

Faculty Excellence Award Application Form



Name: Dr. Brent A. Evans

Rank: Assistant Professor

Department: Economics & Finance

Award applying for:

(Check one)

	Excellence in Teaching Award*
	Excellence in Online Teaching Award*
x	Excellence in Scholarship & Creative Endeavors Award*
	Excellence in University Service*
	Excellence in Scholarship of Teaching & Learning Award*
	Department/Program Excellence Award^
	Irene Rose Community Service Award^
	Laurie Hendrickson McMillian Faculty Award^

*college selection required before being forwarded to university

^university awards

College nominations are due by November 17, 2017 to the college Dean.

College selectees notified by the college by December 3, 2017.

College nominees' final applications received by Center for Teaching and Learning (ctl@gcsu.edu) by March 2, 2018.

Please insert the required documentation in the pages below for the award category you have noted above. Detailed information associated with each award is available online at the Academic Affairs Intranet Forms Page >Forms>Faculty Awards Criteria and Documentation.

<https://intranet.gcsu.edu/system/files/users/matthew.buchanan%40gcsu.edu/FacultyAwardsCriteriaandDocFINAL201718.docx>

Awards Committee

February 23, 2018

Letter of Nomination for Dr. Brent Evans

I am writing to nominate Dr. Brent Evans for the Award for Excellence in Scholarship & Creative Endeavors. Over the last two years Brent has had eight research articles published or accepted for publication. These articles have appeared in peer reviewed economics journals that are well-respected in the discipline. Brent is contributing to the frontier of knowledge in a rapidly growing new field in economics: sports economics. He also incorporates students into his research endeavors, which is a core tenant of our liberal arts mission.

Sports economics is an increasingly important area of economics. It is an area in which economic concepts are constantly applied and evident, but it has not received much attention in the profession. Moreover, it has not always been recognized as a major field in economics. Therefore, publishing in sports economics requires courage and skill. Brent has shown his research maturity by publishing four sports economics articles, not only in top sports field journals, but also in widely distributed general interest economics journals. For example, his examination of the role of conference externalities in college football was published in *Applied Economics*. *Applied Economics* is an "A" journal in economics in nearly all ranking systems due to its strong reputation and distribution among economists. In my opinion this is the most impressive publication by any economics faculty member at Georgia College in the last 5 years. He recently received another acceptance from *Applied Economics* for a paper examining the importance of cognitive ability tests administered to quarterbacks.

The other four sports economics articles Brent has published or forthcoming are also in highly respected economics journals. His work examining college basketball recruiting outcomes will be published in *Applied Economics Letters*, his study of cross-sport recruiting effects will be published in *Journal of Sports Economics*, and his work examining the NBA draft and player value will also be published in *Applied Economics*

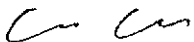
Letters. These are considered "B" level journals that are well read and respected in the profession. The *Journal of Sports Economics* is widely considered the leading publication in the field.

His education work focuses on learning outcomes in economics courses and has been published in two internationally ranked journals, *Journal of Business Education & Scholarship of Teaching* and *Perspectives on Economic Education Research*. He also examined the impact of economic literacy on our country's economic policy during the financial crisis. This work appeared in *The American Economist*, another internationally ranked academic journal.

Brent has begun to work with students on serious academic research, which highlights his dedication to our liberal arts mission. Recognizing that high-level students also enjoy the challenge of expanding the boundaries of knowledge, Brent is now co-authoring a sports economics paper on Daily Fantasy Sports strategies with a recent graduate. Knowing the value of working hands-on with a project, Brent has willingly turned over several major parts of the paper to the student so that they may learn the process of research and publication. Brent is rapidly building a reputation on campus as an excellent researcher whom students can consult for research and other scholarly advice.

Brent is on track to be an excellent economist with an impressive publication history. The articles he has published since arriving here have served to raise the national awareness of Georgia College. Through co-authorships with students, Brent is also helping build the technical skillsets of our students who seek jobs in academia or research. Faculty like Brent will help us become a nationally preeminent public liberal arts university.

Sincerely,



Christopher Clark, Professor
Department of Economics and Finance

February 26, 2018

To Whom It May Concern:

This letter is written in support of the nomination of Dr. Brent Evans for the Georgia College *Excellence in Scholarship & Creative Endeavors Award*. In my opinion Dr. Evans is a very worthy candidate for this award based on his research productivity (ten articles during his brief academic career which includes five articles published during the last two years as a member of the GC faculty) and the impact his research has on student learning.

Dr. Evans is a GC undergraduate alumnus, graduating with a major in economics in 2008. He attended Mississippi State University to pursue his PhD which he completed in 2013. While there he started research on economic education related topics, as well as, merging his passion for economics with his love for sports where he has recently published articles on economic forces at work in NCAA Division I football and basketball recruiting and factors that determine the success of an NBA player.

During the past three years, he has published eight peer reviewed articles on a variety of topics in well-respected international and national economics journals. Using a widely accepted journal ranking resource, "The Australian Business Deans Council Master Journal List," that ranks journals in order of quality from A*, A, B, to C, Dr. Evans published two A level journal articles (in *Applied Economics*), three B level journal articles (one in the *Journal of Sports Economics* and two in *Applied Economics Letters*), and three C level journal articles (in *The American Economist*, in *Perspectives on Economic Education Research*, and in the *e-journal of Business Education & Scholarship of Teaching*). Several of these journals have significant H-indexes, which measure the average number of highly impactful papers published, ranging from 22 to 62.

As I mentioned earlier, a couple of his recently published articles relate to the recruiting of DI football and basketball student athletes and the success of NBA players. While this research is insightful and provides significant new knowledge in the field, he also uses these studies to



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motivate student learning in his classes, as well as, to provide assistance to other econ majors who are working on similar sports related topics for their senior capstone research projects. He has also published several pedagogical articles during his brief career that add to the economics literature related to factors that significantly impact success in economics courses and research that explores the impact of economic literacy on national macroeconomic policy during financial crises.

Dr. Evans is off to a great start in his academic career with the ten articles he's published to date along with several papers currently under review with other well respected economic journal outlets. He has the research skills and the motivation to continue these efforts and I believe he will make significant contributions to the GC community for many years to come.

Respectfully Submitted,

W. Ken Farr

W. Ken Farr, Chair
Department of Economics and Finance

Letter of Support – Dr. Brent Evans

Awards Committee

March 2, 2018

It is my genuine pleasure to enthusiastically recommend Brent Evans for the Excellence in Scholarship and Creative Endeavors Award. Since 2015, he has published eight peer-reviewed articles including two articles in *Applied Economics* which is a highly selective, top tier journal in economics. Based on Brent's published research, working papers and works in progress, it is obvious that Brent is a productive and creative researcher. What may not be obvious is how this productivity is the natural result of his talents, interests and character. Brent is a true scholar who is gifted with a lot of intellectual curiosity. His passion for formulating and investigating interesting questions combined with his empirical research skills inevitably lead to relevant and quality scholarship. His past research productivity is not a fluke but indicative of future potential. He currently has three articles under review and two new working papers.

Because his interests are varied, Brent has published on a variety of topics including the fields of sports economics, the economics of gambling and economic education. This makes his output more impressive since there are often large fixed costs to starting a new research agenda in a different field. For example, it often take considerable time to become familiar with the previous literature in a new area of research. Brent should also be commended for aiming high in targeting some more selective outlets for his research. He has recently published in *Applied Economics*, the *Journal of Sports Economics*, and *Applied Economics Letters*, all of which are first or second-tier journals. He is active presenting his research both on campus and at professional conferences such as the annual meetings of the Southern Economic Association and the Academy of Economics & Finance.

I have worked at Georgia College for over 18 years and have witnessed many new

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*Georgia College and State University, established in 1889, is Georgia's Public Liberal Arts University,
University System of Georgia*

additions to the department. I believe Brent's marginal impact on research productivity for the department is the largest I have seen in any new hire. This is due not only to his own research productivity but also due to his positive effect on the productivity of others. The department has reached a "tipping point" in terms of greater collaboration and overall research activity since his arrival. He has a new research idea every few weeks, and has already begun working with a number of colleagues on a variety of research projects. He is also co-authoring a paper with one of our senior economics majors.

Brent's recent and ongoing success in publishing is worthy of recognition, and I am confident it is a sign of things to come. It is entirely appropriate for Georgia College to reward and encourage such accomplishments, particularly for a newer faculty member.

Sincerely,



J. J. Arias

Professor of Economics

Dear Awards Committee,

This letter is written in support of Dr. Brent Evans for the Excellence in Scholarship and Creative Endeavors Award. Brent's research record boasts work that is original, important, and high quality in the fields of education economics, sports economics, and gambling economics. Importantly, he has built greatly upon his past research resume in just his short time at Georgia College. His current research efforts suggest a promising future of both individual scholarly accomplishments as well as collaborative achievements.

Brent's publications in Sports Economics are symbolic of originality and a desire to push the frontier of a new discipline. Sports Economics is a relatively new and unchartered field that is gaining respect among academic economists. The fact that Brent has published two peer-reviewed sports articles in *general interest* journals shows his research maturity; even non-sports economists value his sports-influenced research findings. For example, his recent co-authored paper entitled "The role of conference externalities and other factors in determining the annual recruiting rankings of football bowl subdivision (FBS) teams" is published in *Applied Economics*, an A rated economics journal with 5.3 citations per paper on average (Research Papers in Economics (RePEc), 2012). This is a good impact factor in economics.

It is important for a teacher-scholar to use their research talents to improve the learning of their students. To that end, Brent contributes research to the impact of teaching practices on the learning outcomes of economics students. His work has been published in the leading pedagogical journal in the economics profession: *The Journal of Economic Education (JEE)*. JEE is well respected, holding an acceptance rate of only 20% (Cabell's, 2016). Additionally, Brent conducts collaborative research with his students, furthering the impact of his scholarly pursuits. He is currently coauthoring a Sports Gambling paper with a junior economics major, Tyler Hooks.

Brent is now also publishing at the intersection of gambling and sports economics. For example, he has a coauthored paper under review at the *Journal of Gambling Studies* (an A ranked journal) with results that greatly inform the conversation over the legality of Daily Fantasy Sports (an online game that draws criticism for its similarity to betting on sports teams). This continues the theme of Brent's research being high quality *and* important to society. To inform the community of his important research, Brent presented this research in a GCSU Times Talk this semester.

I highly recommend Dr. Brent Evans for the award of Excellence in Scholarship and Creative Endeavors.

Sincerely,



Justin R. Roush, PhD.
Assistant Professor of Economics
Georgia College

List of Scholarly Work from ONLY the last five years; all that were published during my time at GCSU are included in my packet. Research under review and other documents are available upon request.

Peer-Reviewed Publications

“From college to the NBA: What determines a player’s success and what characteristics are NBA franchises overlooking?” 2018. *Applied Economics Letters*.

- *Applied Economics Letters* is a double-blind peer reviewed journal rated as a “B” journal by the Australian Business Dean’s List. It has a 24% acceptance rate.

“Evidence on the importance of cognitive ability tests for NFL quarterbacks: What is the relationship between Wonderlic Test scores, draft position, and NFL productivity?” (with Josh Pitts). 2017. *Applied Economics*.

- *Applied Economics* is a double-blind peer reviewed journal rated as a “A” journal by the Australian Business Dean’s List. It has a 25% acceptance rate.

“Cross-sport recruiting effects in NCAA Division I football and basketball.” (with Josh Pitts). *Journal of Sports Economics*. 2017.

- The *Journal of Sports Economics* is a double-blind peer reviewed journal rated as a “B” journal by the Australian Business Dean’s List. It has a 26-27% acceptance rate.

“The determinants of NCAA basketball recruiting outcomes.” (with Josh Pitts). 2017. *Applied Economics Letters* 24: 351-354.

- *Applied Economics Letters* is a double-blind peer reviewed journal rated as a “B” journal by the Australian Business Dean’s List. It has a 24% acceptance rate.

“The role of conference externalities and other factors in determining the annual recruiting rankings of football bowl subdivision (FBS) teams.” (with Josh Pitts) 2016. *Applied Economics* 49, no.1.

- *Applied Economics* is a double-blind peer reviewed journal rated as a “A” journal by the Australian Business Dean’s List. It has a 25% acceptance rate.

“Did economic literacy influence macroeconomic policy preferences of the general public during the financial crisis?” 2015. *The American Economist* 60, no. 2: 132-141.

- *The American Economist* is a double-blind peer reviewed journal rated as a “C” journal by the Australian Business Dean’s List. It has an 11-20% acceptance rate.

"The effects of algebra and geometry skills on performance in high school economics."
(with John R. Swinton and M. Kathleen Thomas) 2015. *Perspectives on Economic Education Research* 9, no. 2.

- *Perspectives on Economic Education Research* is a double-blind peer reviewed journal that is not rated by the Australian Business Dean's List. It is currently not indexed by Cabell's but it had a 20% acceptance rate at the time of submission.

"Online quiz time limits and learning outcomes in economics." (with Robert Culp)
2015. *e-Journal of Business Education & Scholarship of Teaching* 9, no. 1.

- The *e-Journal of Business Education & Scholarship of Teaching* is a double-blind peer reviewed journal rated as a "C" journal by the Australian Business Dean's List. Acceptance rate is 65%.

"What led eminent economists to become economists?" (with William E. Becker and Paul W. Grimes) 2012. *Journal of Economic Education* 43, no. 1: 72-82.

- The *Journal of Economic Education* is a double-blind peer reviewed journal rated as a "B" journal by the Australian Business Dean's List. Acceptance rate is 20%.

Reflective Statement

Dr. Brent Evans

As an economist, my initial interest in conducting research was generally self-indulgent. I had an urge to answer the questions that I found interesting, I wanted to progress towards tenure, and I liked the idea of building a CV that others might consider impressive. However, in recent years and especially since joining Georgia College, my motivation has been greatly enhanced by the realization that good research directly improves my teaching abilities, even if my work isn't always aligned with class content. Recent research, highlighted below, has enhanced my mathematical skills and sparked interest among students. I continue to develop a strong pipeline of research that not only enhances my scholastic record, but also informs lesson plans and strengthens my class content. I think my research has, ultimately, benefitted my students more than it has shaped my career trajectory, and that is now what I value most about the process of conducting research.

Since 2015, I have published eight peer-reviewed articles in well-known economics journals. For two of the articles, the connection between research and teaching is clear. For example, my paper "Online quiz time limits and learning outcomes in economics," was motivated by a lack of pedagogical research on the subject. As a teacher that has used online quizzes, I was surprised to find that time limits was not a subject area that economists had examined. I wanted to address this question simply because I wanted to improve student learning and any desire to publish this research was secondary. In this study, we learned that time limits for online quizzes did appear to influence student learning in some cases, but the effect was small and inconsistent. As a result, I simply stopped implementing time limits on online quizzes for my students. Likewise, "The effects of algebra and geometry skills on performance in high school economics" is an education-based study, in which we aimed to determine what skills are most useful for students taking economics. We found that students with strong skills in Geometry and Algebra were more likely to succeed in economics, but Geometry was a much better predictor. Based on these results, I feel I am better able to anticipate which students should consider a major in Economics and recommend courses or other resources to students struggling with the subject.

Both of these papers were published in 2015, in addition to the article, "Did economic literacy influence macroeconomic policy preferences of the general public during the financial crisis," which is included in my application packet. In this publication, I find that members of the general public were more likely to favor a smaller federal government response to the recent financial crisis and recession if these individuals had received training in economics. For example, those with economics training were less likely to support the statement, "The government should put a limit on CEO salaries," than other members of society. In virtually every economics class I teach, I delve into a discussion on the "Great Recession" and coinciding financial crisis of 2007-2010; thus, my research on the topic helps develop better lesson plans and informs my decisions on the types of content that are included in my lectures. In addition

to these very recent publications, I also have a publication in the *Journal of Economic Education*—the top journal in this field. This 2012 article, “What led eminent economists to become economists?” should help researchers better understand the motivating factors for future economists.

More recently, I have delved into sports economics, an important and growing field in economics. My greatest research accomplishments arose from my work in this field. Since joining GCSU in fall 2016, I have published five sports economics articles. Four of these articles landed in top-tier general interest journals: two in *Applied Economics* (A-level) and an additional two in *Applied Economics Letters* (B). The fifth publication, was published by the *Journal of Sports Economics* (B), which is the top field journal for sports economics research.

