Research note

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Participation in the under-18 Euroleague Next Generation Tournament does not predict attaining NBA, Euroleague, or Eurocup

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Humberto M Carvalho[1], Cristiano Z Morais[1], Ahlan B Lima[1], Luciano G Galvão[1], Bernard Grosgeorge[2], and Carlos E Gonçalves[3]

Abstract

We examined whether participation and individual performance in the under-18 Euroleague Next Generation Tournament (NGT) predicted a future contract with an NBA, Euroleague, or Eurocup squad. Data from 1446 players between 2002–2003 and 2011–2012 seasons were considered. We considered information about each player, including country, the number of games played, and performance index rating (PIR). We tracked the players' highest club level attained in their adult careers. We used a multilevel ordinal regression with a cumulative model in a fully Bayesian framework to examine the probability of the players playing in the NGT attaining the NBA, Euroleague, or Eurocup. Furthermore, we explored in the model if PIR in the NGT was a relevant predictor of achieving the highest club level in adult careers. From the total sample, only a very small percentage attain the NBA (20 in 1446, 1.4%), Euroleague (103 in 1446, 7.2%), and Eurocup (60 in 1446, 4.2%). The results highlight that a very small number of players with a very high PIR per game in the NGT had a higher chance to play in the NBA, Euroleague, or Eurocup. The probability of attainment of NBA and Euroleague for the population of highly selected basketball players playing the under-18 NGT in the first 10 years of the NGT was small. Hence, caution is warranted when assuming the effectiveness of current talent development models, even at the late stages of young players' development, often labelled as young elite players.

Keywords

Basketball, talent development, youth sport

Introduction

The path to expertise in sport is often perceived as a process aiming at building and sustaining a professional career in adulthood. Developmental paths to expertise are based on three main pillars: (i) an early engagement in organized training in a specific sport; (ii) a progressive specialization during adolescence and early adulthood, with proper coaching and gradual increase in practice loads and competitions; and (iii) a transition phase to professional life.[1,2]

Although there are remarkable exceptions to the common narrative, sports organizations embrace this career architecture and display effort and resources to make it possible and fruitful. The International Basketball Federation (FIBA) is no exception to this vision. FIBA is the global governing body that supervises basketball worldwide. Its European branch, FIBA Europe, organizes European championships every year for under-16, under-18, and under-20 national squads. In addition, the European youth championships keep competitive action during the summer. Hence, hundreds of young

Reviewer: Tim Swartz (Simon Fraser University, Canada)

[1]Department of Physical Education, School of Sports, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil
[2]Pôle France Basketball Yvan Mainini, French Basketball Federation, Paris, France
[3]Faculty of Sports Science and Physical Education, University of Coimbra, Coimbra, Portugal

Corresponding author:
Humberto M Carvalho, Department of Physical Education, School of Sports, Federal University of Santa Catarina, Campus Reitor João David Ferreira Lima, 88040-900 Florianópolis, Santa Catarina, Brazil.
Email: hmoreiracarvalho@gmail.com

prospects can be observed and evaluated by international coaches, scouts, and agents.

Besides the national teams' championships, European professional competitions are organized by Euroleague Basketball. Also, Euroleague Basketball organizes a tournament with under-18 teams, Next Generation Tournament (NGT). In addition, elite clubs and academies representing more than 10 countries are invited to participate. According to the Euroleague, the NGT is a 'breeding ground for tomorrow's biggest and brightest basketball stars'.[3] It is assumed that the likelihood of becoming top adult athletes increases by improving young athletes' selection, with better training conditions and a higher volume of competition against the best peers.[4]

During 20 seasons, thousands of players aged 18 participated in the tournament. The young players were screened by professional experts, who are charged with deciding if those elite young players are ready to be recruited by the top teams in the world. However, current evidence suggests that high achievers during adolescence may not develop into successful senior professionals, casting doubts about the predictive utility of talent development models.[5] Furthermore, only a very small percentage of identified young talents reach success at the adult level.[1,2,6] Hence, it is reasonable to question whether participation in NGT as a teenager is a predictor of success at a high adult level and whether those players who excelled in the NGT are the stronger candidates to make a career in the super-elite context of professional basketball. Considering previous research,[7,8] we hypothesized that a very low percentage of NGT participants attain the super-elite level regardless of their performance. However, we did not set any quantitative prediction about the percentage of participants in the NGT that achieve the top professional leagues.

