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Transfer Networks and Talent Flow in the Football Bowl Subdivision Transfer Portal

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This study applied social network analyses to athlete transfers in the Football Bowl Subdivision (FBS) transfer portal from 2019-2024. Utilizing a series of graphs, indicators, and descriptive statistics, the portal's structure and the flow of transfers through conferences and teams were analyzed through a network of effective transfers (i.e., players who made at least one appearance before and after transferring between FBS schools) and a subset of blue-chip transfers (i.e., effective transfers with 4- or 5-star 247 Sports ratings). Results showed autonomous conferences and teams have been central to the portal's inner workings, with many non-autonomous institutions remaining on the periphery. Nonetheless, the non-autonomous conferences and teams tended to experience net gains in transfer volume while the autonomous institutions suffered net losses. This trend reversed when incoming and outgoing transfers were quantified via their associated talent and experience levels, as the autonomous programs typically acquired more talented players.

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The increased commercialization of college sport in recent decades has given rise to lucrative revenue streams for programs operating at its highest levels. During the 2023-2024 fiscal year, the National Collegiate Athletic Association (NCAA) reported nearly $1.4 billion in revenues and a $166 million surplus (Berkowitz, 2025). For NCAA Division I football teams competing in the Football Bowl Subdivision (FBS), the highest level of college football, the financial benefits have become even more immense. Following a $7.8 billion deal with ESPN for the broadcast rights to the College Football Playoff (CFP) through the 2031-2032 season (Dinich, 2024), prominent NCAA conferences and their member schools were granted additional base revenues and incentivized bonuses for CFP participation. Programs in larger conferences, like the Big Ten and Southeastern Conference (SEC), now earn base amounts as high as $21 million a year (Dinich, 2024); furthermore, teams qualifying for the CFP can generate upwards of $6 million in additional revenues for each round of the CFP they advance to (College Football Playoff, 2025). As a result of the increased income, some of the FBS's largest programs, such as those at the University of Texas and Ohio State University, are now reporting annual football revenues as high as $162 million and $127.3 million, respectively (Hughes, 2024).

The links between competitive success and increased revenues in college sport are observable both through the industry's publicized revenue distribution practices and the research conducted by scholars showing how schools' various income streams, such as enrollment, ticket sales, and donations, can increase following periods of athletic success (Chung, 2017; Humphreys & Mondello, 2007; Stinson & Howard, 2008). Institutionally, this has incentivized the hiring of coaches who can field winning teams in a short period of time (Pifer & Huml, 2020). Historically, the primary means by which FBS coaches filled out competitive rosters was through the recruitment of high school graduates (Dumond et al., 2008; Maxcy, 2013; Pifer & Huml, 2020). High-quality recruits, whose skill levels are often quantified by ratings on specialized sites like Rivals and 247 Sports (Caro, 2012; Maxcy, 2013; Pifer et al., 2021), represent valuable commodities in the market for FBS-level talent. Prior studies have shown that recruiting plays a significant role in on-field success, indicating strong relationships between teams' recruiting rankings and their conference winning percentages (Caro, 2012; Maxcy, 2013). Transfer athletes, as an alternative source of talent, have been shown to provide value over traditional recruits (Pifer et al., 2021), but historical mechanisms imposed by the NCAA often hampered the immediate impact these athletes could have and the ease with which they could be procured (Cali, 2014; Carrier & Edelman, 2024; NCSA, 2025). However, in October 2018, the landscape shifted dramatically with the introduction of the transfer portal system (Hosick, 2018).

The NCAA established the transfer portal as a means of introducing more transparency and efficiency to the college-athlete transfer process (Hosick, 2018). Combined with subsequent legislation that provided athletes with greater freedom to change programs and—in the years that followed—the ability to receive direct financial benefits for their name, image, and likeness (NIL), the portal initiated a new era

of college-athlete autonomy and significantly altered the market for playing talent in intercollegiate athletics (Schrotenboer, 2024). From 2021 to 2023, NCAA Division I transfers increased by over 33%, reaching as many as 13,853 in 2023 (NCAA, 2025). Similarly, FBS institutions witnessed a 50% increase in transfers from 2021 to 2023 (NCAA, 2025), with more than 3,500 FBS players entering the portal across the 2023 to 2024 cycles (Schrotenboer, 2024). Amidst the sudden increase in athlete mobility, coaches, administrators, and media members were quick to brand the new-look system as the "wild, wild west" (Weaver, 2021). Prominent coaches both praised and questioned the portal, commending its ability to more quickly improve athletes' and teams' fortunes while simultaneously expressing concerns over increased roster turnover and the timing of its open periods (Corr et al., 2024; Dohrn & Lopez, 2022; Florez, 2025; Nakos, 2024; Schrotenboer, 2024; Stahl, 2024). The NCAA, itself, has insinuated that a "perpetual and unchecked" system resembling free agency in professional sports is disruptive to its typical operations (Schrotenboer, 2024, para. 6).