Because so many students are intrinsically interested in sports, this research has a significant impact on my teaching and interactions with students. Most notably, I am currently working on a project with a former student at Dalton State College, in which we analyze the Daily Fantasy Sports market (e.g. Draftkings.com and Fanduel.com). This research will soon be presented at the Southern Economics Association and Annual Conference and GCSU’s College of Business Research Assembly (COBRA). Because I am teaching a class focusing on the gambling of economics, research in Daily Fantasy Sports can directly transition into classroom lessons. Currently, I am collaborating with Georgia College economics major, Tyler Hooks, on an additional sports gambling paper in which we use gambling markets to quantify the uncertainty of NFL games. This project is in the early stages, and hopefully, will be the first of many cases in which I get to work with a GCSU student on a project that leads to a publication (which can be very valuable for future grad student!). Because so many students are intrinsically interested in sports, the economics department has many students that are choosing to conduct research in the field for their senior capstone project. I have had several students ask for my advice and guidance and I feel that my knowledge in the field will improve the quality of their projects. For example, a student is currently writing a paper on the effects of hand size on quarterback performance in the NFL. While sports research can sometimes be viewed as trivial (and in some cases this is a fair criticism), in the classroom it has proven to be a tremendous tool for improving student interest and learning. The student will learn how to apply econometric concepts and code using statistical software as he completes his project; the skills he learns are valuable on the job market and in other classes even if the research isn’t groundbreaking.

In addition, my constant research efforts keep me current in the field, allowing me to stay abreast of economics news and advancements in the methodology of economics research. I currently have three papers under review in top journals (one of which is the *Journal of Gambling Studies*, which would be my highest ranking publication thus far) and one more paper that is nearing completion. While I understand and appreciate that these articles are not a factor in determining the award winner, I hope that these articles demonstrate my continued efforts to engage in high-impact research.



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March 1, 2018

Letter of Nomination
Georgia College Faculty Excellence Awards

As Dean I endorse Dr. Brent Evans for the university's *Excellence in Scholarship and Creative Endeavors Award*. He has produced a significant level of research with five peer reviewed journal articles during his two years at Georgia College and eight articles in the past three plus years. His most recent research focus is the economic issues of professional and college sports.

Two papers - "Evidence on the importance of cognitive ability tests for NFL quarterbacks: What is the relationship between Wonderlic Test scores, draft position, and NFL productivity?" 2017, *Applied Economics* and "The role of conference externalities and other factors in determining the annual recruiting rankings of football bowl subdivision (FBS) teams." 2016, *Applied Economics* 49, no.1, both appear in *Applied Economics*, an A-level journal using the internationally-accepted Australian Business Dean's Council journal quality list (<http://www.abdc.edu.au/pages/abdc-journal-quality-list-2013.html>).

Dr. Evans co-authors with other faculty and students, is a regular presenter at academic conferences, and an active reviewer for a number of academic journals. He and another Economics faculty member, Brooke Conaway, recently took a group of eight Georgia College students to the Academy of Economics and Finance (AEF) Conference in Houston, Texas (<https://frontpage.gcsu.edu/announcement/economics-student-takes-home-national-research-award>). Senior economics major Hannah Pasko won the Outstanding Undergraduate Student Paper Competition in Economics.

Dr. Evans models a teacher-scholar through his engagement within the Economics discipline, his active and productive scholarship, and his involvement with Georgia College students. As an assistant professor, his stream of publications and presentations, manuscripts under review, and works in progress suggest an extremely productive research stream for years to come. I endorse without reservation Dr. Brent Evans for the university's *Excellence in Scholarship and Creative Endeavors Award*.

Sincerely,

Dale Young, Ph.D.
Dean, J. Whitney Bunting College of Business



Cross-Sport Recruiting Effects in NCAA DI Football and Basketball

Journal of Sports Economics

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Brent A. Evans¹ and Joshua D. Pitts²

Abstract

Using an extensive data set, we conduct an academic study of the determinants of recruiting success in Division I basketball and football. Among many findings, we show that football recruiting is correlated with on-court basketball success, although the relationship is not always positive. However, we do not find any evidence supporting the oft-held claim that on-field football success aids in basketball recruiting. Additionally, our models indicate that recruiting effects differ between “power” and “mid-major” conferences. These findings, among others provided herein, should enhance the literature on recruiting in college sports and could encourage administrators and coaches to reconsider recruiting tactics.

Keywords

recruiting, externalities, NCAA, college football, college basketball

Unlike many private markets, prices or wages cannot determine all outcomes in college sports, as despite the recent implementation of cost of attendance adjustments to athletic scholarships at some universities, there remains wage ceilings in place for college athletes. Thus, a highly valued recruit’s college choice is determined by other factors. Prior research has shown that top recruits choose colleges for

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many reasons, such as recent on-the-field success, academic reputation, and relationships with coaches (Dumond, Lynch, & Platania, 2008; Klenosky, Templin, & Troutman, 2001; among others). In this article, we posit another possible recruiting effect. We test to see if success for a college's football team will lead to enhanced recruiting in basketball and vice versa.

On average, Division I (D1) college football and college basketball are the only profitable athletic programs at each university (Kahn, 2007). Furthermore, unlike many other athletes, elite professional football and basketball players have generally spent at least 1 year in the collegiate ranks. Thus, it seems fitting that these two sports would be subject to an analysis of recruiting effects since these sports garner the most attention and generate the greatest revenues. The importance of recruiting can be shown in the resources allocated toward recruiting. Between the 2008-2009 and 2012-2013 academic years, 19 DI colleges spent over US\$1 million in recruiting expenses for basketball alone ("Database," 2014).¹ Spending was even greater for football—64 teams exceeded US\$1 million for the period. Additionally, teams have trended toward more spending. Among the teams detailed in the report, 72% increased basketball recruiting spending between the 2009 and 2012 years, despite the poor economic conditions of this time span. During the same period, 78% of colleges increased recruiting spending in football.

Media have long considered the possibility that there are spillover effects between football and basketball teams in regard to recruiting. For example, an article on Sports Blog Nation (O'Donnell, 2015, para. 13) ponders if a boost in basketball recruiting is a result of college football success: "FSU can point (basketball recruits) to a football program as visible as any in the country—one that helped 18 players get drafted over the last two season—and tell them they can start a new tradition in basketball." Football coaches at top "basketball schools" have taken advantage of this potential spillover benefit. University of North Carolina's football head coach Larry Fedora states that the basketball team has "made it easier for us because they've paved the way" (Shanker, 2015, para. 6). At the University of Kentucky, one of the nation's top basketball programs, football coaches "usher recruits over to the basketball complex when they first arrive, where Wildcats basketball coach John Calipari often waits to meet them" (Shanker, 2015, para. 14). Likewise, former University of Florida basketball head coach Billy Donovan organized a meeting between elite basketball recruit Mike Miller and legendary football coach Steve Spurrier prior to a pivotal gridiron matchup versus the University of Tennessee (Thamel, 2002). Mike Miller, a South Dakota resident, would eventually sign with the University of Florida and lead the team to the Final Four in 2000, sparking a program turnaround that may not have been possible without the success of Florida's football program.

While head football coaches schmoozing with basketball recruits may be atypical, football recruits are often invited to attend basketball games, and vice versa, to get a taste of the athletic atmosphere (Austin, 2015; Griffith, 2015; and Hunt, 2015). Presumably, the quality of the team fielded and the voracity of the fan base could

influence recruits' perception of the academic program, fan base, or the college as a whole. One might expect that football recruits would feel more favorable about attending a college when its basketball team puts on a good show and draws a large following. At Kansas University, football success still plays a role in basketball recruiting, even if basketball is the main draw. "Sometimes (basketball recruits) visit places and get emotional and commit right there just because the football team won that night or they stormed the field," stated head basketball coach Bill Self (Tait, 2011, para. 10). According to Self, having a full football stadium is just as important for basketball recruiting as it is for football recruiting. If this belief is any reflection of reality, then certainly football success could be positively correlated with basketball recruiting and vice versa.

However, recruiting spillover effects between basketball and football could also be negative. Top recruits in football, for example, may avoid colleges with a history of basketball success. Or, as Rival.com National Recruiting Director Mike Farrell puts it, "Football players prefer to go to football schools." According to University of Kentucky football recruiting coordinator Vince Marrow, rival football programs often "use Kentucky's 'basketball school' label against the football program" in an effort to steer recruits (Shanker, 2015, para. 6). Thus, the relationship between on-field and recruiting success in basketball and football is more complicated than one might initially imagine. Since there are feasible explanations for positive or negative spillover effects between the sports in regard to recruiting, we have no a priori expectation on the direction of any cross-sport recruiting effects.

Literature Review

Recruiting outcomes are nearly universally shown to enhance on-the-field success. For example, Bergman and Logan (2014) find that attaining a five-star recruit increases the odds of a college football team appearing in a Bowl Championship Series (BCS) bowl game by about 4% when including school fixed effects in the econometric modeling. Langelett (2003) finds similar evidence that recruiting rankings are correlated with on-the-field success. Additionally, he finds that success leads to better recruits. Thus, recruiting rankings could have long-term effects on college football success as improved recruiting leads to better seasons, which leads to better recruits, and so on.

Not surprisingly, luring a top recruit, which leads to better on-field performance, can also lead to higher revenues. Brown (2011) reports that a premium college football player is worth more than US\$1 million to his college. Similarly, Lane, Nagel, and Netz (2014) estimate that the marginal revenue product of a college basketball player drafted into the National Basketball Association (NBA) also exceeds US\$1 million at high-revenue-generating programs. Alternatively, at relatively low-revenue-generating basketball programs, the expected marginal revenue product of a player drafted into the NBA ranges from US\$150,000 to US\$275,000. In another study examining the marginal revenue products of college basketball

players, Borghesi (2015) estimates player values using revenue sharing methods that are similar to the NBA and National Football League, in which players earn 50% of a team's revenues. He finds that a five-star basketball recruit in his freshmen year is worth about US\$613,000, while lower rates recruits are worth the following amounts: US\$166,000 (four star), US\$91,000 (three star), and US\$50,000 (one and two stars).

Benefits extend beyond increased revenues. Achieving success on the field in both football and basketball has shown to increase the quantity and quality of the general applicants a college receives (Grimes & Chressanthi, 1994; Pope & Pope, 2009; and others). In basketball, simply reaching the "Sweet 16" of the National Collegiate Athletic Association (NCAA) tournament is associated with a 3.2% increase in applications for the following scholastic year, while winning the NCAA championship leads to 7.4% increase (Pope & Pope, 2009). Not surprisingly, tuition rates tend to increase for schools with recent football and basketball success (Alexander & Kern, 2009). Since recruiting is such a major part of building a winning team, and building a winning team can lead to profitable programs that improve a school's bottom line, attaining high-profile recruits is economically important for colleges, head coaches, and administrators alike.

Prior research on the determinants of recruiting success is largely focused on NCAA DI college football. Dumond, Lynch, and Platania (2008) find that on-the-field success, the quality of football facilities, inclusion in a "BCS Conference," scholarship restrictions, and the college's academic reputation all impact recruits' college choice.

Coaching experience is also shown to correlate with on-the-field success. For example, Adler, Berry, and Doherty (2012) show that middle-of-the-road teams experience a decline in success following a new coaching hire. However, a coaching change does not seem to have a short-run effect on success for college football teams that were already struggling. Regardless, coaching experience could certainly affect a recruit's choice of college. Indeed, a means-end investigation by Klenosky, Templin, and Troutman (2001) found that among the 27 D1 football players interviewed, 25 stated that a coach or a coaching staff was an attribute who influenced their decision to attend a given college. Other researchers have shown that a head coach's experience level might impact recruits' college choice; in particular, highly ranked recruits seem to avoid attending colleges with first-year coaches (Dumond et al., 2008; Pitts & Evans, 2016). Additionally, anecdotal evidence shows that players may choose to reopen their recruitment after a coach leaves a school (Bean, 2015).

In addition to on-the-field success and coaching experience, a school's academic prowess may influence a recruit's college choice. Generally, academic and recruiting outcomes are shown to be positively correlated. Dumond et al. (2008) show that colleges with a better academic reputation are able to lure more highly ranked recruits. Likewise, Huffman and Cooper (2012) find that the value of a school's degree and the nonfootball career opportunities afforded by attending the college were among the most important factors cited by recruits. Finally, Pitts and

Evans (2016) show that a school's acceptance rate is inversely correlated with recruiting outcomes.

There may also be differences in recruiting based simply upon a school's conference. For example, recruits may feel that there is more exposure to be gained by playing in BCS conferences, such as the SEC or BIG 10, even if the college is, otherwise, similar to colleges in non-BCS conferences. Schools in BCS conferences tend to attain more lucrative television deals and, unlike teams from other conferences, are guaranteed entry into a BCS bowl upon winning their conference. Thus, recruits may feel that BCS conferences offer greater opportunities than non-BCS conferences. Indeed, Treadway et al. (2014) find that membership in a BCS conference is a major determinant of a recruit's collegiate choice. There may also be differences among the BCS conferences as well—in terms of recruiting and the effects of recruiting. For example, Caro (2012) shows that recruiting success can be used to accurately predict on-the-field success in all BCS conferences except the Big East, Atlantic Coast Conference (ACC), and Pac-12. Pitts and Evans (2016) show that there are both positive and negative externalities associated with team success; for example, a BCS bowl win by one team is correlated with improve recruiting outcomes for other teams in the same conference, while a Heisman trophy for a given team is correlated with worsened recruiting among conference member schools.

Data

We construct models predicting recruiting success in both basketball and football. In an effort to create models with similar approaches and data, we use recruiting rankings from Rivals.com, one of the most prominent resources for recruiting information. We use data from 112 football and basketball programs that have competed in the Football Bowl Subdivision (FBS) college football subdivision since the 2002-2003 season, the first season of published recruiting data.² While we would prefer to provide virtually identical dependent variables as proxies for recruiting success, far more data are provided in football than in basketball. Thus, there are some small differences between the basketball and football recruiting dependent variables in our study.

For basketball, we construct our own measure of overall recruiting success by employing the "Rivals 250 Bonus Scale," a rating system that the website utilizes for football recruiting.³ In this system, the number one overall recruit receives 100 points, the second overall recruit receives 83 points, and so forth; the point values exhibit an asymptotic decay with the 150th-ranked player earning 23 points. While this system is a bit arbitrary, it is used to partially determine the recruiting rankings for college football, which have been frequently utilized in the field of sports economics. The mean recruiting points attained by a team in a given year is 47.5 (roughly equivalent to signing one recruit ranked from #41 to #45, or perhaps, two recruits ranked from #146 to #150) for the entire sample. Our dependent variable for

basketball recruiting (BRECruITING) is the recruiting points that each basketball team received in a given year, standardized for each year—thus, the mean for this variable is 1 and the standard deviation is 0.

Football recruiting data are far more expansive (and more complicated). While only the top 150 recruits are provided in the basketball Rivals.com ratings, Rivals provides team recruiting rankings for all FBS teams using a recruiting ranking points system.⁴ As with basketball, we utilize the number of recruiting points a football team earns in a given year.⁵ For football, recruiting points are calculated based on the average Rivals Rating of a team's top 20 recruits and the "Rivals 250 Bonus Scale." The mean for total football recruiting points is 917.7 and the standard deviation is 718.2. We construct the dependent variable, football recruiting points system (FRECruITING), which is the recruiting points earned by a team in a year, standardized in each year.

Inclusion of control variables was inspired by research detailed in the literature review section and based on conventional wisdom of the determinants of recruiting success in football and basketball. Variables are described in Table 1. In Table 2, we provide the overall data summary statistics in addition to summary statistics for power conferences in football and basketball. The football power conferences are the ACC, Big Ten, Big 12, Pac-12, SEC, and the now-defunct Big East.⁶ These conferences are also among the power conferences in basketball, along with the Atlantic 10 Conference. We hoped to create some control for the availability of recruits in proximity to the colleges. A casual perusal of the Rivals data clearly indicates that recruits are more likely to attend an in-state school than an out-of-state college. Thus, we create BSTATETALENT, which is the number of top 150 recruits going to high school in a college's state divided by the number of power conference teams in that state. For example, if there are eight top 150 recruits in Georgia, which contains two power conference teams, BSTATETALENT would equal four.⁷ While this variable does not completely capture the availability of in-state talent, it does provide *some* control. Likewise, FSTATETALENT is the number of four- or five-star recruits in a state divided by the number of BCS colleges in that state. Typically, there are about 125 four- or five-star football recruits in a given year.