Two methodological issues arise from the research question. The first issue is the definition of elite, a recurrent problem in sport sciences literature. To avoid misunderstandings, we set the top-level as participating in the most important and wealthy leagues globally, the National Basketball Association (NBA) and the Euroleague. We also considered the second tier of European Basketball, the Eurocup, as a super-elite context. We set a minimum game participation criteria to establish that the player had relevant participation at NBA, Euroleague, or Eurocup level. The second issue lies in establishing a standard to evaluate and discriminate the players' performances in the NGT. We used the Performance Index Rating (PIR). The indicator is generalized in FIBA and European basketball to assess players' performances at the highest competitive club levels (Euroleague and Eurocup) and in various national domestic and regional leagues.[9] PIR is a composite score derived from basic individual statistics: points, rebounds, assists, steals, blocks and fouls drawn, and subtraction of missed field goals, missed free throws, turnovers, shots rejected and fouls committed. PIR is similar to, but not the same as the NBA's player efficiency rating (EFF),[10] one of the first available and most commonly used statistical indicators for comparing the overall value of players.[11] PIR is sensitiveness to the playing context (e.g. team and opposing team and respective playing systems). Nevertheless, to our best knowledge, no reliable, standardized outcome of body size or physical performance is available to describe the players participating in the NGT. PIR use in applied research is limited and mainly related to descriptions of young basketball players' performance.[12–15] Nevertheless, we consider PIR a valuable and stable instrument for the present study to compare performances across time and competitions.

The invited teams competing in the NGT come from several countries and clubs that vary yearly. Also, there was variation in season format across seasons. Hence, the resulting data structure causes an analytical problem due to the distribution characteristics of the sample and different sources and levels of variation with a cross-classified nesting. However, complex data structures are often the case in applied research in youth sport[16,17] and can be addressed through hierarchical/multilevel modelling in a fully Bayesian framework.[18] In addition, Bayesian methods allow a powerful approach to handling big, structured, and hierarchical data, facilitating parameter estimations and the results' interpretation.[19]

According to this conceptual framework, we examined if performance participation in the NGT predicted a future contract with an NBA, Euroleague, or Eurocup squad. In particular, we examined if PIR scores in the NGT were linked to the probability of becoming a super-elite player.

Methods

Data

We considered data from 1446 players playing in the under-18 Euroleague NGT between 2002–2003 and 2011–2012 seasons. The data were available online and extracted from the Euroleague NGT website (https://www.adidasngt.com/). We retained the following information from each player: country, the number of games played, and Performance Index Rating (PIR).

We tracked the players' highest club level attained in their adult careers by examining the available data at the NBA, Euroleague (https://www.euroleague.net/), and Eurocup (https://www.eurocupbasketball.com/) websites. We only considered the information of players' clubs from European countries. The NBA is the highest club level, and the Euroleague and Eurocup are the first- and second-tier in Europe.

Variables

A summary of the variables in the present is displayed in Table 1.

Table 1. Discrete variables that are used as inputs into our statistical model (players' Performance Index Rating in the under-18 Euroleague Next Generation Tournament was included as a continuous input variable).

Factor	Levels	Number of levels
Season	2002–2003; 2003–2004; 2004–2005; 2005–2006; 2006–2007; 2007–2008; 2008–2009; 2009–2010; 2010–2011; 2011–2012	10
Country	Belgium; Bosnia and Herzegovina; Czech Republic; Croatia; Denmark; England; France; Germany; Greece; Israel; Italy; Latvia; Lithuania; Montenegro; Poland; Russia; Serbia; Slovenia; Spain; Switzerland; Turkey; Ukraine	22
Super-elite level attained at the adult professional level	not attained; Eurocup; Euroleague; NBA	4

Performance Index Rating. The PIR is a composite score describing the player's performance in a game, composed of the sum player's points, rebounds, assists, steals, blocks, and fouls drawn, and subtraction of missed field goals, missed free throws, turnovers, shots rejected, and fouls committed. We adjusted PIR scores by the number of games of each player given different tournament formats between 2002–2003 and 2011–2012. Hence, we considered each player's PIR averaged over games in an NGT. Adjusting the overall tournament PIR by the number of games played provides an interpretable outcome of players' game performance that is commonly reported and interpreted in the applied context of Euroleague (https://www.euroleaguebasketball.net/euroleague/stats/).