However, apart from press conference quotes, media-based articles, and the NCAA's self-published statistics, relatively little attention has been devoted to the portal's inner workings, transfer trends, and the quantifiable flow of talent between conferences and schools. If the assumption that transfer athletes provide teams with a more polished commodity holds true (Dohrn & Lopez, 2022; Pifer et al., 2021), and teams can improve through the addition of transfer portal athletes, then a clearer understanding of the talent flowing through the portal is warranted. To date, scholarly research conducted on the transfer portal has mainly focused on situational changes for college athletes following transfers (Dohrn & Lopez, 2022) or challenges in managing team culture amidst steady roster turnover (Corr et al., 2024). Therefore, to build upon these studies and lend clarity to the transfer portal's operations, this study addressed the following research questions:

RQ1: Which FBS conferences and teams have been more or less influential to the transfer portal during its early years of operation?

RQ2: Which FBS conferences and teams have typically experienced net gains or net losses in relation to the volume, experience level, and talent level of incoming and outgoing transfers during the transfer portal era?

In exploring these questions, 4,245 observations of transfer portal entrants in FBS football from 2019 to 2024 were collected, attached to quantifiable levels of playing talent (i.e., 247 Sports and Pro Football Focus ratings) and experience (i.e., snap counts), and then linked to the FBS schools and conferences they moved between. Utilizing social network analyses and descriptive statistics, the structure of the network and the flow of transfers between FBS conferences and teams were mapped out and quantified through various metrics. These quantifications measured the extent to which leagues and programs were involved in and central to the FBS transfer network and whether they typically experienced net gains or net losses in relation to the volume, talent level, and experience level of incoming and outgoing transfers. This approach also provided a snapshot of the internal structure of the

transfer portal during its formative years, visualizing the density of the network and identifying which conferences and teams were more or less likely to function as hubs (distributors) or authorities (receivers) within the portal. Practically, these findings lend clarity to a space in need of more objective and accurate information as the NCAA and its affiliates contemplate future transfer portal regulations (Florez, 2025). Academically, this study provides researchers looking to engage in more precise, theory-driven works with a comprehensive view of the system during its formative years.

Literature Review

Background Information and Industry Reports

In October 2018, the NCAA introduced the transfer portal as a "notification-of-transfer" mechanism that effectively allowed college athletes to alert new programs to their availability by entering their name in an electronic database (i.e., the portal) accessible by other NCAA institutions (Dohrn & Lopez, 2022; Pifer et al., 2021). According to the NCAA, the portal was intended, in part, to end "the controversial practice in which some coaches or administrators would prevent students from having contact with specific schools" (Hosick, 2018, para. 4). A series of rule changes spurred by legal challenges to the NCAA followed the portal's introduction, culminating most recently in an April 2024 ruling that permitted college athletes to transfer with immediate eligibility so long as specific academic requirements were being met (Russo, 2024). The windows during which college athletes can transfer are sport-specific, but—like many requirements surrounding transfers—they change frequently following court filings and closer scrutiny from stakeholders (Olson, 2024; Russo, 2024). For the 2024-2025 academic year, the windows for FBS football lasted from December 9 to December 28 and April 16 to April 25 (Olson, 2024). The portal also opens for 30 days to players whose head coaches have left for a different program and allows graduate students to enter during the academic year.

Functionally speaking, the transfer portal helps facilitate the movement of playing talent between different athletic programs. This provides teams with an additional pool of more established players to recruit from and gives players more power in choosing where they want to play (Dohrn & Lopez, 2022; Pifer et al., 2021). Prior studies on other NCAA revenue sports have demonstrated the relatively higher productivity of transfer talent in comparison to high school recruits (Pifer et al., 2021), with these players often viewed as being more established and better-known commodities in relation to their freshman peers. Before the portal's advent, college athletes had to undergo more rigorous and potentially penalizing processes to change programs. Mobility was contractually limited, to an extent, by the National Letter of Intent, and hardship waivers were required in many cases to transfer without having to sit out a season (Carrier & Edelman, 2024; NCSA, 2025; Pifer et al., 2021). However, the recent changes lifting many of these restrictions have granted players more freedom to find a new program so long as they follow the proper timelines and notification procedures with their compliance office (Dohrn & Lopez, 2022).

