRL	NED	POR	SUI	WAL	Count
Aquatics	14.9%		14.2%		6.7%				4.8%	7.8%	4.2%	13.7%		7.9%		6.5%		9
Archery																		0
Athletics		9.0%			9.3%	15.9%	9.2%	8.8%	5.9%	5.7%	6.6%	9.0%			14.5%		10.0%	11
Badminton											5.0%				7.2%			2
Basketball					7.7%	8.8%											8.5%	3
Boxing																		0
Canoe					5.0%													1
Cycling	7.8%							17.0%				9.5%		7.7%				4
Equestrian																		0
Fencing																		0
Football	7.6%		10.4%					6.0%	8.1%	10.0%			7.5%					6
Gymnastics		6.6%						7.2%								7.6%		3

PRIORITISATION IN ELITE SPORT

Sport	Values	Count
Handball	13.9%, 4.9%, 7.8%	3
Hockey	8.6%	1
Judo	6.1%, 12.0%, 7.9%	3
Modern Pentathlon		0
Rowing	7.7%, 6.0%, 10.6%, 9.8%	4
Rugby*	7.3%, 8.8%	2
Sailing	6.2%, 8.7%, 5.9%, 6.6%	4
Shooting	6.7%	1
Table Tennis		0
Taekwondo		0
Tennis	13.4%	1
Triathlon		0
Volleyball	7.0%, 7.0%	2
Weightlifting		0

Sport	Values	Count
Wrestling		0
Biathlon		0
Bobsleigh		0
Curling		0
Ice hockey	6.3% 6.0% 5.4%	3
Luge		0
Skating	6.4% 16.6%	2
Skiing	13.8% 9.5% 20.8%	3
Totals	38.0% 27.9% 40.4% 43.6% 28.7% 41.2% 38.1% 41.1% 21.6% 35.5% 22.5% 42.1% 29.3% 29.2% 37.4% 40.3% 40.7%	