In college football and basketball, simple winning percentage is not a complete measure of overall success; for example, winning 80% of a season's games in a major conference typically leads to greater postseason outcomes than a mid-major conference team with the same winning percentage. For this reason, we provide multiple measures of on-the-field success. Recruits are likely influenced by the recent success of college teams. For basketball, recent on-court performance outcomes are estimated by BWIN1, BWIN2, BTOP255, BCHAMPS5, and BTOURNEYS5.

Of course, there are other possible motivations. Since top recruits are often hoping to reach the NBA, we include BDRAFT5. Additionally, players may prefer to play for coaches with a history of success. Thus, we include BCOACHTOURNEYS and BCOACHCHAMPS to account for the quality of the head coach. We also provide two simple dummy variables for coaching experience. BCOACHNEW1

Table 1. Variable Descriptions.

BRECRUITING ^a	Basketball recruiting points (standardized for each year)
FRECRUITING ^a	Football recruiting points (standardized for each year)
BSTATETALENT	Top 150 recruits divided by the number of power conference schools, in state
BWIN1	Basketball winning percentage in year prior to recruits' first year
BWIN2	Basketball winning percentage, 2 years prior to recruits' first year
BTOP255	Regular season finishes in the AP Top 25; 5 years prior to recruits' first year
BCHAMPS5	NCAA championships, 5 years prior to recruits' first year
BTOURNEYS5	NCAA tournaments, 5 years prior to recruits' first year
BDRAFT5	NBA draft picks from college, 5 years prior to recruits' first year
BCOACHTOURNEYS	Total tournament appearances by team's head coach
BCOACHCHAMPS	Total NCAA titles by team's head coach
BCOACHNEW1	Team has new head coach in recruits' first collegiate year
BCOACHNEW2	Team has new head coach in year prior to recruits' first season
FSTATETALENT	Four- and five-star recruits divided by the number of power conference schools, in state
FWIN1	Football winning percentage in year prior to recruits' first year
FWIN2	Football winning percentage, 2 years prior to recruits' first year
FTOP255	Regular season finishes in the AP top 25; 5 years prior to recruits' first year
FBCSBOWLS5	BCS Bowl appearances, 5 years prior to recruits' first year
FCHAMPS5	NCAA DI FBS titles, 5 years prior to recruits' first year
FBOWLBAN	Equals 1 if team is under a bowl ban in recruits' first season
FDRAFT5	First round NFL draft picks from college, 5 years prior to recruits' first year
FCOACHBCSBOWLS	Total BCS bowl appearances by team's head coach
FCOACHCHAMPS	Total NCAA FBS titles by team's head coach
FCOACHNEW1	Team has new head coach in recruits' first collegiate year
FCOACHNEW2	Team has new head coach in year prior to recruits' first season

Note. NCAA = National Collegiate Athletic Association; NBA = National Basketball Association; NFL = National Football League; BCS = Bowl Championship Series; FBS = football bowl subdivision.

^aDependent variables.

equals one if the head coach is “brand new” to the team during the recruits first year. In this scenario, the head coach may have not even been a part of the recruiting process, and players may have enrolled prior to the head coach signing—we expect that players will shy away from brand new coaches. BCOACHNEW2 equals one if the head coach is in his second full season during the recruits first collegiate year. In this scenario, the head coach would have been a “new coach” during a recruit’s senior year of high school, a pivotal time for recruiting.

Similar controls are provided for football; only minor changes were needed to account for differences in postseason structures (e.g., attaining a BCS bowl in college football is an accolade that is not comparable with any achievement in basketball). We also add one new variable, FBOWLBAN, which is a dummy

Table 2. Summary Statistics.

Variable	All FBS	Power (Football)	Mid-Major (Football)	Power (Basketball)	Mid-Major (Basketball)
BSTATETALENT	2.025 (1.731)	2.105 (1.755)	1.916 (1.692)	2.098 (1.750)	1.922 (1.699)
BWIN1	57.370 (16.275)	60.060 (15.198)	53.675 (16.977)	60.104 (15.202)	53.495 (16.957)
BWIN2	57.366 (16.297)	60.110 (15.338)	23.597 (16.827)	60.119 (15.329)	53.466 (16.837)
BCHAMPS5	0.041 (0.220)	0.063 (0.266)	0.010 (0.127)	0.063 (0.267)	0.008 (0.122)
BTOURNEYS5	1.713 (1.693)	2.302 (1.709)	0.904 (1.291)	8.688 (7.607)	0.882 (1.267)
BDRAFT5	1.617 (2.220)	2.401 (2.495)	0.540 (1.070)	2.388 (2.486)	0.525 (1.059)
BCOACHTOURNEYS	6.410 (7.016)	8.620 (7.589)	3.374 (4.676)	8.688 (7.607)	3.181 (4.387)
BCOACHCHAMPS	0.192 (0.668)	0.286 (0.826)	0.064 (0.304)	0.290 (0.832)	0.055 (0.255)
BCOACHNEW1	0.137 (0.349)	0.132 (0.339)	0.157 (0.364)	0.131 (0.338)	0.158 (0.365)
BCOACHNEW2	0.136 (0.350)	0.131 (0.337)	0.160 (0.367)	0.130 (0.337)	0.161 (0.368)
FSTATETALENT	5.291 (4.563)	5.189 (4.545)	5.431 (4.587)	5.176 (4.526)	5.455 (4.612)
FWIN1	52.007 (22.188)	56.312 (20.932)	46.095 (22.517)	56.091 (21.119)	46.221 (22.394)
FWIN2	52.007 (22.283)	56.378 (21.072)	45.687 (22.432)	56.029 (21.324)	45.987 (22.302)
FTOP255	1.103 (1.490)	1.665 (1.608)	0.331 (0.830)	1.644 (1.608)	0.337 (0.837)
FCHAMPS5	0.047 (0.258)	0.081 (0.335)	—	0.080 (0.333)	—
FBCSBOWLS5	0.0328 (0.749)	0.525 (0.910)	0.057 (0.259)	0.521 (0.906)	0.055 (0.255)
FDRAFT5	4.418 (2.219)	2.228 (2.552)	0.276 (0.735)	2.203 (2.546)	0.276 (0.739)
FBOWLBAN	0.005 (0.069)	0.007 (0.084)	0.002 (0.040)	0.007 (0.084)	0.002 (0.041)
FCOACHCSBOWLS	0.674 (1.706)	1.081 (2.113)	0.116 (0.486)	1.067 (2.103)	0.118 (0.491)
FCOACHCHAMPS	0.118 (0.432)	0.197 (0.547)	0.008 (0.107)	0.195 (0.544)	0.008 (0.108)
FCOACHNEW1	0.167 (0.373)	0.151 (0.358)	0.190 (0.392)	0.151 (0.358)	0.190 (0.392)
FCOACHNEW2	0.164 (0.373)	0.148 (0.358)	0.186 (0.389)	0.150 (0.358)	0.184 (0.388)
n	1,454	842	612	852	602

Note: FBS = football bowl subdivision.

variable indicating whether a team will be under a bowl ban in a recruit's first year with the college. There are 10 instances of bowl bans in the data.⁸

Model

To analyze the effects of various sport-specific, coaching, and cross-sport variables on recruiting in college basketball and football, we estimate the following fixed effects model:

$$r_i = x_i' \beta + \alpha_i + \varepsilon_i, \quad (1)$$

where r_i is the recruiting achievement attained by team i , x_i' is the set of explanatory variables, α_i is the college-specific fixed effect, and ε_i is a random error term. We opt for fixed effects for each school based on the results of a test of joint significance.⁹ We also conducted a Hausman test to compare random and fixed effects models and found clear evidence supporting a fixed effects approach.¹⁰

Note that our fixed effects model will account for differences among colleges that are not captured by the data as long as these differences do not vary over time. For this reason, we choose not to include variables that vary little or none during the years studied. For example, a school's acceptance rate usually does not change much over time. Since the effect of acceptance rate is virtually constant during the years studied, fixed effects for each college will inherently account for acceptance rate and other academic characteristics. Likewise, we considered including a variable for each team's conference. However, as will other variables, conference alignment did not change for the vast majority of teams in the data set—college-specific fixed effects will naturally account for conference effects in most cases. We ultimately chose to omit conference variables to avoid multicollinearity concerns and found little change to results when conference variables were included.

In total, we estimate six distinct models. For both football and basketball, we estimate one model including all data, one model including only power conference teams, and one model including teams not among the power conferences (mid-majors). In doing so, we are able to find overall effects and search for differences between major and minor D1 FBS colleges.

Results

Using data from Rivals.com and other sources, we estimate three separate models predicting basketball recruiting success. The first model includes all colleges in the FBS system from 2002 to 2015. The second and third models include only power conference teams and mid-majors, respectively. Results for models predicting basketball recruiting performance are provided in Table 3. We find, not surprisingly,

Table 3. Regressions Predicting Basketball Recruiting Points.

Variable	All FBS Colleges	Power Conference Teams	Mid-Major Conference Teams
BSTATETALENT	.069*** (.015)	.109*** (.024)	0.060*** (0.023)
BWIN1	.002 (.001)	.008*** (.002)	0.001 (0.002)
BWIN2	.000 (.002)	.004* (.002)	−0.001 (0.002)
BTOP255	.042 (.032)	−.008 (.044)	0.247*** (0.083)
BTOURNEYS5	−.017 (.026)	−.036 (.039)	0.032 (0.047)
BCHAMPS5	.150 (.125)	.163 (.161)	−0.091 (0.790)
BDRAFT5	.038** (.016)	.037* (.021)	−0.048 (0.047)
BCOACHTOURNEYS	−.009 (.007)	−.002 (.009)	−0.047*** (0.013)
BCOACHCHAMPS	.285*** (.109)	.091 (.150)	1.467*** (0.318)
BCOACHNEW1	−.241*** (.053)	−.349*** (.087)	−0.151* (0.078)
BCOACHNEW2	.074 (.054)	.134 (.088)	0.059 (0.079)
FWIN1	−.000 (.001)	−.001 (.002)	0.001 (0.002)
FWIN2	.000 (.001)	.003 (.002)	−0.002 (0.002)
FTOP255	−.003 (.027)	−.020 (.037)	0.005 (0.072)
FBCSBOWLS5	−.043 (.046)	−.062 (.060)	−0.259 (0.160)
FCHAMPS5	.067 (.102)	.066 (.122)	—

Note. Model 1, $R^2 = .587$; Model 2, $R^2 = .541$, $R^2 = .609$. FBS = football bowl subdivision.

***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

that the level of talent in state is positively correlated with basketball recruiting. For the primary model, a one-unit increase in BSTATETALENT is associate with a 0.07 standard deviation increase in recruiting points—an increase of about five overall recruiting points. This variable is also positively correlated with recruiting in Models 2 and 3, but the significance is greater in Model 2, which includes only power conference teams. This is not surprising; power conferences are more likely to land top recruits, so the quantity of top recruits, in state, is more important for these programs.

Surprisingly, recent on-court success (BWIN1, BWIN2, BTOP255, BTOURNEYS5, and BCHAMPS5) is shown to be insignificant in predicting recruiting in the primary model. However, the two secondary models indicate differing effects of this variable between power conference teams and mid-majors. For power conference teams, a 1% increase in prior-year winning percentage is correlated with a 0.008 standard deviation increase in recruiting points. Likewise, there is a marginally significant effect of winning percentage 2 years prior to recruiting. However, these variables are not significant in the model containing only mid-majors. For mid-majors, it appears that top 25 finishes is a major determinant of recruiting outcomes. For each additional top 25 finish in the 5 years prior to recruiting, a team can expect to increase recruiting points by about 0.25 standard deviations (or 8.3 recruiting points). The other two on-court achievement variables (BTOURNEYS5 and BCHAMPS5) are not significant in any of the models.

Each additional NBA draft pick in the prior 5 years is associated with a 0.04 standard deviation increase in recruiting points in both the primary model and the model for power conferences. Among mid-majors, the effect is not significant. This may suggest that players with NBA aspirations are more likely to attend colleges with a pipeline of NBA talent—traditionally, power conference teams. Thus, NBA draft pick history is less important for mid-majors.

The differences between power conference teams and mid-majors continue in the coaching variables. Among the mid-majors, employing a head coach with tournament history actually harms the college's basketball recruiting efforts. For each additional tournament appearance for the head coach, the mid-major team can expect a 0.05 standard deviation *decrease* in recruiting points. Conversely, a head coach with championships can expect much improved recruiting outcomes—for each additional title, recruiting prowess jumps by about 1.47 standard deviations or about 49 recruiting points.¹¹ This is an increase in points equivalent to landing one recruit ranked #35–#40, nationally. BCOACHNEW1 is the only variable shown to be significant among all the three models. Having a new coach during recruits' first collegiate season is correlated with a 0.24 standard deviation decrease in recruiting points for the primary model, and the effect is greater for power conference teams. However, there is no clear indication that the teams with head coaches in their second year (BCOACHNEW2) will recruit differently from otherwise similar teams. Therefore, it appears that colleges can expect a decline in recruiting points at the time of coaching turnover, but the effect is short lived.

While these findings are interesting, our primary focus is on the cross-sport recruiting aspect. Is basketball recruiting a function of football success? According to our models, it is not. Five variables measuring on-field football success are included in the models, and not one of these variables is even marginally significant. While some media members have advocated the benefits of football success on basketball recruiting, we do not find no evidence that this is the case.

We now turn our attention to football recruiting. As with basketball, we construct three fixed effects models predicting football recruiting success. This dependent variable for football is far more descriptive than the dependent variable for basketball since recruiting points are provided for several hundred college football recruits each year compared to only the top 150 recruits in college basketball. Thus, it is no surprise to see a much higher R^2 for the football models. We provide results for all the three models in Table 4.

As with basketball, we find a strong positive correlation between in-state talent (FSTATETALENT) and the recruiting dependent variables in the model including power conference teams. For power conference teams, a one-unit increase in FSTATETALENT is associated with a 0.04 standard deviation (about 30 recruiting points) increase in recruiting points. This indicates that each additional top recruit in state, per team, is associated with an in-state power conference team landing one recruit with “limited propotential” that “may be more of a role player.”¹² However, we find an insignificant effect of this variable for mid-majors; again, this is likely

Table 4. Regressions Predicting Football Recruiting Points.

Variable	All FBS Colleges	Power Conference Teams	Mid-Major Conference Teams
FSTATETALENT	.003 (.066)	.044*** (.011)	.012 (.018)
FWIN1	.001 (.001)	.005*** (.001)	.001 (.002)
FWIN2	.001 (.001)	.004*** (.001)	.002 (.002)
FTOP255	.052*** (.018)	.047** (.024)	.057 (.086)
FCHAMPSS	-.058 (.082)	-.088 (.101)	—
FBCSBOWLS5	.080** (.033)	.051 (.043)	.346* (.208)
FBOWLBAN	-.362** (.175)	-.394** (.234)	—
FDRAFT5	.006 (.009)	.012 (.012)	.034 (.055)
FCOACHBCSBOWLS	-.007 (.021)	-.032 (.026)	.381** (.163)
FCOACHCHAMPS	.134* (.076)	.291*** (.054)	-.854 (.638)
FCOACHNEW1	-.188*** (.032)	-.229*** (.054)	-.240*** (.085)
FCOACHNEW2	.116*** (.032)	.302*** (.053)	.084 (.086)
BWIN1	-.003*** (.001)	-.000 (.001)	-.003 (.002)
BWIN2	-.001 (.001)	.003*** (.002)	.000 (.003)
BTOP255	.067*** (.020)	.047* (.028)	.069 (.088)
BTOURNEYSS	-.032* (.017)	-.030 (.026)	.022 (.054)
BCHAMPSS	.188** (.075)	.125 (.097)	-.660 (.442)

Note. Model 1, $R^2 = .836$; Model 2, $R^2 = .761$; Model 3, $R^2 = .458$. FBS = football bowl subdivision. ***Significant at the 1% level. **Significant at the 5% level. *Significant at the 10% level.

because mid-majors are unlikely to land many four- and five-star recruits, so the availability of these players is not necessarily important. This finding demonstrates the importance of running models for power conference teams and mid-majors separately, since the primary model suggests that in-state talent has no effect on recruiting. The results for FWIN1, FWIN2, and FTOP255 underscore this point—power conference recruits seem interested in recent on-field performance, but mid-major recruiting is not a function of recent on-field success, according to our model. The last on-field performance variable, FBCSBOWLS5, is found to be positive and significant in the primary model but insignificant in the other models.