These changes have led some in the industry to compare the modern market for college athletes with the "free agency" system in many professional sports leagues (Corr et al., 2024; Schrotenboer, 2024), and industry research conducted by the NCAA and affiliated groups seems to support the assertion that college-athlete mobility is rising. From 2021 to 2023, the NCAA documented a steady rise in portal entries among FBS football players, with estimates showing 2,273 athletes entered the portal in 2023 compared to 1,512 in 2021 (NCAA, 2025). On3, a media and technology company that provides news and analysis from high school and college sports, estimated that nearly 2,800 FBS players (approximately 25% of all FBS scholarship players) entered the portal during the 2023-24 academic year (Nakos, 2024). It was further claimed that 72 FBS teams lost at least 20 scholarship players to the portal in 2023-24, marking a vast increase from 2021-22 when just 25 programs lost that many. Significant increases were also witnessed in the number of FBS players making "lateral" transfers to programs in autonomous conferences (883 players to autonomous schools in 2023-24 versus 454 in 2022-23) and the number of players "transferring up" from non-autonomous to autonomous programs (239 in 2022-23 versus 123 in 2021-22).

These industry-level findings coincide with a number of NCAA administrators and coaches who have publicized their perceptions of the portal's impact via the media. According to former University of Alabama football coach Nick Saban, transfers are becoming heavily linked to the NIL money and financial benefits associated with them.

> Right now it's about money. There's a lot of things that just come down to money. Where players go to school comes down to money. So if you have a collective and you have money, you're going to have an opportunity to be successful. You're going to be able to retain the players on your team that you want to retain, almost like a pro team. And you're also going to be able to get free agents to come into your program, and you're also going to be able to recruit better high school players because you've got financial opportunities for them as well. (Stahl, 2024, para. 9).

Saban also believes relaxed transfer rules have created "more parity" between programs, particularly within autonomous conferences like the SEC, as players with "experience" and "proven quality" are freed to move to other programs (Stahl, 2024, para. 3). To this end, Saban has suggested the portal "helps some of the teams that weren't quite as good get better quickly so that they can compete with those top-level teams" (Stahl, 2024, para. 6); however, according to former Ole Miss coach Lane Kiffin, increased player mobility has led to greater roster instability and difficulties in developing team culture. "Unfortunately, now, it's like plug and play" (Corr et al., 2024, p. 4).

Prior academic literature has paid some attention to the transfer portal's effects on athletic outcomes and team culture. Dohrn and Lopez (2022) conducted a study under the human capital theory's assumption that transfer athletes' skills, knowledge, and expertise make them valuable commodities in the market for playing talent. Analyzing a sample of NCAA Division I quarterbacks, they found teams receiving

the transfers did not significantly improve their rankings or winning percentages, but the transfers generally moved to lower-ranked programs and significantly improved their individual performances and positions on the depth chart. Corr et al. (2024) interviewed several FBS coaches and found that, while the portal was viewed as a vital tool for achieving short-term success, building a squad composed mainly of transfers was problematic to the "cultivation of meaningful organizational culture" (p. 1). More specifically, aggregated interview results suggest coaches felt a need to prioritize the acquisition of transfer talent while considering the effects of the portal on roster construction. These effects included difficulties in garnering commitment and buy-in from the players and sustaining a consistent, winning culture. The interviewed coaches lamented how easy the portal made it for younger players to "quit" without "earning" their playing time (Corr et al., 2024, p. 8). There was also a consensus that the portal allowed programs to bring in talented players while at the same time facilitating the departure of squad members who would have traditionally worked hard while waiting for an opportunity. According to Kiffin:

> You're not going to have phenomenal culture. It doesn't mean I don't work on it, but I think I have to realize it just is what it is. These transfer kids, they're going to a place if it's the best at that time. It's not about the school and they're not in their third, fourth, fifth year with you to where they know how we do it. (Corr et al., 2024, pp. 3-4)

Sport Labor Market Research

Although direct, comprehensive analyses of player movement through the FBS transfer portal remain scarce, prior research—largely from the sports economics space—foreshadows the patterns and outcomes that could emerge in a market where athletes have been granted further agency and mobility. Simon Rottenberg (1956), in one of the seminal analyses of labor markets in professional sport, described how the reserve clause—a rule that bound players to their current teams at the expiry of a contract—did not appear to lead to an equal distribution of talent in Major League Baseball (MLB). He argued a free labor market would result in as efficient a distribution of talent as leagues governed by salary caps, revenue sharing, reserve clauses, or other restrictive mechanisms.