Season. We considered each season of the under-18 Euroleague Adidas Next Generation tournament between 2002–2003 and 2011–2012 as a discrete variable with 10 levels. We considered data from the first 10 years of the under-18 Euroleague NGT. 2002–2003 was the first edition of the tournament. By right-censoring our observation in the data in the 2011–2012 season, we assume that players attain the highest club level until about 28 years of age. Hence, we consider a reasonable adult age range to achieve the NBA and Euroleague. For the players that participated in more than one NGT season, we considered the season with the highest adjusted PIR by the number of games played.

Country. We considered the country of the clubs participating in the under-18 Euroleague Adidas Next Generation tournament between 2002–2003 and 2011–2012 as a discrete variable with 22 levels. The countries identified were as follows: Belgium, Bosnia and Herzegovina, Czech Republic, Croatia, Denmark, England, France, Germany, Greece, Israel, Italy, Latvia, Lithuania, Montenegro, Poland, Russia, Serbia, Slovenia, Spain, Switzerland, Turkey, and Ukraine.

Highest adult professional level. The highest adult professional level attained is our target variable. We tracked the players' highest club level attained in their adult careers of those participating in the NGT between 2002–2003 and 2011–2012, until November 2021. Players were classified as not attaining any of the elite club levels when: they were not referenced in any of the data extracted describing all athletes participating in the NBA, Euroleague, or Eurocup; those who were referenced in one season but played less than 12 min per game in the NBA, or less than 10 min per game in the Euroleague or Eurocup. Players were classified as attaining the Eurocup level when they played at least one season with more than 10 min per game. Players were classified as attaining the Euroleague level when they played at least one season with more than 10 min per game. Finally, players were classified as attaining the NBA level when they played at least one complete regular season with more than 12 min per game. Hence, the attainment of a specific highest club level in an adult career was set as an ordinal variable with the following four levels: 1. not attaining any of the elite club levels; 2. attaining the Eurocup level; 3. attaining the Euroleague level; and 4. attaining the NBA level.

Statistical analysis

Statistical software, code repository, and reproducibility. To warrant scientific transparency and reproducibility of our analyses,[20] a repository containing the data and code necessary to recreate the analyses and figures is available at https://osf.io/vs8et/. The Bayesian estimations were run using R statistical language,[21] with the 'brms' package,[22] which uses Stan[23] to compute the posteriors. Visualization of the results was based on the 'ggplot2' package.[24]

Model specification. The probability of the under-18 NGT players between 2002–2003 and 2011–2012 seasons attaining the NBA, Euroleague, or Eurocupwas modelled using multilevel ordinal regression with a cumulative model in a fully Bayesian framework. We adopted ordinal regression to avoid associated errors using metric models on skewed ordinal data.[20] For more details about ordinal models, see Bürkner and Vuorre.[25] Furthermore, multilevel modelling allows us to incorporate the information in the data into our models while adjusting for dependencies between

different levels and sources of variation. The multilevel ordinal model specification can be described as follows:

$$p(y = k|\mu_{ij},\ \tau_k, \tau_{k-1}) = \Phi(\tau_k - \mu_{ij}) - \Phi(\tau_{k-1} - \mu_{ij})$$

$$\mu_{ij} = \beta_1 PIR + u_i + v_j$$

$$\beta_1 \sim Normal(0,\ 2)$$

$$u_i \sim Normal(0, \sigma_i)$$

$$v_j \sim Normal(0, \sigma_j)$$

$$\tau_k \sim student - t(3,\ 0,\ 2.5)$$

$$\sigma_i \sim Exponential(1)$$

$$\sigma_j \sim Exponential(1)$$

In our model, we assume that our outcome of interest y, attaining a specific highest club level in the adult career, is four ordinal categories ($k \in \{1,\ 2,\ 3,\ 4\}$). To model the relative probability of each ordinal category, we stated the relative probabilities of the ordinal categories are conditional on a set of thresholds τ_k ($k \in \{1,\ 2,\ 3\}$). We used a standard cumulative distribution function Φ to allow us to map the cumulative probabilities onto an unbounded parameter space divided up by the thresholds τ_k. The parameters for Φ were fixed with a mean $\mu = 0$ and a standard deviation $\sigma = 1$ for identification.[25] Since our outcome was potentially nested within seasons and countries, we accounted for nesting by considering varying intercepts to the latent mean, which will be μ_{ij} for the i^{th} season and j^{th} country. μ_{ij} was modelled with a β_0 representing the intercept for the latent mean, set to zero for identification purposes, PIR added as a predictor, and group-level parameters u_i (season-level) and v_j (country-level) describe variation on μ_{ij}. The thresholds τ_k were held constant across NGT season i and country j. For convenience, we standardized the adjusted PIR score by subtracting the score by the sample mean and dividing it by the sample standard deviation.