Unlike basketball recruiting, the quantity of draft picks is not clearly correlated with football recruiting—FDRAFT5 is not significant in any of the models. However, we find a strong and significant coefficient for FBOWLBAN in both the primary model and the model including power conference teams.¹³ This may indicate that bowl bans are effective punishments for rule violations.

The coaching variables are generally significant although the results are again highly dependent upon participation in a power or mid-major conference. Among mid-majors, a team possessing a head coach with BCS bowl appearance can expect improved recruiting outcomes, but there is no clear connection between BCS bowl coaching experience and recruiting for power conference teams. In the primary model and for power conference teams, there is a positive and significant effect for

FCOACHCHAMPS indicating that recruits are more likely to be lured by coaches with national titles.¹⁴ As with basketball, teams with a “brand new” coach can expect to greatly suffer in recruiting. For power conference teams, having a first-year coach is associated with a 0.23 standard deviation (or about 138 points—equivalent to one very elite prospect) decrease in recruiting prowess. The effect is even stronger for mid-majors. While a first-year coach will field a team of lower quality recruits, second-year power conference coaches receive a massive boost in recruiting. Having a second-year coach is associated with a 0.30 standard deviation (about 207 points) increase in recruiting prowess. This finding may explain why coaching turnover has increased in recent years—while first-year power conference coaches recruit poorly, total recruiting after 2 years is actually improved, on net, after the signing of a new coach! However, this effect is apparently confined to power conference coaches as indicated by the insignificant coefficient for FCOACHNEW2 in model containing mid-majors.

Among the five basketball variables, four variables exhibit significance in the primary model. Yet again, there are discrepancies between power conference and mid-major teams. Thus, we will focus on these models in our discussion. In the primary model, basketball winning percentage in the season immediately prior to a football seasons harms recruiting for that football team. Likewise, recent NCAA tournament appearances in basketball are also inversely correlated to football recruiting prowess. Interestingly, we find positive effects for BTOP255 and BCHAMPS, and the coefficients are rather large. Each additional top 25 basketball finish in the prior 5 years is associated with a 0.07 standard deviation improvement in football recruiting, and each additional championships leads to a 0.19 standard deviation increase. For power conference teams, only two of these variables are found to be significant—winning percentage 2 years prior and top 25 finishes in the past 5 years are both positively correlated with football recruiting. Finally, we find no significance among the basketball variables for mid-majors. Considering these cross-sport effects as whole, it appears that on-court basketball success does influence football recruiting, but the effects are complicated and may differ from conference to conference and team to team.

Conclusions

On average, football and men’s basketball are the only profit-earning programs at NCAA D1 colleges and revenues and profits have risen greatly in recent years. Recent economic data indicate the nearly unfathomable financial magnitude of these sports. For example, national TV advertising alone for the NCAA basketball tournament has topped US\$1 billion for five straight seasons, greatly exceeding advertising spending for the lengthier NBA play-offs (Kantar Media, 2016). Meanwhile, ESPN is paying US\$470 million per year to have exclusive rights to the three-game NCAA college football play-offs. Aside from the direct revenues that many NCAA schools

enjoy, success in these sports has been shown to increase enrollment applications (Pope & Pope, 2009), tuition rates (Alexander & Kern, 2009), and undoubtedly has the potential to greatly improve a college's image and expand its exposure.

Not surprisingly, D1 colleges have increased their willingness to invest in the recruiting of athletes, but players themselves are not permitted to receive payment. Thus, we seek to answer the question that a few other researchers have addressed, "What do top basketball and football recruits' value when choosing a college?" Positing a new possible motivating factor, we test whether football players base their decision not just on the team's recent football success but also on the performance of its basketball team. Likewise, do basketball players consider the success of a college's football team?

After estimating three different regression models for both sports, we find no evidence to support the purported belief that basketball recruiting is a function of football success. However, we find ample evidence that college football recruiting is impacted by on-court basketball success. In our primary model, four of the five basketball success variables are correlated with football recruiting. However, two of the four variables (top-25 finishes and NCAA titles in the past 5 years) are positively correlated with football recruiting, while the other two (winning percentage in prior season and NCAA tournament appearances in previous five season) are inversely correlated with football recruiting prowess. According to Duke University football coaches, basketball success is a "double-edged sword" that helps gain notoriety for the college but may discourage top recruits who are looking for an athletic program dedicated to football success (Shanker, 2015). Indeed, our findings are consistent with this anecdotal evidence. Football recruiting is a function of on-court basketball success, but the correlation is not unidirectional.

In addition to these cross-sport findings, we uncovered some other interesting results that sports researchers may find helpful in preparing models predicting recruiting success. Perhaps most interestingly, we find that new head coaches in football tend to receive a major recruiting boost during their second year, which more than overcomes the initial decline in recruiting prowess that occurs in the first year. This effect is not observed among mid-majors, which could indicate that power conference athletic departments should be more willing to facilitate coaching turnover than mid-major departments. In general, we find major differences between power conference and mid-major conference recruiting effects, indicating that recruiting strategies should greatly differ between these groups.

As with any research, but particularly true in recruiting studies, there are some limitations within the data. For example, the success (or failure) of one college has the potential to impact recruiting outcomes throughout the nation as top recruits flee or gravitate toward certain colleges. Unfortunately, fully accounting for these "recruiting competition" effects is not feasible. Additionally, the recruiting points system generated by Rivals.com is not necessarily an accurate depiction of player potential; perhaps college teams are able to more adeptly recognize player potential than Rivals.com. If this is the case, the dependent variables in our study may not

accurately reflect recruiting prowess. This is particularly problematic for basketball recruiting, which appears to receive much less attention by Rivals.com (and other recruiting databases). Since (arbitrarily) only the top 150 recruits are provided by the website, many valuable recruits are not included in the data set. Furthermore, certain attributes (height, quickness, etc.) may be in higher demand in certain seasons, which causes players with these attributes to receive more attention from colleges than they would in other seasons. Again, the data do not account for such possibilities. An improved dependent variable for recruiting success would greatly improve the validity of future research. Lastly, there is always a concern for omitted variable bias, and we certainly welcome any suggestions for other potentially relevant variables. While fixed effects account for important differences from college to college, these effects do not do a good job of handling *changes* in the differences among colleges. For example, college-level fixed effects will account for the beautiful weather in southern California, which may lure recruits to University of California, Los Angeles, but fixed effects may not adequately reflect the development of a new workout facility, stadium upgrade, or a new collegiate branding campaign. Indeed, there are limitless possible factors that influence a recruit's decisions, and we encourage future researchers to join us in testing for the magnitude of such effects.

Despite these potential limitations in the data, our study should further our understanding of recruiting outcomes in college sports. We analyze potential spillover effects between football and basketball success and recruiting, which is apparently the first time such possibility has been addressed in an academic nature. Clearly, this is our greatest value added, but the subfield will also benefit from simply having another study that includes newer data that were unavailable to researchers in the past. We hope that our study can spark future research in the field and ultimately lead to a better understanding of why some colleges can field successful sports programs while others cannot.

Appendix A

BRECRUITING

Points are applied based on a recruit's overall college ranking using the following scale, using the "Rivals 250 Bonus Scale." In basketball recruiting, Rivals.com only identifies the top 150 recruits (source: <https://footballrecruiting.rivals.com/content.asp?SID=880&CID=1364602>).

- #1 = 100 points
- #2 = 83 points
- #3 = 82 points
- #4 = 81 points
- #5 = 80 points
- #6 = 76 points

#7 = 75 points
#8 = 74 points
#9 = 73 points
#10 = 72 points
#11 = 69 points
#12 = 68 points
#13 = 67 points
#14 = 66 points
#15 = 65 points
#16 = 64 points
#17 = 63 points
#18 = 62 points
#19 = 61 points
#20 = 60 points
#21 = 59 points
#22 = 58 points
#23 = 57 points
#24 = 56 points
#25 = 55 points
#26–30 = 53 points
#31–35 = 51 points
#36–40 = 49 points
#41–45 = 47 points
#46–50 = 45 points
#51–55 = 43 points
#56–60 = 41 points
#61–65 = 40 points
#66–70 = 39 points
#71–75 = 38 points
#76–80 = 37 points
#81–85 = 36 points
#86–90 = 35 points
#91–95 = 34 points
#96–100 = 33 points
#101–105 = 32 points
#106–110 = 31 points
#111–115 = 30 points
#116–120 = 29 points
#121–125 = 28 points
#126–130 = 27 points
#131–135 = 26 points
#136–140 = 25 points

#141–145 = 24 points

#146–150 = 23 points.

Appendix B

FRECRUITING

Points are attained based on a team's top 20 commitments. Bonus points are given to players ranked among the top 250 national recruits. The process for obtaining points is thoroughly described below (sources: <https://rivals100.rivals.com/aboutrankings.asp?Sport=1> and <https://footballrecruiting.rivals.com/content.asp?SID=880&CID=1364602>).

Total points = Rivals rating points + Rivals 250 bonus points.

a. Rivals Rating (RR) Scale (Top 20-rated commitments)

(Rivals rating = points)

Rivals.com has assembled the top team of recruiting analysts in the nation with both national and regional experts based on all throughout the country. With those strengths, players at a number of different positions will be ranked once a month from June until February. The rankings are compiled after countless hours of film evaluation; personal observations; and input from professional, college, and high school coaches. In the finished product, players are ranked a number of different ways, but the most important ways are numerically by position, qualitatively by stars and a new ranking system that grades players on the expected impact they will make in college. Players are ranked numerically on a national level at their positions. The numerical ranking at each position varies depending on the depth of the talent at the position. Players are also ranked on their quality with a star ranking. A five-star prospect is considered to be one of the nation's top 25–30 players, four star is a top 250–300 or so player, three stars is a top 750-level player, two stars means the player is a mid-major prospect, and one star means the player is not ranked. The ranking system ranks prospects on a numerical scale from 6.1 to 4.9.

- 6.1 Franchise player; considered one of the elite prospects in the country, generally among the nation's top 25 players overall; deemed to have excellent pro potential; high-major prospect.
- 6.0–5.8 All American candidate, high-major prospect, considered one of the nation's top 300 prospects, deemed to have propotential, and ability to make an impact on college team.
- 5.7–5.5 All-region selection, considered among the region's top prospects and among the top 750 or so prospects in the country, high- to mid-major prospect, deemed to have propotential, and ability to make an impact on college team,

- 5.4–5.0 DI prospect, considered a mid-major prospect, deemed to have limited propotential but definite DI prospect, may be more of a role player.
- 4.9 Sleeper; no Rivals.com expert knew much, if anything, about this player; a prospect that only a college coach really knew about.

6.1 = 150 points

6.0 = 135 points

5.9 = 120 points

5.8 = 105 points

5.7 = 90 points

5.6 = 75 points

5.5 = 60 points

5.4 = 45 points

5.3 = 30 points

5.2 = 15 points.

Prospects without an assigned rating will count for no points. All FBS committed prospects will have a rating once evaluated and rankings are updated.

Rivals 250 Bonus Scale (all commitments)

#1 = 100 points

#2 = 83 points

#3 = 82 points

#4 = 81 points

#5 = 80 points

#6 = 76 points

#7 = 75 points

#8 = 74 points

#9 = 73 points

#10 = 72 points

#11 = 69 points

#12 = 68 points

#13 = 67 points

#14 = 66 points

#15 = 65 points

#16 = 64 points

#17 = 63 points

#18 = 62 points

#19 = 61 points

#20 = 60 points

#21 = 59 points

#22 = 58 points

#23 = 57 points

#24 = 56 points
#25 = 55 points
#26–30 = 53 points
#31–35 = 51 points
#36–40 = 49 points
#41–45 = 47 points
#46–50 = 45 points
#51–55 = 43 points
#56–60 = 41 points
#61–65 = 40 points
#66–70 = 39 points
#71–75 = 38 points
#76–80 = 37 points
#81–85 = 36 points
#86–90 = 35 points
#91–95 = 34 points
#96–100 = 33 points
#101–105 = 32 points
#106–110 = 31 points
#111–115 = 30 points
#116–120 = 29 points
#121–125 = 28 points
#126–130 = 27 points
#131–135 = 26 points
#136–140 = 25 points
#141–145 = 24 points
#146–150 = 23 points
#151–155 = 22 points
#156–160 = 21 points
#161–165 = 20 points
#166–170 = 19 points
#171–175 = 18 points
#176–180 = 17 points
#181–185 = 16 points
#186–190 = 15 points
#191–195 = 14 points
#196–200 = 13 points
#201–205 = 12 points
#206–210 = 11 points
#211–215 = 10 points
#216–220 = 9 points
#221–225 = 8 points
#226–230 = 7 points

- #231–235 = 6 points
- #236–240 = 5 points
- #241–245 = 4 points
- #246–250 = 3 points.

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Notes

1. These figures likely pale in comparison to the actual spending required for recruiting. For example, one major component of coaches' duties is to aid in recruiting players. Thus, one might consider that a portion of a coach's salary is indirectly spent on recruiting efforts.
2. Air Force, Army, and Navy were omitted from the data set. Other colleges that entered the Football Bowl Subdivision (FBS) system after 2002 were also excluded (Florida International, Old Dominion, etc.).
3. See Appendix A.
4. Unlike basketball, recruiting rankings are provided for all FBS teams. Thus, recruiting rankings could serve as a dependent variable. However, recruiting rankings provide less information than the Rivals.com points system. For example, the 2014 Alabama Crimson Tide football team earned 3,263 points, 419 points more than the second-ranked team. While the recruiting ranking difference would only be one unit, this is a huge margin in overall recruiting prowess that a recruiting ranking variable would not reveal.
5. See Appendix B for a full description.
6. These conferences were provided a guaranteed selection among the Bowl Championship Series (BCS) bowls. For this reason, we also include Notre Dame among the power conference teams, since it also was provided guaranteed BCS bowl placement if it finished among the top eight teams in the BCS poll.
7. In some states, there are no power conference teams, but there is a mid-major college. In these instances, we treated the number of power colleges as one, so as to not divide by zero. In future editions of this article, we plan to create more sophisticated variables to capture in-state talent.
8. We also created a "tournament ban" variable for basketball. However, we opted to drop the variable after discovering that only one team in our data set had experienced a tournament ban.

9. The F -test of joint significance for the fixed effects for each school yielded a test statistic of 4.49 for the primary basketball regression and 19.34 in the primary football regression. Thus, we reject the null hypothesis that fixed effects are zero. We also considered including fixed effects for each year and each conference, but these variables were found to be jointly insignificant.
10. A Hausman test comparing fixed and random effects yielded a χ^2 value of 136.26 for the primary basketball model and 631.81 for the primary football model. Thus, we reject the null hypothesis of the random effects model being preferable and use the fixed effects model.
11. Among the mid-majors, there are 33 instances of teams led by a coach with a national title.
12. This conclusion is based on the Rivals.com system for a player garnishing 15–30 points. Of course, a gain in points could also be a result of upgrading players rather than gaining a new recruit.
13. Note that only 10 teams were under a bowl ban, and 9 of them were in power conferences. For this reason, FBOWLBAN is excluded from “mid-major” model.
14. While FCOACHCHAMPS exhibits a negative coefficient in the mid-majors model, the finding is suspect. Among these teams, only four were led by a coach with at least one national title.

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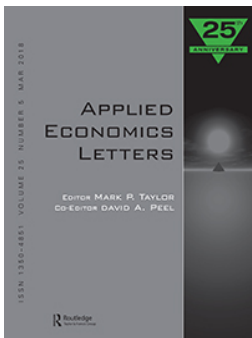
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From college to the NBA: what determines a player's success and what characteristics are NBA franchises overlooking?