> It follows that players will be distributed among teams so that they are put to their most "productive" use; each will play for the team that is able to get the highest return from his services … this is exactly the result which would be yielded by a free market. (Rottenberg, 1956, p. 256)

The assertion that players, regardless of most labor market restrictions, will likely end up with the team that values them the most became associated with two fundamental economic concepts—the invariance principle and the Coase theorem (Coase, 1960; Rascher et al., 2021). Essentially, when transaction costs are minimal, the distribution of talent should hardly be affected by whether a player or team has more control over the player's rights. Although potential transaction costs persist via changes in academic progress and adjustments to new teammates, coaches, tactics, and team cultures (Corr et al., 2024; Dohrn & Lopez, 2022; Schrotenboer, 2024),

the formal frictions (e.g., sit-out rules, specific transfer barriers, and a lack of direct compensation) in the portal era are relatively low, especially with teams now able to provide direct NIL compensation to their players.

To this point, some of the previous literature implies the transfer portal could be dispersing human capital in a manner not too dissimilar to the prior system. Rottenberg (1956) noted, in the absence of free agency or a similar system, players would "distribute themselves among teams on other criteria" as teams "bid for players by offering other quantities than price" (p. 257). Prior to the transfer portal and NIL remunerations, the college-choice decisions of current and prospective athletes typically favored universities with strong facilities, quality academics, successful coaches, large media footprints, and recent or historical on-field success (Dumond et al., 2008; Mirabile & Witte, 2017; Nixon et al., 2021; Pitts & Evans, 2024). Therefore, to the extent these programs are the same ones offering substantial NIL payments and opportunities to win on a national stage in the portal era, one might expect the flow of talent or resulting outcomes to not look vastly different than what was observed in prior years.

In prior research, Pifer and colleagues (2021) looked at Division I men's basketball transfers and found that transfer outcomes in the pre-portal era mirrored those found by Dohrn and Lopez in the FBS portal era (2022); that is, revenue sport athletes more frequently transferred from higher-level to lower-level programs (as opposed to the reverse), and they experienced significant boosts in their individual usage and statistical performance (Dohrn & Lopez, 2022; Pifer et al., 2021). In further conducting a social network analysis of Division I men's basketball transfers, Pifer et al. (2021) also observed that transfers occurred more frequently during coaching changes and between schools in the same state. Pitts and Evans (2024), during a timeframe that coincided with the early stages of the transfer portal, showed that FBS programs' average NIL valuations were positively related to their 247 Sports recruiting points, even after controlling for school-level fixed effects. However, the amount of NIL funding necessary to improve the talent level was noted as being "cost-inhibitive for most programs" (p. 1), leading the authors to conclude the implementation of NIL was unlikely to dramatically alter the distribution of recruited talent in college football (i.e., from higher revenue to lower revenue programs). These findings echoed those of an earlier study by Huml et al. (2019), where—in offering a quantity other than price—it was found that FBS and Division I men's basketball teams constructing new athletic facilities experienced little to no change in their ability to recruit better players. Despite the advancement and completion of these projects, the status quo was largely maintained as the inflowing quality of talent remained relatively stable across teams in both leagues.

Other studies have highlighted the possibility for labor market asymmetries to emerge in contexts where player mobility and availability increase while teams' resources remain relatively unequal. Juravich and Mills (2017), for example, found recruited talent became more broadly distributed across NCAA Division I men's basketball teams following the introduction of the National Basketball Association's (NBA) one-and-done rule in 2005 that prohibited high school players from going

straight to the professional ranks. As a result of the expanded labor pool, a trickle-down effect was observed as top recruits who had previously gone directly to the NBA now attended college. In most cases, these recruits signed with top-level programs, allowing low- and mid-level programs to acquire recruits who would have previously played for top programs. It is also possible that certain asymmetries are the result of teams having preferred commodities in the FBS transfer market, as some programs—often those with fewer financial resources—intentionally recruit less reputable players of a specific profile or implement coaching schemes that allow them to achieve higher performance with lower-rated talent (Maxcy, 2013; Turcott & Pifer, 2018).