We used weakly informative priors to regularize our estimates. For the priors of the τ_k, we regularized the estimates using a student-t (3, 0, 2.5) prior, the default prior defined in the 'brms' package.[22] In addition, we used a normal (0, 2) prior for the population-level parameter, given parameter space after standardization, and an exponential (1) prior for the group-level parameters.

We run four Markov chains for 2000 iterations with a warm-up length of 250 iterations for each model. The length of the chains and warm-up was sufficient to achieve convergence and obtain a reasonable effective sample size, given the computation time. The models were inspected and validated using posterior predictive checks.[26] We extracted the expected mean of the posterior predictive distribution from the posterior draws to describe the probabilities in our models.

Results

In a Bayesian framework, the assessment of our model quality involves comparing the counts of the different responses (1. not attaining; 2. attaining Eurocup level; 3. attaining Euroleague level; 4. attaining NBA level) in data predicted by the fitted model against the observed data that the models were fitted on. We present the posterior predictive checks as supplementary material. Also, the distribution of cases by adult level achieved is available between 2002–2003 and 2011–2012 (Supplementary Figure 1) and aggregated by country (Supplementary Figure 2) and season (Supplementary Figure 3). Only a very small percentage attain the NBA (20 in 1446, 1.4%), Euroleague (103 in 1446, 7.2%), and Eurocup (60 in 1446, 4.2%).

Probabilities of attaining the highest club level in an adult career for the Euroleague NGT participants between 2002–2003 and 2011–2012 seasons, adjusted by PIR and country, are displayed in Figure 1. There was a substantial variation in the probability of attaining the highest club level in the adult career between 2002–2003 and 2011–2012. In addition, there was a large variation by country in the probability of attaining the super-elite level (Supplementary Figure 4). For example, players of clubs participating in the NGT from France, Russia, or Slovenia had a higher probability of attaining the super-elite level than Greece, Italy, or Spain.

In Figure 2, we display estimated model probabilities of attaining the four levels of competition for given values of the PIR. For every iteration of the Markov chain, parameters β_1, τ_1, τ_2, τ_3, μ, and σ were generated (for all values of i and j). For a given value of PIR, these generated parameter values were substituted into the $p(y = k|\mu_{ij},\ \tau_k, \tau_{k-1})$ formula to obtain a probability. This iteration process is repeated over and over again to obtain estimated probabilities and associated credible intervals. Conditional to our model, players with very high PIR scores in the NGT had a higher likelihood of playing in the NBA and Euroleague. On the other hand, players with a PIR score per game lower than 10 were unlikely to attain the super-elite level. However, the interpretations of our model need to be conservative, as our predictions may be insufficiently sensible at extreme values given the very small data of players achieving the NBA.

We interpreted only countries with players achieving the NBA and clubs in the Euroleague (Supplementary Figure 5). These also represent high-ranked countries in the FIBA rankings. Conditional to our model, it was possible to observe variation between countries in the probability of attaining the super-elite level predicted by the NGT performance index. For example, the PIR per game in the NGT with the highest likelihood for players achieving Euroleague and Eurocup was lower for France club players than Spain club players (Figure 3).