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ARTICLE



From college to the NBA: what determines a player's success and what characteristics are NBA franchises overlooking?

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ABSTRACT

Considering NBA players who were drafted between 2006 and 2013, the author analyses the determinants of draft position, playing time and player productivity. By comparing these factors simultaneously, one is able to consider if there are some factors that correlate with players' draft positions, but fail to correlate with on-court performance. For example, the results reveal that a player's college turnover rate does not predict his draft position or his playing time in the NBA despite evidence that turnover-prone college players are less effective in the NBA. These results can be used to improve draft-day decisions for NBA executives.

KEYWORDS

Basketball; NBA draft; sports economics; labour

JEL CLASSIFICATION

Z2; L83; J40; J31

I. Introduction

Using a data set of NBA draftees from 2006 to 2013, I consider the connectivity between college performance and playing outcomes in the NBA. Prior research (Evans and Pitts [forthcoming](#); Berri, Brook, and Fenn 2011; Berri 2005) has largely considered what factors influence draft position. While the determinants of draft position are briefly explored herein, I focus primarily on the determinants of player productivity and playing time 3 years into a player's NBA career. By doing so, I am able to compare the factors that correlate with NBA productivity with the characteristics that affect a draft position and playing time in order to determine if there are some factors that NBA executives are failing to properly consider. Results indicate that NBA executives undervalue the importance of college turnover rates in regard to both draft position and playing time; while turnover-prone college prospects tend to perform worse than their counterparts in the NBA, they are not treated any differently in regard to draft position and playing time. Many other interesting results are highlighted that should help researchers and NBA managers better understand the factors that are important in creating a competitive NBA team.

II. Model and data

The data set employed contains 379 players who were selected in the NBA draft between 2006 and 2013. The 2006 draft was selected as the starting point since it was the first year in which teams could not draft high school seniors. The 2013 ending point was chosen because I consider performance during a player's third NBA season; players drafted after 2013 have not played three full seasons. I only include players who participated in college basketball; thus, many international players are omitted. The players are re-sorted so that the variable DRAFT# is a player's ordinal draft position among those who played college basketball.

All data were gathered from Realgm.com and basketball-reference.com. Variables included were based on prior research and conventional wisdom on the characteristics that seem important for a player to have a successful NBA career. POINTS, ASSISTS, REBOUNDS, STEALS, BLOCKS, TURNOVERS and FOULS all represent production of each statistic per 40 min of play during a player's final collegiate season. Because the frequency of these variables differs among positions, each of these variables has been standardized by position.¹

Thus, these variables reveal a player's proficiency relative only to other players at the same position. TWOPT%, THREEPT% and FT% indicate the shooting percentage of two-point field goals, three-point field goals and free throws, respectively, during a player's final college season, standardized by position.

I include additional team and coaching-specific variables. WIN% is the winning percentage of a player's college basketball team during his final season and POWERCONF is a dummy variable indicating whether a player's team participated in one of the major college basketball conferences – ACC, BIG 10, BIG 12, BIG EAST, PAC 12 and SEC. Because coaching could impact a player's potential, I include controls for a head coach's career winning percentage (COACHWIN%) and the number of years the coach has served as a head coach at any NCAA D1 programme (COACHEXP).

Since players with more potential often choose to enter the NBA draft prior to completing 4 years of college, I include the dummy variables TWOYEAR, THREEYEAR and FOURYEAR, which indicate how many seasons each prospect played in college. Likewise, younger players may be seen as having more potential; thus, I include the age in years (AGE) of a player on draft day. The final controls (HEIGHT and BMI) account for a player's size.

Using the variables described earlier, I estimate five regressions. The first aims to determine the characteristics correlated with a player's draft position:

$$\begin{aligned} \text{DRAFTPOSITION}_n = & \beta_0 + \alpha_n \text{COLLEGESTATS} \\ & + \beta_1 \text{WINPCT} + \beta_2 \text{POWERCONFERENCE} \\ & + \beta_3 \text{COACHWIN\%} + \beta_4 \text{COACHEXP} \\ & + \beta_5 \text{TWOYEAR} + \beta_6 \text{THREEYEAR} \\ & + \beta_7 \text{FOURYEAR} + \beta_8 \text{AGE} \\ & + \beta_9 \text{HEIGHT} + \beta_{10} \text{BMI} \\ & + \alpha_k \text{POSITION} + \alpha_j \text{YEAR} + \varepsilon_{it} \end{aligned}$$

where a player's draft position is regressed on previously described variables. In addition, I include fixed effects for player position and draft year, because a player's quality per position and in general varies from year to year. The second set of regressions aims to identify what characteristics correlate

with player performance in the NBA. Two different dependent variables are utilized – NBAMINUTES and NBAWINSHARES. NBAMINUTES is the total minutes played during a player's third NBA season, while NBAWINSHARES is the total win shares a player earned per 1000 min played.² I estimate this model with and without controls for a player's draft position in order to consider both the determinants of player performance, in general, and the factors that correlate with performance even after controlling for draft position. In doing so, I am able to consider if there are factors that NBA executive are failing to correctly consider when making draft selections.

III. Results

Regression results are provided in Tables 1 and 2. In the first model, I find negative coefficients for nine variables (POINTS, ASSISTS, STEALS, BLOCKS, TWOPT%, WIN%, POWERCONF, COACHEXP and HEIGHT), indicating that each of these variables is associated with lower, and therefore 'better' draft positions. On the contrary, I find that FOULS, FOURYEAR, AGE and HEIGHT are correlated with higher draft positions. These results will be used to consider how the factors correlating with draft outcomes and performance outcomes differ.³

The second and third regressions provided in Table 1 consider the determinants of NBA performance without accounting for draft position. In other words, these results consider what factors align with player performance in the NBA, in general. The first of these regressions utilizes NBAMINUTES as the dependent variable. The results reveal that POINTS, REBOUNDS and STEALS are all positively correlated with playing time in the NBA. For example, a 1 SD increase in points per 40 min of play in college is associated with playing 148.6 more minutes during a player's third NBA season. I find that a player's foul rate in college is associated with playing fewer minutes. Players who competed on high-achieving college teams and in major conferences typically played more minutes than otherwise similar players, as evidenced by positive coefficients for WIN% and POWERCONF. I also find marginal evidence that

²The NBAMINUTES variable includes all players in the data set, while NBAWINSHARES includes only players who received NBA playing time during their third season.

³For thorough analyses on the determinants of draft position, see Evans and Pitts (forthcoming), Berri, Brook, and Fenn (2011) or Berri (2005).

Table 1. Baseline results for the NBA draft and NBA performance.

Dependent Var	DRAFT#		NBAMINUTES		NBAWINSHARES	
	Coeff.	p-Value	Coeff.	p-Value	Coeff.	p-Value
NBAWIN%	–	–	–	–	5.967	0.000***
POINTS	–4.069	0.000***	148.579	0.009***	–0.008	0.966
ASSISTS	–1.240	0.072*	33.643	0.558	0.147	0.463
REBOUNDS	–0.219	0.724	100.075	0.054*	0.139	0.428
STEALS	–1.653	0.010**	183.537	0.001***	0.118	0.487
BLOCKS	–2.348	0.000***	16.750	0.757	0.085	0.659
TURNOVERS	–0.621	0.392	–26.344	0.663	–0.441	0.031**
FOULS	1.493	0.024**	–117.603	0.033**	0.055	0.766
TWOPT%	–1.445	0.010**	66.333	0.157	–0.201	0.192
THREOPT%	–0.642	0.281	6.185	0.901	0.224	0.187
FT%	–0.133	0.835	48.342	0.366	0.047	0.796
WIN%	–0.227	0.000***	15.510	0.000***	–0.009	0.513
POWERCONF	–3.782	0.011**	242.147	0.049**	–0.078	0.849
COACHWIN%	0.032	0.675	–11.719	0.067*	0.016	0.422
COACHEXP	–0.124	0.050*	2.255	0.669	–0.005	0.792
TWOYEAR	2.065	0.290	66.037	0.685	–0.567	0.280
THREYEAR	3.059	0.163	–16.365	0.929	–0.897	0.153
FOURYEAR	7.060	0.006***	–136.667	0.520	–1.639	0.024**
AGE	3.737	0.000***	–231.475	0.000***	0.369	0.046**
HEIGHT	–1.666	0.006***	125.444	0.013**	0.126	0.466
BMI	0.345	0.571	88.844	0.081*	0.031	0.853
INTERCEPT	–42.936	0.000***	5465.225	0.166	–9.250	0.160
n	379		379		269	
R ²	0.521		0.318		0.287	

Notes: *, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

Table 2. Results including draft position variables.

Dependent Var	NBAMINUTES		NBAWINSHARES	
	Coeff.	p-Value	Coeff.	p-Value
DRAFT	–62.067	0.000***	–0.140	0.004***
DRAFT ²	0.523	0.026**	0.003	0.002***
NBAWIN%	–	–	6.188	0.000***
POINTS	–5.286	0.921	–0.035	0.857
ASSISTS	–13.737	0.792	0.062	0.756
REBOUNDS	87.570	0.061*	0.079	0.647
STEALS	125.821	0.010**	0.145	0.392
BLOCKS	–74.053	0.139	–0.009	0.963
TURNOVERS	–54.952	0.316	–0.449	0.027**
FOULS	–53.800	0.285	0.119	0.514
TWOPT%	6.436	0.880	–0.236	0.127
THREOPT%	–9.945	0.825	0.257	0.127
FT%	34.683	0.474	–0.031	0.862
WIN%	6.175	0.130	–0.017	0.253
POWERCONF	96.422	0.390	–0.004	0.992
COACHWIN%	–10.137	0.079*	0.016	0.432
COACHEXP	–2.712	0.572	–0.003	0.848
TWOYEAR	176.939	0.233	–0.386	0.459
THREYEAR	126.576	0.446	–0.646	0.300
FOURYEAR	144.804	0.457	–1.408	0.051*
AGE	–93.038	0.068*	0.390	0.039**
HEIGHT	69.441	0.133	0.132	0.437
BMI	101.843	0.027**	–0.001	0.998
INTERCEPT	4112.496	0.234	–	–
N	379		269	
R ²	0.448		0.317	

Notes: *, ** and *** denote significance at 10%, 5% and 1% levels, respectively.

players with historically successful college coaches actually receive less playing time. Interestingly, results

indicate that older players (AGE) receive far less playing time than other players, while both taller (HEIGHT) and bigger (BMI) players receive more minutes, all else equal.

The regression utilizing NBAMINUTES considers the factors that correlate with NBA playing time, while the last regression in Table 1 addresses the question: what factors are correlated with a player's on-court proficiency, regardless of how much playing time he receives? In this regression, the dependent variable, NBAWINSHARES, is the number of win shares a player earned per 1000 min of play. This catch-all variable serves to provide an objective measure for overall performance that is far more comprehensive than simple statistical measures like points per game or plus-minus.⁴ The first control variable, NBAWIN%, is positive and significant. This is to be expected since a player's potential win shares will be much higher if his team earns more wins.⁵ Interestingly, most variables are found to be insignificant. While, for example, collegiate points per 40 min (POINTS) are shown to improve a player's draft selection and increase the number of minutes he plays; it does not seem to actually correlate with his performance when he

⁴For a thorough discussion of win shares, visit <http://www.basketball-reference.com/about/ws.html>.

⁵The number of win shares available for a team is roughly the number of wins it attains in a given season. These wins are divided among players into win shares, based on player performance. Thus, it is necessary to control for a team's winning percentage since winning teams will naturally distribute more win shares to their players than losing teams.

plays. This could indicate that NBA franchises are mistakenly selecting high-scoring players early in the NBA draft and also giving these players too much playing time. Interestingly, I find TURNOVERS to be significant in this regression, despite the fact that it was not relevant in determining a player's draft position or NBA minutes. This could indicate that NBA franchises are mistakenly drafting turnover-prone players too early in the draft and also providing these players with too much playing time. Additionally, I show that FOURYEAR players generate fewer wins than one-and-done players, which aligns with the finding that four-year players are drafted later than one-year players. Additionally, older players seem to outperform younger players, after controlling for other factors.

Considering the results from Table 1 in unison, it appears that there are major discrepancies among the factors that influence draft selections, playing time and on-court performance. To further investigate these findings, I estimate three additional regressions in Table 2, in which playing time (NBAMINUTES) and playing performance (NBAWINSHARES) in the NBA are regressed on previously defined characteristics in addition to a player's draft position. Because draft position may not be linearly correlated with these dependent variables, I include both DRAFT# and DRAFT², in which the latter variable is players' draft positions squared. Not surprisingly, these variables are significant in both regressions. This indicates that NBA teams are not clueless in regard to the NBA draft. Players drafted earlier tend to play more minutes and play more effectively, although the relationship is not linear as indicated by the significant coefficient for DRAFT².

Because a player's draft position has been properly accounted for in Table 2, any significant finding would indicate that a factor is significant even after controlling for draft position. For example, I find that REBOUNDS is significant in determining NBAMINUTES. Considering two similar players who were drafted in roughly the same slot, the player with more college rebounds tends to earn more playing time. This result may indicate that teams should place more value on college rebounding proficiency when making draft selections. Similarly, I find a significant positive coefficient for STEALS. While Table 1 results indicate that NBA executives may be using steals as a performance predictor when making draft selections, results from Table 2 show that players with many steals receive more minutes in the NBA, even

after controlling for draft position. Thus, it appears that NBA franchises value a steal proficiency, but not as much as they should. In addition to marginally significant findings for COACHWIN% and AGE, I find that larger players (as indicated by BMI) tend to play more minutes than otherwise similar players.

The final regression considers the factors that correlate with a player's actual performance, after controlling for draft position. The most obvious takeaway from this regression is that college turnover rate (TURNOVERS) could be a useful statistic for NBA executives to consider when making draft selections. Even after controlling for a draft position, a 1 SD increase in a player's turnover rate in college is associated with a 0.45 unit decrease in win shares per 1000 min. Taken literally, this suggests that NBA executives could increase win totals by using turnover rate to inform draft selections. Likewise, I find that NBA players who spend four years in college tend to perform worse in the NBA. While results from Table 1 indicate that four-year players are drafted later than other players, the finding in Table 2 suggests that NBA executives are underestimating the adverse qualities associated with drafting four-year players. Finally, the results for AGE are quite interesting. Table 1 results show that NBA teams are not considering player age (after controlling for other factors) when making draft selections, but AGE is correlated with both playing time and win shares. Specifically, Table 2 results show that younger players play more minutes despite the fact that older players are more effective. This could indicate that NBA franchises have chosen to 'invest' in younger players under the belief that such players have greater potential to improve. But, my results indicate that teams interested in short-run performance are better off drafting older players, all else equal.

IV. Conclusions

The results presented herein indicate that there is a clear disconnection between the factors that predict a player's performance in the NBA and the characteristics that NBA executives actually value, in regard to both how early a player is drafted and the playing time that he receives. In particular, I find no evidence that college turnover rate has any impact on draft position or a player's NBA playing time, despite clear evidence that frequently committing turnovers in college are associated with decreased

performance in the NBA. In addition, I show that older players actually tend to outperform younger players, even after controlling for other important factors such as the number of college years in which a player competed. Using such results, NBA executives and managers could improve decision-making in regard to draft selections and the allocation of playing time.

Disclosure statement

No potential conflict of interest was reported by the author.

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The determinants of NCAA basketball recruiting outcomes

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The determinants of NCAA basketball recruiting outcomes

Using recruiting rankings from Rivals.com, the authors examine the determinants of recruiting success among D1 NCAA men's basketball programs. After controlling for a host of potentially relevant variables, the authors find that recruiting outcomes are correlated with recent on-court success, historical on-court success, stadium size, and playing in a "power" conference. Additionally, teams with a history of sending players to the NBA receive heightened recruiting outcomes. A team with a new coach can expect difficulties with recruiting, while head coaches with national championships receive a recruiting boost. Finally, the authors show that recruiting strategies for guards may differ from recruiting strategies for other players.