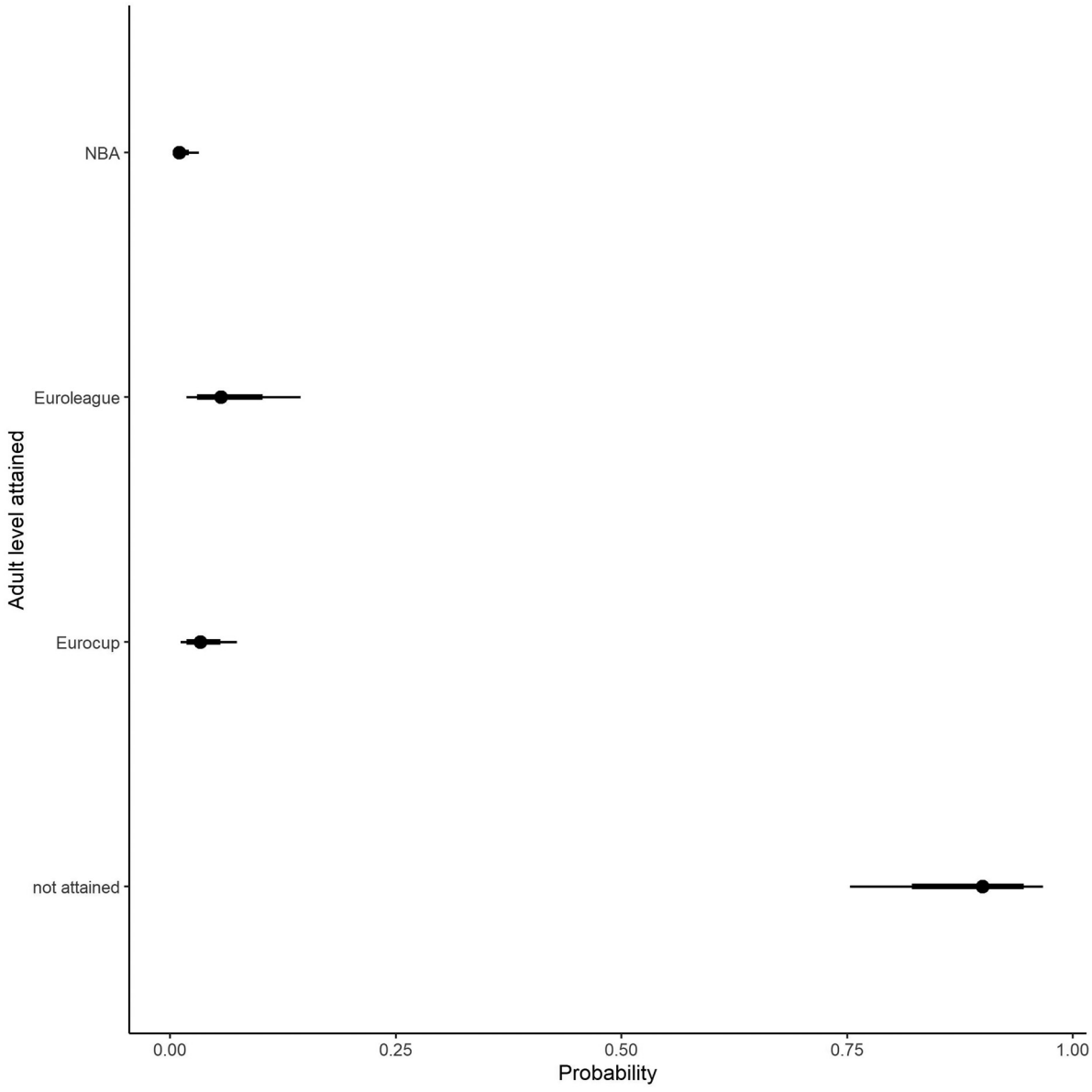

Figure 1. Probability of attaining super-elite professional level for the players participating in the under-18 Euroleague Basketball Next Generation Tournament between 2002–2003 and 2011–2012. Uncertainty estimates are expressed as 68% and 90% credible intervals.

Discussion

We aimed to verify whether participation in Europe's most exclusive tournament at 18 years of age was a predictor of attainment of the super-elite adult level. Furthermore, we examined if excelling at the under-18 NGT was linked to the probability of becoming a super-elite player.

The selection system assumes that at the age of 18 years, the most successful players are already performing at the highest level. However, no evidence supports this assumption, either scientifically or empirically. From an evolutionary point of view, there are diverse profiles and trajectories. Some players make significant progress very quickly from the start of their specialization and then can continue to progress for a long time or not. For others, the improvement is much slower, and they may continue to progress for a long time or not.

The talent development sports systems, including selection and recruitment programs in the largest competition structures, do not assume significant financial risk. Hence, it offers very few 'second chances' to those with later physical, technical, tactical, and behavioural development, often late maturers and/or born near the end of the competitive calendar year. This attitude has generated a vicious cycle that leads, over time, to the loss of potential talent and prevents us from knowing if the very best up-and-coming players (apart from injured players) are present at the NGT tournament.