Keywords: basketball; recruiting; sports; sports economics

JEL Codes: Z2, Z21, Z22, L83

I. Introduction

Fielding a winning basketball team earns a college more than bragging rights. Top recruits are worth more than \$1 million to their college (Brown & Jewell, 2004) and simply reaching the "Sweet 16" of the NCAA tournament is associated with 3.2% more general college applications for the following year. While on-the-court success is a function of many characteristics, player talent is surely an important component.¹ Because basketball can impact a college's bottom line and recruiting is so important in college basketball, a study on the determinants of basketball recruiting is a worthwhile endeavor.

Researchers have shown that college football recruiting can be affected by a college's prior on-field success (Langlett, 2003; Pitts & Evans, 2016), academic prowess (Pope & Pope, 2008; Grimes & Chressanthis, 2006), coaching experience (Dumond et al., 2008; Adler et al., 2012), and conference (Caro, 2012; Pitts & Evans, 2016). Few researchers have focused on basketball recruiting. Most recently, Evans & Pitts (working paper) found that basketball recruiting is impacted by similar variables, but their research only considered D1 colleges with both basketball and football programs. While there are related studies, the current research is the first academic investigation of the determinants of basketball recruiting outcomes.

II. Model and Data

In an effort to mirror prior research, we use recruiting data from Rivals.com, which releases annual rankings of the top-150 basketball recruits. To create a rating system for players, we employ the "Rivals 250 Bonus Scale".² In this system, the number one overall recruit receives 100 points and fewer points are given to each successive player until the 150th player earns 23 points. Our dependent variable, RECRUITING, is the overall sum of these points for each college in a given year. All 135 NCAA D1 colleges that signed a top-150 recruit during the

¹ The 2014 and 2015 champions, UConn and Duke, fielded rosters that contained seven and eight top-150 recruits, respectively.

² <https://footballrecruiting.rivals.com/content.asp?SID=880&CID=1364602>

13 years for which Rivals.com has released recruiting data (2003-2015) are included in the dataset. On average, teams earned 44.7 recruiting points each year.

Variables were chosen based on prior research and conventional wisdom to represent three distinct categories—basketball, coaching, and scholastic. Eleven basketball-specific variables are included. To account for the availability of nearby talent, we created the variable, STATETALENT, which is calculated by dividing the available in-state recruiting points for each college by the number of power conference teams in that state. We included seven variables measuring recent and historical on-court success. WIN1 is the winning percentage in the season immediately prior to recruiting. We also developed variables indicating whether a team finished its most recent season ranked among the top-25 in the AP poll (RANKED1), the number of times the college was ranked in the prior five years (RANKED5) and in team history (RANKEDAT). We created similar variables for NCAA championships (CHAMP1, CHAMPS5, and CHAMPSAT). By including multiple measures of on-court success, we are able to better analyze the motivations of recruiting outcomes.

Because recruits may wish to attend a college with a history of developing NBA-level talent, we created DRAFT5, which is the number of draftees from each college in the previous five years. We also include stadium capacity (STADIUM), under the assumption that colleges with larger venues may have enhanced fan following or better financial support. Lastly, POWERCONFERENCE is a dummy variable indicating if the team competes in one of the six power conferences (ACC, Big East, Big 10, Big 12, Pac-12, and SEC).

We created five coaching variables. COACHNEW1 and COACHNEW2 are dummy variables indicating whether each team has a first or second-year coach, respectively, during a recruit's first collegiate season. Similarly, COACHEXP is the number of years a coach has served as a head coach at any D1 NCAA program. We also included COACHCHAMPSAT, which indicates the number of NCAA titles a coach has attained.

Finally, we constructed variables regarding the scholastic and demographic nature of the college. ACCEPTANCE indicates the percentage of new applicants to a college that were accepted between 2003 and 2012 and RESEARCH is a dummy variable indicating whether the college is labeled as a “very high research activity” institution by the Carnegie Classification of Institutions of Higher Education.

After data collection, we estimated the following model using ordinary least squares (OLS):

$$\begin{aligned} \text{BRECRUITING}_{it} = & \beta_0 + \beta_1 \text{STATEGUARDTALENT}_{it} + \beta_2 \text{WIN1}_{it} + \beta_3 \text{RANKED1}_{it} + \\ & \beta_4 \text{CHAMPS1}_{it} + \beta_5 \text{RANKED5}_{it} + \beta_6 \text{CHAMPS5}_{it} + \beta_7 \text{RANKEDAT}_{it} + \beta_8 \text{CHAMPSAT}_{it} + \\ & \beta_9 \text{DRAFT5}_{it} + \beta_{10} \text{STADIUM}_{it} + \beta_{11} \text{POWERCONFERENCE}_{it} + \beta_{12} \text{COACHNEW1}_{it} + \\ & \beta_{13} \text{COACHNEW2}_{it} + \beta_{14} \text{COACHEXP}_{it} + \beta_{15} \text{COACHCHAMPSAT}_{it} + \\ & \beta_{16} \text{ACCEPTANCE}_{it} + \beta_{17} \text{RESEARCH}_{it} + \varepsilon_{it} \end{aligned}$$

where recruiting points for college i in year t are regressed on relevant independent variables. In addition, we estimated a regression that only includes players listed as guards. This inclusion was motivated by Treme et al. (2011), who found that signing top-ranked guards (but not forwards or centers) leads to immediate on-court success—each additional five star guard signed led to 1.6 more wins in the player’s freshman season. While the total system-wide recruiting points are fixed in a given year, recruiting points for each position are not. For example, 79 of the top-150 recruits were guards in 2010, whereas only 67 guards were among the top-150 in 2011. For this reason, we included fixed effects for each recruiting year in the guards-only regression. In doing so, we account for differences in available recruiting talent each year. In addition, the variable STATELENT only includes recruiting points for guards in this fixed effects regression.

III. Results

Regression results are presented in Table 1; first, we focus on the OLS model for players of all positions. Among basketball-specific variables, eight are significant at the 5% level. We find a positive correlation for STATETAENT, indicating that teams located in a state with many top-150 players will tend to out-recruit teams that have less available in-state talent. We also find a positive coefficient for WIN1 and RANKED1; the coefficient for the latter variable indicates that finishing a season ranked is correlated with 17.4 more recruiting points. Considering that the 150th-rated recruit is worth 23 recruiting points, the coefficient for RANKED1 is quite substantial. While finishing a season ranked may immediately impact recruiting, the lack of significance for RANKED5 indicates that these benefits are short-lived. However, historical success does play a role in recruiting, as indicated by the coefficients for RANKEDAT and CHAMPSAT. Interestingly, we find no significance for CHAMPS1 or CHAMPS5.

[Table 1 near here]

Teams that send players to the NBA can expect greater recruiting outcomes; for each additional draftee in the prior five seasons, a college can expect 8.0 more recruiting points. We also find positive and significant coefficients for STADIUM and POWERCONFERENCE, indicating that teams with large stadiums, playing in power conferences, will receive a recruiting boost.

Three of four coaching variables are significant, although the signs indicate that coaching experience does not unilaterally influence recruiting. Teams with first-year head coaches receive substantially lower recruiting outcomes, but this effect does not persist into a coach’s second year. Interestingly, we find a negative correlation for COACHEXP, suggesting that coaches with

less experience out-recruit veteran coaches.³ Not surprisingly, we find that coaches with NCAA titles enjoy enhanced recruiting.

Finally, we find mixed results for the scholastic variables. While we do not find any significance for ACCEPTANCE, we find a positive and significant sign for RESEARCH, indicating that research institutions earn greater recruiting outcomes than otherwise similar schools. While this could suggest that recruits prefer better academic schools, it's also possible that research institutions have other characteristics that improve recruiting outcomes.⁴

Next, we estimated a model containing recruits that are listed as guards. We find a major disparity for WIN1, which is highly significant in the model containing all players, but insignificant for guards. Similarly, we find a much smaller coefficient for RANKED1. Compared to the recruiting of top players, in general, it appears that the recruiting of guards is less dependent on teams' recent on-court success. The other major disparity between the regressions is found among the coaching variables. While coefficients for COACHEXP and COACHCHAMPSAT are significant in the baseline model, they are not clearly relevant in the guards-only regression. Considering these results in aggregate, it appears that the determinants of recruiting for top-150 guards is similar, but not equivalent to, the recruiting of top-150 players in general.

IV. Conclusions

This study examines the determinants of recruiting success among division 1 NCAA men's basketball teams. Our results suggest that the availability of in-state talent, winning percentage and finishing ranked in the AP poll in the year prior to recruiting, total all-time championships and ranked seasons, recent draft picks, stadium size, and playing in a power conference are all significantly correlated with recruiting ranking. Recruiting is also correlated with three of four coaching variables; recruiting outcomes are lower for first-year coaches and experienced coaches, while head coaches with NCAA titles receive a recruiting boost. Lastly, we find that research institutions achieve better recruiting outcomes than other colleges. Prior research (Treme et al., 2011) indicates that guards provide more immediate impact to on-court success than forwards or centers. To investigate this idea, we estimate a model including only guards. We find a few differences between this model and the regression including all players; most notably, recent on-court success for college teams seems to be far less important in the recruiting of guards than for top-150 players in general. We hope that our research encourages further investigation and look forward to developing a more thorough study as more recruiting data become available.

³ We suspected this could result from players avoiding older coaches. However, when coaching age was included in regressions, it was insignificant and the negative coefficient for COACHEXP remained.

⁴ For example, research institutions usually have more students; recruits may prefer to attend large institutions.

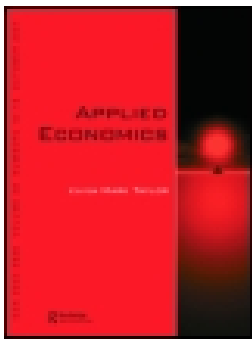
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Table 1. OLS and Fixed Effects Results

Basketball Variables	All Players		Guards Only	
	Coefficient	pValue	Coefficient	pValue
STATETALENT	0.102	<0.000**	0.119	<0.000**
WIN1	0.142	0.044*	0.049	0.25
RANKED1	17.389	<0.000**	4.774	0.044*
CHAMPS1	13.759	0.35	8.867	0.32
RANKED5	2.374	0.12	1.650	0.078
CHAMPS5	-4.123	0.58	2.459	0.59
RANKEDAT	0.391	0.001**	0.103	0.16
CHAMPSAT	5.054	<0.000**	2.219	<0.000**
DRAFT5	8.019	<0.000**	2.765	<0.000**
STADIUM	1.392	<0.000**	0.484	0.003**
POWERCONFERENCE	24.544	<0.000**	11.930	<0.000**
Coaching Variables				
COACHNEW1	-14.044	<0.000**	-5.107	0.009*
COACHNEW2	5.342	0.099	1.572	0.43
COACHEXP	-0.446	0.004**	-0.129	0.18
COACHCHAMPSAT	8.707	0.001**	2.925	0.061
Scholastic Variables				
ACCEPTANCE	6.695	0.26	4.728	0.19
RESEARCH	5.775	0.029*	3.174	0.050
INTERCEPT	-28.054	0.001**	-12.008	0.001**
Model Stats				
<i>n</i>	1753		1753	
<i>R</i> ²	0.495		0.303	

Note: * and ** denote significance at 5 and 1% levels, respectively.



Evidence on the importance of cognitive ability tests for NFL quarterbacks: what are the relationships among Wonderlic scores, draft positions and NFL performance outcomes?

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Evidence on the importance of cognitive ability tests for NFL quarterbacks: what are the relationships among Wonderlic scores, draft positions and NFL performance outcomes?

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ABSTRACT

Employing data on National Football League (NFL) quarterbacks drafted between 2002 and 2012, the authors consider whether factors correlated with a quarterback being more productive in the NFL are the same factors that correlate with an improved draft position. In particular, the authors consider the relevance of scores on the Wonderlic test. Contrary to all prior literature on the subject, the authors find that performance on the Wonderlic test is positively correlated with NFL performance. However, the authors find no clear evidence that Wonderlic scores are correlated with draft position. Beyond this primary finding, the authors reveal many other interesting results that should help researchers better understand a quarterback's progression from college to the NFL.

KEYWORDS

NFL draft; NFL productivity; Wonderlic; football

JEL CLASSIFICATION

L83; M51; Z20; Z22

I. Introduction

One of the most important determinants of a National Football League (NFL) franchise's long-term success is its choices in the annual NFL draft. The selections that a franchise makes on draft day can elevate a team to contender status or lead to a path of perpetual disappointment. This is especially true for the drafting of quarterbacks, which is clearly evident when considering the performance of NFL franchises during the 2016–2017 NFL season. The final four teams remaining in the NFL playoffs – Atlanta Falcons, Green Bay Packers, New England Patriots and Pittsburgh Steelers – all possessed elite quarterbacks by most standards. The starting quarterbacks for all four teams were attained through the NFL draft and all of these quarterbacks have spent their entire professional careers (an average of nearly 13 seasons) playing for the same franchises. Considering the importance of the NFL draft, it is not surprising that franchises are willing to devote significant time and resources to evaluating prospects, particularly at the quarterback position.

Despite the enormous amount of effort put into evaluating talent at the quarterback position by numerous people, forecasting productivity and

selecting the best quarterback prospect is neither an exact science nor a simple process. College quarterbacks often start for only one or two seasons, compete against disparate levels of competition and participate in offences that are often far different from traditional NFL systems. With so many factors to consider, which characteristics *should* teams pay close attention to on draft day? In our research, we consider (A) the factors that NFL teams *should* emphasize when drafting quarterbacks, based on past performance of NFL quarterbacks and (B) the factors that NFL teams actually seem to consider, based on selections in prior drafts. By analysing both of these factors simultaneously, we are able to see if there are some factors that NFL franchises are systematically overemphasizing or failing to appropriately include in their considerations.

In the current article, we choose to focus much of our analysis on the Wonderlic test. This cognitive ability test, developed by Eldon F. Wonderlic in 1936, consists of 50 multiple choice questions. A participant's score on this exam is simply the number of correct answers he attains during the 12 min provided. One need only browse the internet to determine that most members of sports media find

little value in administering the Wonderlic test to potential NFL quarterbacks.¹ More so, previous academic literature offers no evidence that scores on the Wonderlic test are correlated with the NFL productivity of quarterbacks. However, our study offers ample evidence that there is indeed a significant relationship between Wonderlic scores and productivity for NFL quarterbacks. Despite this finding, we show that Wonderlic scores are not significant in determining the draft positions of quarterbacks. Thus, it appears that NFL franchises are failing to account for the value of Wonderlic scores when evaluating and drafting quarterbacks.

II. Literature review

The majority of prior studies on the subject consider the impact of various factors related to a player's collegiate career on either draft position, NFL productivity or both. There is evidence that collegiate productivity, speed, height, body mass index (BMI) and variables measuring a player's performance in various NFL combine drills are significant predictors of when a player will be selected in the NFL draft and, to a lesser extent, his NFL productivity (Treme and Allen 2009; Berri and Simmons 2011; Wolfson, Addona, and Schmicker 2011; Mulholland and Jensen 2014; Weir and Wu 2014). In these studies, NFL productivity is typically measured by number of games played, number of games started and position specific statistics such as passing yards, net points (see Berri, Schmidt, and Brook 2006) or approximate value.

Some studies show that players from Bowl Championship Series (BCS) universities and schools ranked in the final Associated Press Top 25 poll tend to be selected earlier in the NFL draft, relative to otherwise comparable prospects.² In a study by Kitchens (2015), this finding is reported as evidence of statistical discrimination in hiring in the NFL labour market. Hendricks, DeBrock and Koenker (2003) find additional evidence of statistical

discrimination. Their research reveals that players entering the draft from Football Bowl Subdivision (FBS) schools are selected earlier than players from Football Championship Series (FCS) schools.³ Yet, players from FCS schools actually have longer careers than players from FBS schools, other things equal.

Another strand of literature, in the Exercise Science discipline, focuses more closely on the NFL combine. These studies typically seek to determine whether there are statistically significant correlations between NFL productivity and the variables measured at the combine. For example, Kuzmits and Adams (2008) do not find any consistent evidence of a statistically significant relationship between the combine variables and their NFL performance measures, except in the case of sprint drills for running backs, in which faster times are correlated with being selected earlier in the NFL draft.