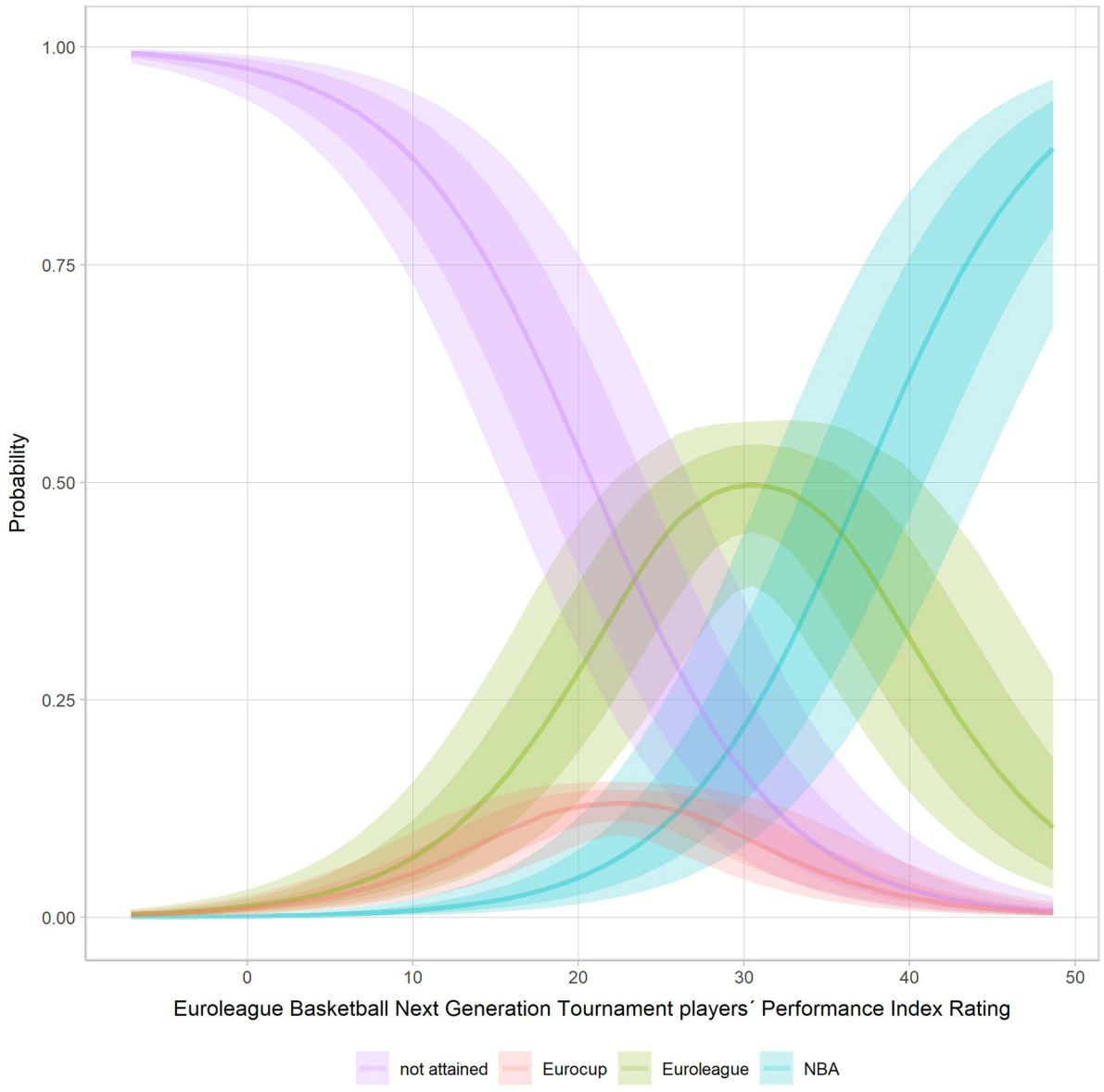

Figure 2. Probability of attaining super-elite professional level given the players' performance level in the under 18 Euroleague Basketball Next Generation Tournament. Uncertainty estimates are expressed as 68% and 90% credible intervals.

We intentionally established a restrictive definition of elite competitions: the NBA and the Euroleague. Furthermore, we considered attaining the highest level based on the criteria that players needed to play at least one quarter per game in a full season. We wanted to avoid the cases of players who had sporadic or tenuous participation in competitions, although under contract with an NBA or Euroleague club. Also, the data in this study represent a highly selected and exclusive group of basketball players aged 18 years.

Players with superior performance in the under-18 NGT, measured by PIR, were more likely to be selected to a major league club or franchise (the case in the NBA). Consequently, players who excelled at 18 years were deemed by recruiters as top prospects for the NBA or Euroleague. Naturally, probabilities of achieving the NBA were near zero for players with PIR per game in the NGT below about 15. Thus, our hypothesis that performance at NGT would not influence the probabilities of being selected was not confirmed. Indeed, to be better than peers at 18 years means that players are perceived as performers approaching the adult level and ready for professional competitions. In Europe, the age group named under-18 is considered the last stage of specialization. Above that age, players compete in adult championships. In the USA, players must be at least 19 years old to be eligible for the NBA draft.

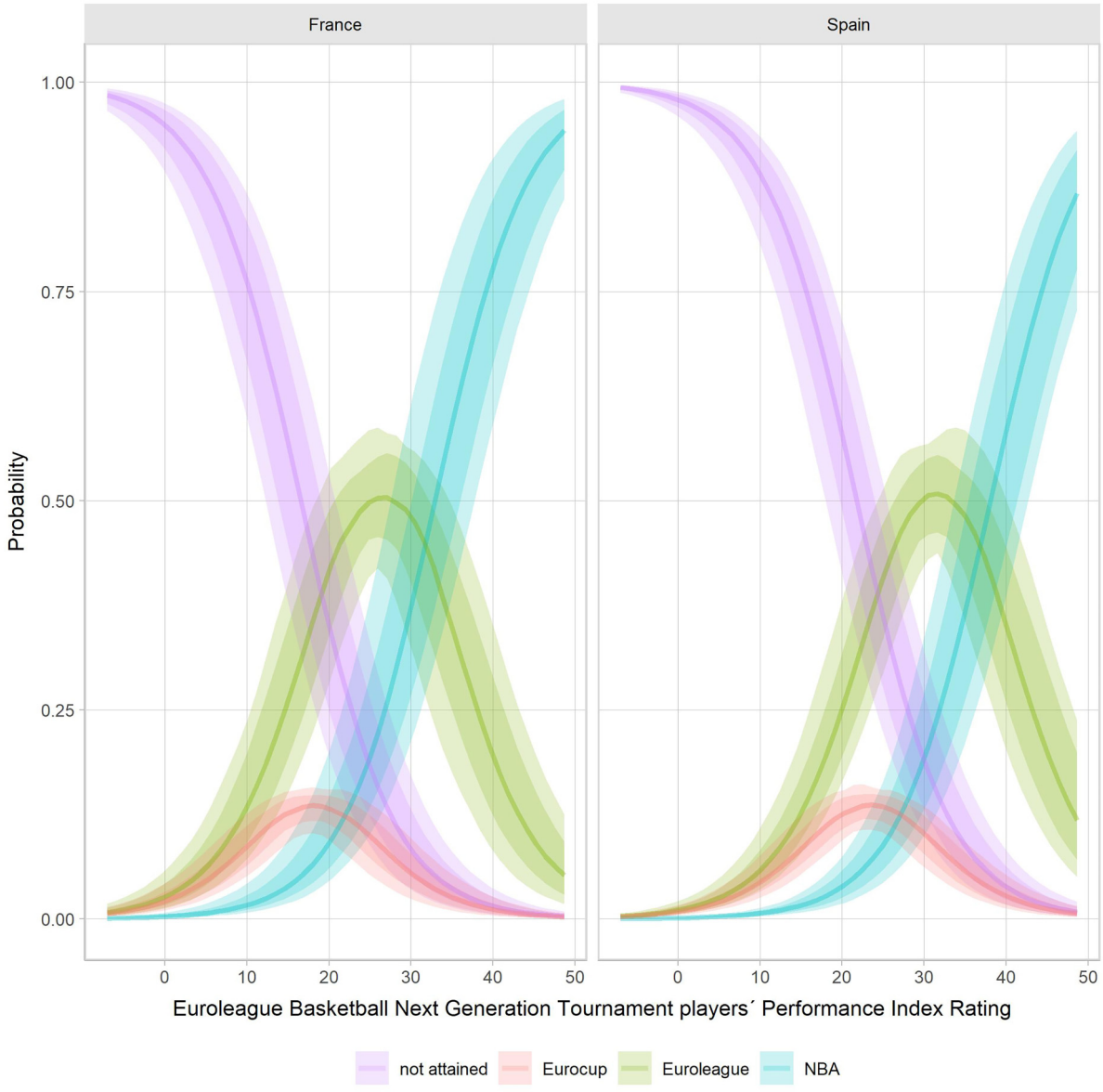

Figure 3. Example of contrasts in the probability of attaining super-elite professional level given the players' performance level in the under 18 Euroleague Basketball Next Generation Tournament by countries, in the case France and Spain. Uncertainty estimates are expressed as 68% and 90% credible intervals.

Surprisingly, the probability of being recruited by a Euroleague club is higher than playing in the second European tier, the Eurocup. However, paradoxically, the Eurocup has more teams than the Euroleague, with more jobs available. Furthermore, this probability pattern is stable across all PIR percentiles. These observations raise questions about the environments of youth talent developmental programs in professional clubs that warrant further inspection. It would also be possible to move the questioning by putting oneself in the position of the very ambitious and motivated player who would apply the saying to him: 'who can do more can do less'.

The probability of top under-18 basketball players being selected for a super-elite league was low, conditional on the data and models. For the NBA, the highest probability was associated with a very good performance in the under-18 NGT, as measured by PIR per game. However, players with the highest PIR per game represent about 3% of the sample. This trend is stable across the NGT 10 years span of observation. Playing in the NBA is a distant perspective for most players with a PIR per game lower than at least 35. Of the top under-18 basketball players with a PIR per game of 25 to 35, 50% were likely to play in the Euroleague.

It would be plausible that countries with greater basketball traditions and hosting Euroleague clubs would produce