Additionally, there is a strand of literature that gives specific attention to the impact of a player's Wonderlic score on his draft position and expected NFL productivity; these studies are of particular interest to the current research. There is disagreement between these studies as to the importance of Wonderlic scores in determining draft order. Berri and Simmons (2011), Gill and Brajer (2012) and Welter (2013) all find that a player's Wonderlic test score has a significant impact on when he is selected in the NFL draft. Alternatively, Mirabile (2005) and Lyons, Hoffman and Michel (2009) find no evidence of a significant relationship between Wonderlic scores and draft order. Gill and Brajer (2012) do not examine the relationship between Wonderlic scores and NFL productivity for quarterbacks. However, Lyons, Hoffman and Michel (2009), Mirabile (2005), Welter (2013) and Berri and Simmons (2011) find no significant relationship between Wonderlic scores and NFL productivity.

As explanatory variables in regression models, a few studies include pre-draft player rankings constructed by media outlets (Treme and Allen 2009;

¹For example, see the following: (1) <http://bleacherreport.com/articles/1130900-nfl-draft-2012-how-important-is-a-wonderlic-score-to-on-field-success>, (2) <http://www.sportingnews.com/nfl/news/wonderlic-test-nfl-combine-results-past-scores-does-it-predict-success/2y203zun9z7g1kpu2nuasywkj>, (3) https://en.wikipedia.org/wiki/Wonderlic_test#Predictor_of_success_in_the_NFL, (4) <https://www.theguardian.com/sport/blog/2015/feb/17/testing-the-nfls-wonderlic-do-athletes-really-need-to-be-smart-to-succeed> and (5) <http://profootballtalk.nbcsports.com/2013/04/18/were-officially-out-of-the-wonderlic-business/>. Last Accessed 2 March 2017.

²BCS universities include schools belonging to the Atlantic Coast, Big East, Big 12, Big Ten, Pacific-12 and Southeastern conferences as well as Notre Dame.

³FBS universities include schools from the aforementioned BCS conferences as well as those belonging to the Mid-American, Conference USA, Mountain West, Sun Belt and Western Athletic conferences. FCS universities include those schools playing a tier below FBS schools in the NCAA system.

Gill and Brajer 2012; Kitchens 2015). However, it would seem that these pre-draft player rankings may obscure the relevance of other explanatory variables in models predicting draft outcomes. For example, these pre-draft rankings may make it difficult to determine the relationship between productivity in college or performance at the NFL combine and draft order if players who are highly productive in college or excel at the NFL combine are the same players who receive better pre-draft rankings.

The current study also differs from the existing literature in other important ways. For example, the study by Lyons, Hoffman and Michel (2009) essentially only includes dummy variables identifying position along with Wonderlic scores and fails to account for anything else that might be correlated with NFL productivity. Also, in several of their regressions, the authors employ several interaction terms between Wonderlic scores and position dummies, which could lead to high SEs for their Wonderlic variable. Mirabile (2005) only examines quarterbacks drafted between 1989 and 2004; thus, there is little overlap between our samples. Furthermore, we consider very different measures of NFL productivity in our study. The primary NFL outcomes measured by Mirabile (2005) are quarterback salaries and quarterback ratings during players' rookie seasons. Similarly, Welter (2013) considers different NFL productivity measures than those employed in our study. The primary NFL outcomes measured by Welter (2013) are number of plays per season and quarterback rating. Berri and Simmons (2011) only examine the NFL productivity of quarterbacks who played in at least 100 games at some point during their first 4 years in the NFL, while the current study considers the NFL productivity of all quarterbacks drafted between 2002 and 2012. Lastly, Berri and Simmons (2011) and Welter (2013) do not employ average productivity per season as the dependent variable in their models. Rather, both studies appear to treat individual NFL seasons for quarterbacks as separate observations, and they use different estimation methods to correct for the interdependence of errors associated with

such a sampling procedure. For these reasons, a new and more comprehensive study using updated data should improve researchers' understanding on the role of Wonderlic scores as a predictor of NFL success.

III. Data and empirical methods

The data for this study are collected from multiple sources, which are listed at the bottom of Table 1. All quarterbacks selected in the NFL draft between 2002 and 2012 who completed the Wonderlic test are included in the sample.⁴ This time period is chosen for sample inclusion due to

Table 1. Definitions of variables.

Variable	Definition
BCS ^b	Equals 1 if quarterback played for a BCS university; 0 otherwise
Win% ^b	Winning percentage of quarterback's university in his final collegiate season
NFL coach ^{ab}	Equals 1 if quarterback's head coach in his final collegiate season was previously an NFL head coach; 0 otherwise
QB drafted ^a	Number of quarterbacks from a player's university selected in the NFL draft in the five years preceding the player's selection in the NFL draft
Early exit ^b	Equals 1 if quarterback enters the NFL draft before his collegiate eligibility is exhausted; 0 otherwise
BMI ^b	Quarterback's BMI calculated as (weight × 703)/height ²
Height ^b	Quarterback's height measured in inches
Forty ^{cd}	Quarterback's time in the 40-yard dash measured in seconds
Pass yards/att ^b	Quarterback's passing yards per attempt in his final collegiate season
Comp% ^b	Quarterback's completion percentage in his final collegiate season
INT% ^b	Quarterback's interception percentage in his final collegiate season
Heisman finalist ^b	Equals 1 if quarterback was ever a Heisman Trophy finalist during his collegiate career; 0 otherwise
Wonderlic ^d	Quarterback's score on the Wonderlic test
Media ^f	Number of news entries focused on quarterback in the month preceding the NFL draft
PICK ^e	Quarterback's draft position in the NFL draft
NFL outcomes	
Games started ^a	Number of games started per season during quarterback's NFL career
Approximate value ^a	Quarterback's approximate value per season during his NFL career
NFL wins ^a	Number of wins per season during quarterback's NFL career
NFL pass yards ^a	Quarterback's passing yards per season during his NFL career

^aPro-Football-Reference.com, ^bsports-reference.com/cfb, ^cnfldraftscout.com, ^dnflcombinerresults.com, ^eNFL.com, ^fLexis Nexis Academic. NFL: National Football League; BCS: Bowl Championship Series; BMI: body mass index.

⁴Only 16 of the 137 quarterbacks drafted between 2002 and 2012 did not complete the Wonderlic test. Furthermore, only 3 of these 16 quarterbacks were selected earlier than the sixth round – Andrew Walter (third round), Isaiah Stanback (fourth round) and Jonathan Crompton (fifth round), which suggests elite prospects are not skipping the Wonderlic test. Also, only 8 of these 16 quarterbacks actually attended the NFL combine. Thus, very few quarterback prospects appear to have self-selected out of taking the Wonderlic test. At any rate, to check the robustness of our results, a Heckman selection model was estimated by both maximum likelihood and the two-step method. The results are nearly identical to those presented in Table 4. Thus, to save space, we do not report these results in the article, but they are available upon request.

the addition of the Houston Texans in 2002; thus, 32 teams are participating in the NFL draft over the entire time period examined. Also, except in the case of players with careers shorter than 4 years, this allows for at least 4 years of data collection to calculate average NFL productivity measures for each player. Definitions of each variable used in the empirical analysis are reported in Table 1. In Table 2, descriptive statistics are reported for the non-binary variables and frequency distributions are provided for the binary dummy variables.

In order to examine the relationship between individual and school characteristics of a quarter-

back and the spot he is selected in the NFL draft, the following OLS regression is estimated:

$$PICK_i = x'_i\beta + y'_i\gamma + \varepsilon_i \quad (1)$$

where $PICK_i$ is the draft position of quarterback i , x'_i is a set of school characteristics, y'_i is a set of individual player characteristics, β and γ are parameters to be estimated and ε_i is a random error term.

School characteristics include a dummy variable indicating whether or not the quarterback attended a BCS university (*BCS*) and a dummy variable indicating whether or not the quarterback's head coach during his final collegiate season had any previous experience as an NFL head coach (*NFL coach*). Also, the winning percentage (*Win%*) of each quarterback's university is collected for the player's final collegiate season. Lastly, attending universities well known for producing NFL quarterbacks may have an impact on a player's draft position given that teams have imperfect information about players. To account for this potential relationship, we construct the variable, *QB drafted*, which accounts for the number of quarterbacks from a player's university, over the previous 5 years, who were selected in the NFL draft.

Because highly coveted prospects may choose to leave college early, we include the variable, *early exit*, which is simply a dummy variable indicating whether a quarterback had any college eligibility remaining when he entered the NFL draft. We also include a dummy variable indicating whether a quarterback was a Heisman trophy finalist (*Heisman finalist*) in addition to a quarterback's height (*height*), *BMI* and 40-yard dash time (*forty*).⁵ Lastly, we account for a quarterback's score on the Wonderlic test (*Wonderlic*), his passing yards per attempt in his final collegiate season (*Pass yards/att*), his completion percentage in his final collegiate season (*Comp%*) and his interception percentage in his final collegiate season (*INT%*).

In order to examine the relationship between individual and school characteristics of a quarterback and his productivity in the NFL, the following OLS regression is estimated:

$$PROD_i = x'_i\beta + y'_i\gamma + \varepsilon_i \quad (2)$$

Table 2. Descriptive statistics for non-binary variables and frequency distributions for binary variables.

Descriptive statistics		
Variable	Mean and SD	
Win%	69.09 (19.57)	
QB drafted	0.65 (0.80)	
BMI	27.88 (1.31)	
Height	75.40 (1.73)	
Forty	4.80 (0.17)	
Pass yards/att	8.00 (0.98)	
Comp%	62.34 (5.25)	
INT%	2.48 (0.99)	
Heisman finalist	0.27 (0.45)	
Wonderlic	27.66 (7.03)	
PICK	107.23 (80.31)	
Media	37.98 (55.07)	
NFL outcomes		
Games started	4.35 (4.94)	
Approximate value	3.03 (4.13)	
NFL wins	2.04 (2.81)	
NFL pass yards	947.64 (1157.11)	
Frequency distributions		
Variable	0	1
BCS	40	81
NFL coach	109	12
Early exit	100	21

Total number of observations = 121.

SDs are in parenthesis under the means for non-binary variables.

NFL: National Football League; BCS: Bowl Championship Series; BMI: body mass index.

⁵If a quarterback's 40-yard dash time is unavailable at *nflcombineresults.com*, then the measure is obtained from *nfldraftscout.com*.

where $PROD_i$ represents the NFL productivity of quarterback i , δ reveals the relationship between draft position and NFL productivity and all other variables and parameters are as previously defined. The NFL productivity measures include games started per season (*games started*), approximate value per season (*approximate value*), wins per season (*NFL wins*) and passing yards per season (*NFL pass yards*).⁶

We also estimate a variation of Equation (2) that accounts for a quarterback's draft position. The following equations are estimated via a two-stage least squares (TSLS) regression in order to examine a quarterback's NFL productivity while accounting for his draft position:

$$PICK_i = x'_i\beta + y'_i\gamma + \alpha Media_i + \varepsilon_i \quad (3)$$

$$PROD_i = x'_i\beta + y'_i\gamma + \delta PICK_i + \varepsilon_i \quad (4)$$

where $Media_i$ is the number of news entries focusing on a quarterback in the month preceding the NFL draft according to Lexis Nexis Academic, α is a parameter to be estimated and all other variables and parameters are as previously defined. The media coverage variable is the instrument used to estimate the TSLS regression. Hausman's test of endogeneity developed by Cameron and Trivedi (2005) indicate that TSLS is more appropriate than OLS when including $PICK$ as an explanatory variable in Equation (4) for all of the various NFL outcomes measured in this study.

IV. NFL draft results

Table 3 presents the OLS results for the draft position regressions.⁷ The second column of results includes fixed effects for the year in which a quarterback was drafted, while the first column does not include these year fixed effects. Results with year fixed effects included are reported to account for changes in demand for quarterbacks across years as well as to account for particularly strong/weak

quarterback draft classes.⁸ The majority of the findings presented in Table 3 align with findings from previous research. For example, our results show that taller quarterbacks with faster 40-yard dash times tend to be selected earlier in the draft, other things equal. A one SD increase in a quarterback's height is associated with him being selected about 26 spots earlier in the draft, while a 1 SD improvement in a quarterback's 40-yard dash time is related with him being selected about 18 spots earlier in the draft. Similar to Weir and Wu (2014), there is no evidence that a quarterback's draft position is improved by staying in college longer than required, as evidenced by an insignificant coefficient for *early exit*. Similar to Berri and Simmons (2011), we find some evidence that quarterbacks with higher BMIs tend to be selected earlier in the draft, all else equal. Also, similar to Berri and Simmons (2011), we find no evidence that a quarterback's passing yards per attempt in college is correlated with draft position.

There is no clear evidence that a quarterback's interception percentage or winning percentage in his final collegiate season impacts his draft position. Similarly, we do not find any evidence that playing for a head coach with previous NFL head coaching experience impacts the draft position of quarterbacks. Also, similar to Weir and Wu (2014), we find no evidence that quarterbacks from BCS colleges are selected earlier in the draft, other things equal. However, quarterbacks who are Heisman finalists in college do tend to be selected about 61–64 spots earlier in the NFL draft than otherwise similar quarterbacks who were not Heisman finalists. It is likely that this variable captures attributes that are otherwise difficult to measure such as perceived character and leadership ability as these are often, but not always, traits associated with Heisman Trophy candidates. Thus, it makes sense that quarterbacks receiving this recognition in college would tend to be drafted higher in the NFL.

The results also suggest that a one SD increase in a quarterback's completion percentage in his final

⁶Details on the calculation of the approximate value measure created by mathematician Doug Drinen and reported by Pro-Football-Reference.com are available at http://www.pro-football-reference.com/blog/?page_id=8061.

⁷In addition to the OLS regressions reported in Table 3, ordered probit estimates were obtained using the round in which a player was selected as the dependent variable. The results for these models are extremely similar to those reported in Table 3. To save space, they are not reported here but are available upon request.

⁸For example, if there are many strong quarterback prospects in a given draft, a prospect may be selected later in the draft than he would be if the quarterback pool was more typical. Conversely, a prospect in a weak draft year for quarterbacks will probably be drafted earlier if there are few strong prospects.

Table 3. OLS draft position regression.

Variable	Without year fixed effects	With year fixed effects
Constant	1054.23*** (2.94)	1188.71*** (3.12)
BCS	-12.78 (-0.96)	-12.58 (-0.85)
Win%	0.64 (1.56)	0.55 (1.27)
NFL coach	8.20 (0.40)	19.84 (0.94)
QB drafted	-15.79* (-1.86)	-17.96** (-2.12)
Early exit	-22.25 (-1.21)	-17.33 (-0.87)
BMI	-9.47** (-2.03)	-7.55 (-1.56)
Height	-14.18*** (-3.08)	-15.88*** (-3.40)
Forty	114.78** (2.51)	98.45** (2.08)
Pass yards/att	3.25 (0.43)	8.69 (1.05)
Comp%	-2.79* (-1.94)	-3.62* (-1.96)
INT%	4.13 (0.60)	2.40 (0.31)
Heisman finalist	-61.18*** (-3.24)	-63.56*** (-3.52)
Wonderlic	-1.21 (-1.25)	-0.93 (-0.85)
R^2	0.35	0.41
Adjusted R^2	0.28	0.28

Robust t -statistics are in parenthesis under the coefficients.

*Significant at the 10% level; **significant at the 5% level; ***significant at the 1% level.

NFL: National Football League; BCS: Bowl Championship Series; BMI: body mass index.

collegiate season is associated with him being selected about 17 spots earlier in the NFL draft. Interestingly, we find that quarterbacks from collegiate programmes with a recent record of producing NFL quarterbacks tend to be selected earlier in the NFL draft. A one SD increase in the number of quarterbacks selected from a quarterback's university in the previous 5 seasons is correlated with him being selected about 14 spots earlier in the draft. It is likely that this finding is related to imperfect information in the draft. If a quarterback is coming from the same collegiate programme that recently produced an NFL quarterback, then coaches and general managers likely view this as a positive attribute for the quarterback.

Lastly, in regards to Wonderlic test scores, our findings align with Mirabile (2005) and Lyons, Hoffman and Michel (2009) and run contrary to Berri and Simmons (2011), Gill and Brajer (2012) and Welter (2013). That is, we do not find statistically significant evidence that a quarterback's Wonderlic score impacts his draft position.

Table 4. OLS NFL productivity regressions not accounting for draft position.