more top-level talents regarding the players' nationalities. Furthermore, the popularity and wealth of sport and the incentives to become a recognized professional athlete would enlarge the recruitment base and provide outstanding talent development programs with optimal environments and expert coaches. Additionally, as mentioned above, the countries with Euroleague clubs are also the highest-seeded FIBA ranking, normally resulting in increased public support. However, our estimates do not discriminate the efficiency of particular sports systems in developing super champions, as the results show similar patterns across the 22 analyzed countries. The only exception may be France which demonstrates slightly better efficiency in its development programs. It is possible to speculate that this apparent efficiency is due to the hybrid French system, where a strong, nationwide talent program run by the French Basketball Federation coexists with private programs managed by professional clubs. For instance, Denmark and Serbia present similar results, probably from the hyper-restrictive characteristics of the recruitment process, which selects very few super athletes, regardless of their national origins.

It has been a common idea to assess the value of youth specialization programs by the number of players that receive a professional contract offer. We contend that being a professional athlete in a minor league does not mean that the top elite level was reached or that those with professional contracts could build a sustainable career and life. There is anecdotal evidence that suggests that it does not always happen that way. The lack of strong evidence about the long-term effects on the sports trajectories of those labelled as elite players at 18 years of age still represents a reality in the field. Nevertheless, the PIR validity to describe players' performance accurately remains to be established through comprehensive empirical research, and caution is warranted in the interpretations.

A final note about the analytical choices. We used a Bayesian approach resulting from two theoretical and empirical considerations: the stochastic nature of the human development and selection process and the sample's non-normal distribution. Furthermore, we did have a priori and posterior predictions result from the joint probability of the information a priori before seeing the data, i.e., the researcher's reasoning about the phenomenon and the likelihood of the data we assume about the information in the sample. Our model is implemented through a succession of estimates of the distribution of probabilities about the predicted variable. In this sense, we do not define what is true or false and assign a probability value to every possible outcome.

In summary, the probability of attainment of NBA and Euroleague for the population of highly selected basketball players playing the under-18 NGT in the first decade of the tournament was very small. In particular, the players who performed better at the under-18 NGT had a higher probability of playing in the NBA or Euroleague.

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ORCID iD

Humberto M Carvalho https://orcid.org/0000-0002-2855-0296

Supplemental material

Supplemental material for this article is available online.

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