Variable	Games started	Approximate value	NFL wins	NFL pass yards
Constant	-57.01** (-2.20)	-31.22 (-1.34)	-29.06* (-1.82)	-10,425.20 (-1.60)
BCS	1.15 (1.27)	1.00 (1.30)	0.47 (0.83)	237.92 (1.09)
Win%	-0.002 (-0.10)	-0.01 (-0.69)	-0.004 (-0.30)	-1.14 (-0.22)
NFL coach	0.38 (0.22)	0.43 (0.32)	0.36 (0.39)	216.12 (0.49)
QB drafted	-0.10 (-0.20)	-0.38 (-0.99)	-0.17 (-0.65)	-63.62 (-0.54)
Early exit	0.48 (0.42)	0.33 (0.35)	0.19 (0.28)	259.40 (0.86)
BMI	0.70** (2.58)	0.50** (2.11)	0.36** (2.45)	108.93 (1.66)
Height	0.78*** (2.79)	0.44* (1.66)	0.37* (1.96)	136.29* (1.94)
Forty	-5.50** (-2.19)	-5.03** (-2.48)	-2.77** (-2.05)	-782.42 (-1.21)
Pass yards/att	0.56 (1.13)	0.68 (1.50)	0.35 (1.17)	119.83 (1.00)
Comp%	-0.02 (-0.29)	0.02 (0.34)	0.002 (0.05)	-6.06 (-0.31)
INT%	0.04 (0.10)	0.13 (0.43)	0.06 (0.30)	-14.73 (-0.16)
Heisman finalist	4.05*** (3.65)	3.59*** (3.75)	2.53*** (3.95)	846.49*** (3.00)
Wonderlic	0.17*** (2.95)	0.12** (2.60)	0.09*** (2.95)	33.89** (2.33)
R^2	0.35	0.35	0.34	0.27
Adjusted R^2	0.27	0.28	0.26	0.18

Robust t -statistics are in parenthesis under the coefficients.

NFL: National Football League; BCS: Bowl Championship Series; BMI: body mass index.

*Significant at the 10% level; **significant at the 5% level; ***significant at the 1% level.

V. NFL productivity results

Table 4 presents the NFL productivity regression results without accounting for a quarterback's draft position. Many of these findings are also in agreement with previous research. For example, the findings suggest that taller, bigger and faster quarterbacks tend to be more productive in the NFL, other things equal. Based on the SDs reported in Table 2 and the OLS results reported in Table 4, a 1 SD increase in a quarterback's height is associated with him starting about 1.35 more games per season, earning about a 0.76 higher approximate value per season, winning about 0.64 more games per season and throwing for about 236 more yards per season. Similarly, a one SD improvement in a quarterback's 40-yard dash time is associated with him starting about one more game per season, earning about a 0.86 higher approximate value per season and winning about 0.47 more games per season. Only Berri and Simmons (2011) find no relationship between a quarterback's 40-yard dash time and his expected NFL productivity.

We also find that quarterbacks who were Heisman Trophy finalists in college tend to be more productive in the NFL. Based on the results reported in Table 4, other things equal, Heisman Trophy finalists tend to start about 4 more games per season, have approximate values per season about 3.59 points higher, win about 2.53 more games per season and pass for about 846 more yards per season than quarterbacks who were not Heisman Trophy finalists. Similar findings are reported in Table 5 for Heisman Trophy finalists. When comparing these findings for Heisman Trophy finalists to the means for the NFL outcomes reported in Table 2, there is much evidence that Heisman Trophy finalists enjoy substantially more productive careers than otherwise similar quarterbacks who were not Heisman Trophy finalists in college. This suggests that Heisman Trophy voters as a whole exhibit at least some level of proficiency in identifying elite talent at the quarterback position.

Table 5. TSLS NFL productivity regressions accounting for draft position.

Variable	Games started	Approximate value	NFL wins	NFL pass yards
Constant	-71.81* (-1.91)	-45.12 (-1.43)	-35.05 (-1.57)	-13,070.10 (-1.38)
PICK	0.01 (0.54)	0.01 (0.64)	0.01 (0.39)	2.51 (0.39)
BCS	1.33 (1.39)	1.17 (1.46)	0.54 (0.92)	270.00 (1.16)
Win%	-0.01 (-0.42)	-0.02 (-0.98)	-0.01 (-0.48)	-2.75 (-0.44)
NFL coach	0.27 (0.15)	0.32 (0.24)	0.31 (0.34)	195.54 (0.45)
QB drafted	0.12 (0.20)	-0.17 (-0.36)	-0.08 (-0.27)	-24.01 (-0.16)
Early exit	0.79 (0.61)	0.62 (0.58)	0.32 (0.43)	315.23 (0.93)
BMI	0.84** (2.20)	0.62* (1.98)	0.42** (2.01)	132.68 (1.42)
Height	0.97** (2.08)	0.63 (1.57)	0.45 (1.59)	171.85 (1.45)
Forty	-7.11* (-1.74)	-6.54** (-1.99)	-3.42 (-1.55)	-1,070.39 (-1.03)
Pass yards/att	0.52 (1.01)	0.63 (1.37)	0.33 (1.08)	111.68 (0.90)
Comp%	0.02 (0.15)	0.06 (0.69)	0.02 (0.30)	0.94 (0.04)
INT%	-0.02 (-0.05)	0.07 (0.24)	0.04 (0.18)	-25.10 (-0.26)
Heisman finalist	4.91** (2.56)	4.40*** (2.75)	2.88** (2.54)	999.98** (2.08)
Wonderlic	0.19*** (2.81)	0.14** (2.57)	0.09*** (2.73)	36.93** (2.13)
R ²	0.35	0.36	0.34	0.27
Adjusted R ²	0.26	0.27	0.26	0.18

Robust t-statistics are in parenthesis under the coefficients.

*Significant at the 10% level; **significant at the 5% level; ***significant at the 1% level.

NFL: National Football League; BCS: Bowl Championship Series; BMI: body mass index.

Whether or not a quarterback had a collegiate head coach with previous NFL head coaching experience does not appear to be a good predictor of NFL productivity. Similarly, we find no evidence that a quarterback's winning percentage or interception percentage in his final collegiate season is correlated with his productivity in the NFL. Also, contrary to Weir and Wu (2014), we do not find evidence of a significant relationship between whether or not a quarterback exits college early and his NFL productivity. Lastly, contrary to Mirabile (2005) and Weir and Wu (2014), there is no evidence to suggest that quarterbacks from BCS universities enjoy more productive NFL careers, other things equal. Thus, according to our analysis, teams are correct to give little consideration to these variables on draft day, as shown in Table 3.

Table 5 presents the NFL productivity regression results while accounting for a quarterback's draft position. Our findings for these regressions can be best compared with previous studies by Lyons, Hoffman and Michel (2009) and Berri and Simmons (2011) since each of these studies also include a quarterback's draft position in some of their NFL productivity regressions. Lyons, Hoffman and Michel (2009) find evidence that a quarterback's draft position is correlated with his NFL productivity, after controlling for other factors. However, similar to Berri and Simmons (2011), we do not find any evidence that a quarterback's draft position is correlated with his NFL productivity. According to the TSLS estimates reported in Table 5, a quarterback's draft position is not a statistically significant determinant of any of the NFL outcomes measured in our study. This is somewhat of an indictment on the ability of NFL coaches and general managers to sort quarterbacks by productivity in the draft because we would expect the coefficients on the PICK variable to be negative and statistically significant in our regressions if coaches and general managers were adept predictors of a quarterback's expected productivity.

Comparing the results in Tables 4 and 5 to those in Table 3 does offer some suggestions for teams to improve their draft strategies of quarterbacks. The results in Table 3 show that a quarterback's completion percentage in his final collegiate season is significantly correlated with his draft position. However, the variable is not significantly correlated

with a quarterback's NFL productivity in any of the results reported in Tables 4 and 5. Thus, teams appear to be assigning too much weight to a quarterback's collegiate completion percentage on draft day. Similarly, we find no evidence that quarterbacks from college programmes with a recent record of producing NFL quarterbacks have more productive NFL careers, other things equal. However, Table 3 shows that those same quarterbacks do tend to be selected earlier in the draft. Thus, it certainly seems that teams may be relying on this poor predictor of productivity in the face of imperfect information about quarterbacks.

One of the most consistent findings is the significance of Wonderlic scores as a predictor of higher productivity for quarterbacks. This finding is present in both Tables 4 and 5. Thus, not only do we find that NFL teams give little to no consideration to a quarterback's Wonderlic score on draft day, as shown in Table 3, we also find ample evidence that it *should* factor into their draft day decisions regarding quarterbacks. As has been previously mentioned, this finding contradicts all four previous articles that have investigated the relationship between Wonderlic scores and NFL productivity for quarterbacks. Table 2 shows that the average Wonderlic score for our data set is 27.66 with a SD of 7.03. Based on the results presented in Table 5, a one SD increase in a quarterback's Wonderlic score is associated with the quarterback starting about 1.34 additional games each NFL season, earning a 0.98 point higher approximate value per season, winning about 0.63 more games each season and having about 260 more passing yard per season. These relationships may seem small initially, but considering the averages for the NFL productivity variables shown in Table 2, these results are quite meaningful. For example, the average quarterback in our sample only starts about four games per season in the NFL. Thus, an increase of 1.34 expected starts per season is a substantial increase relative to the average. Similarly, the average quarterback in our sample earns an approximate value per season of 3.03. Thus, a 0.98 point increase in approximate value per season is again a substantial increase relative to the average. Similar statements can be made for the other two NFL productivity measures as well. Furthermore, among those variables with significant coefficients in any of the TSLS estimates reported in Table 5

and excluding *Heisman finalist*, a one SD increase in a quarterback's Wonderlic score is correlated with similar or larger increases in expected NFL productivity.

VI. Further discussion on Wonderlic scores and the expected productivity of NFL quarterbacks

We do not mean to overstate the importance of the Wonderlic test as a predictor of NFL productivity for quarterbacks since there are certainly better predictors of a quarterback's NFL productivity; however, scores on the test are shown to have a statistically significant, and rather meaningful, relationship with the number of games started per season, approximate value per season, wins per season and passing yards per season for a quarterback. This finding might be interpreted as evidence of a relationship between intelligence and productivity at the quarterback position; however, there are additional explanations for this relationship. Individuals who score well on the Wonderlic test likely also exhibit other personality traits that are positively correlated with a quarterback's expected NFL productivity. For example, they may exhibit greater attention to detail, better preparation/study habits, better work ethic and more commitment to achieving a goal. Also, since individuals only have 12 min to complete the 50 question Wonderlic test, it may be that quarterbacks who score well on the test simply perform well under pressure or in high stress situations.

Through a thorough meta-analysis of the Psychology literature, Ackerman and Heggestad (1997) show that personality traits such as introversion and stress reaction are negatively correlated with various measures of intelligence, while personality traits such as extroversion are positively correlated with various measures of intelligence. To the extent that a quarterback's Wonderlic score implies his likelihood of possessing these personality traits correlated with intelligence, it makes sense that introverted quarterbacks who respond poorly to stressful situations would experience less productivity in their careers than otherwise similar extroverted quarterbacks whose teammates may view them as more amiable teammates. Thus, there are a number of things that may be correlated with Wonderlic scores, other than just cognitive ability, which may help to explain our findings.

Among academics and many others, Wonderlic scores have garnered a poor reputation as a predictor of NFL performance. However, many coaches, general managers, owners, fans and media pundits often discuss a quarterback's intelligence, work ethic, study/preparation habits, attitude, performance under pressure and other psychological traits likely positively correlated with Wonderlic scores in relation to his ability to comprehend offensive schemes, adjust to various defensive strategies, motivate teammates as well as his ability to understand or read defensive coverages. Thus, it seems that our finding aligns with conventional wisdom.

VII. Discussion on disparate findings

This is the first academic study we are aware of that finds a direct link between a quarterback's Wonderlic score and his productivity in the NFL. As previously mentioned, Mirabile (2005), Lyons, Hoffman and Michel (2009), Berri and Simmons (2011) and Welter (2013) all find no evidence of a relationship between Wonderlic scores and expected NFL productivity for quarterbacks. Our results may differ from those of previous research due to sample selection, differences in measures of NFL productivity or empirical methodology.

It is likely that the difference between our findings and those by Berri and Simmons (2011) is driven by sample selection. Berri and Simmons (2011) include in their sample only quarterbacks who logged at least 100 plays in a given season. Then, rather than examining the career averages of these quarterbacks as we do in our study, they treat individual seasons completed by a quarterback as separate observations. Thus, they are essentially attempting to identify factors correlated with quarterback productivity from a sample heavily weighted towards fairly productive NFL quarterbacks, whereas our sample includes quarterbacks with much less productive careers and is more similar to the sample of quarterbacks available to NFL teams in a draft. Similar to Berri and Simmons (2011), Welter (2013) treats individual seasons by a quarterback as separate observations rather than focusing on the career averages of quarterbacks.

The sample used by Lyons, Hoffman and Michel (2009) does not include only quarterbacks but also players at all NFL positions except offensive linemen,

kickers and punters, and they normalize their NFL performance measures in order to estimate regressions including players from different positions. Furthermore, they only examine the 2002–2004 NFL draft classes. While their sample consists of 762 players, only 32 of those players are quarterbacks. Even with the interaction terms included in their empirical models, it may be difficult to distinguish the impact of Wonderlic scores on quarterback productivity from the impact of Wonderlic scores on the expected productivity of other positions given their sampling and estimation procedures.

Mirabile's (2005) measure of a quarterback's NFL performance is his salary and his passer rating in his rookie season. First, a quarterback's salary in his rookie season is a poor measure of his productivity since it is almost exclusively determined by his draft position. Second, only focusing on a quarterback's rookie season for any productivity measure is likely inadvisable since many quarterbacks tend to have relatively unproductive rookie seasons and may not even play at all during their rookie seasons as they adjust to the differences between college and professional football. Furthermore, focusing only a quarterback's rookie season may discount the importance of Wonderlic scores if quarterbacks with higher Wonderlic scores are better able to adjust to the nuances of professional football following their rookie seasons.

In regards to the disparate findings across the literature concerning the relationship between a quarterback's Wonderlic score and his draft position, it seems that this can largely be explained by the time period under consideration. Berri and Simmons (2011), Gill and Brajer (2012) and Welter (2013) all find a significant relationship between a quarterback's Wonderlic score and his draft position. The samples employed by Berri and Simmons (2011) and Welter (2013) consist of quarterbacks drafted between 1999 and 2008, while the sample employed by Gill and Brajer (2012) consists of quarterbacks drafted between 2004 and 2008. On the other hand, Mirabile (2005), Lyons, Hoffman and Michel (2009) and our study all find an insignificant relationship between a quarterback's Wonderlic score and his draft position. Mirabile's (2005) sample consists of quarterbacks drafted between 1989 and 2004. Lyons, Hoffman and Michel (2009) sample consists of quarterbacks

drafted between 2002 and 2004, and our sample consists of quarterbacks drafted between 2002 and 2012. Thus, the ability of Wonderlic scores to predict a quarterback's draft position seems to vary depending on the time period under consideration, which may be reflective of constantly changing opinions among NFL front office personnel regarding the validity of scores as a predictor of a quarterback's productivity.

VIII. Conclusion

While we find evidence that Wonderlic scores correlate with NFL performance among quarterbacks, we do not find clear evidence that Wonderlic scores correlate with draft position. This puzzling result indicates that Wonderlic scores can be used as an indicator of a quarterback's potential value, but NFL teams seem to be either unaware or unwilling to use the information when making their draft selections. Admittedly, more research is probably needed. Among studies on the subject (including the current research) results are evenly split; three studies find that Wonderlic scores correlate with the draft positions of quarterbacks and three additional studies find no correlation. If NFL teams are indeed ignoring or paying too little attention to a quarterback's Wonderlic score, our research suggests that it should be a much more important consideration when deciding which quarterback to select in the NFL draft. Thus, our findings could be valuable to NFL coaches, managers and executives. In other words, our results regarding Wonderlic scores are not just trivially interesting; rather, NFL teams could use this information to improve their selections of quarterbacks in the NFL draft.

Disclosure statement

No potential conflict of interest was reported by the authors.

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