Player mobility in response to labor market changes has also been examined in leagues outside of college sport. For example, the 1995 Bosman ruling by the European Court of Justice abolished a "retain and transfer system" in European professional soccer that required transfer fees to be paid for out-of-contract players and limited the number of European Union players a team could field (Frick & Simmons, 2014). With those restrictions lifted and consumer demand for the product surging, player mobility and wages both increased in the post-Bosman era (Frick, 2009; Frick & Simmons, 2014). An increasing number of players from outside Western Europe migrated to the top leagues in England, Spain, Germany, France, and Italy to earn higher salaries (Frick, 2009). Milanovic (2005) suggested increased player mobility yielded a concentration of global playing talent among Europe's elite clubs, further entrenching modes of dominance that were already prevalent. Thus, the prior literature has highlighted patterns and trends that could similarly be observed in the flow of FBS transfers through a market now characterized by increased athlete mobility. With coaches claiming to have observed changes in roster construction and management following the portal's advent (Corr et al., 2024; Stahl, 2024), and economic literature noting shifts (e.g., talent compression, increased transfer volume, and inconsistent talent distribution across levels) that can occur when teams with differing resources gain access to more talent (Frick, 2009; Juravich & Mills, 2017; Milanovic, 2005), further examinations of talent flow through the FBS transfer portal remain justified.

Method

Data and Data Collection

Data for this study were collected from two primary sources—247 Sports and Pro Football Focus. First, records of transfer portal entries in FBS football were pulled from 247 Sports, a scouting and recruiting website with data that has been reliably used in prior studies (Huml et al., 2019; Pifer & Huml, 2020; Pifer et al., 2021; Pitts & Evans, 2024). In addition to the transfer players' names, these datasets contained their 247 composite recruiting ratings, playing positions, hometowns, transfer dates, and the names of the programs they transferred between. Initially, every FBS transfer portal entrant from 2019-24 recorded on the site was used to populate a dataset containing 10,968 portal entrants from FBS programs. However, due to the scope of the study, constraints in data availability (i.e., performance data and talent

measures outside of FBS football are largely unavailable), and methods that required identifiable pre- and post-transfer institutions, the sample was narrowed to only include entrants who transferred to fellow FBS programs and appeared in at least one game before and after transferring. This meant removing approximately 42% of the FBS entrants from the preliminary sample who were not linked to a post-transfer institution (i.e., they did not "resurface" after entering the portal) and an additional 20% of the initial FBS entrants who were identified as having transferred to non-FBS (e.g., Division I Football Championship Subdivision, Division II, or Division III) programs. Following these reductions, the final sample of "effective transfers" (i.e., players who transferred within the FBS and appeared in at least one game at both institutions) consisted of 4,245 observations.

Measures of Talent and Experience

The 247 Sports composite ratings served as initial measures of talent assigned to players by the site's experts at the final stage of their recruitment from high school. Numerous studies have relied on 247 ratings, or the ratings produced by similar systems, to quantify playing talent in college football (Caro, 2012; Huml et al., 2019; Maxcy, 2013; Pifer & Huml, 2020; Pifer et al., 2021). These ratings range from 0.7 to 1.0 and are often converted into "star ratings" for ease of interpretation; that is, players with composite ratings of 0.98 to 1.0 earn five stars, players with ratings from 0.9 to 0.97 earn four stars, players rated 0.8 to 0.89 earn three stars, and players rated 0.7 to 0.79 receive two stars (Adams, 2024). For football players, a five-star prospect is viewed as a future first-round pick in the NFL Draft, four-star prospects are expected to be drafted across the remaining slots or prioritized as undrafted free-agent signings, and three-star prospects are identified as players with strong potential to be significant contributors at the NCAA Division I level. Two-star prospects have limited potential to develop into professional athletes and are likely just role players at the Division I level (Adams, 2024). Players who are not rated or who have ratings below 0.7 typically receive the "unranked" label from 247; conversely, those who receive four- and five-star ratings are generally categorized as elite, "blue-chip" prospects. For the purpose of being included in the talent flow analyses across conferences and teams, any effective transfer in the sample not rated by 247 was assigned a rating of 0.6.

In addition to the 247 composite ratings, players' prior season grades from Pro Football Focus (PFF), a sports analytics company dedicated to comprehensive analyses of NFL and NCAA Division I football players, were attached to the FBS transfer records as additional, more current measures of talent. In instances where a player had grades from multiple seasons prior to transferring, the attached PFF grade was an average weighted by the snaps played in each season. As a company, PFF employs over 600 analysts, a subset of whom are trained to evaluate "every player on every play during a football game" (PFF, 2025, para. 2). The grades they produce at a seasonal level range from 0 (bad) to 100 (good) and allow players to be compared to others at their position (i.e., the grades do not distinguish between positional value). These grades help overcome the limitations of traditional football statistics that

are neither applicable across positions nor indicative of a player's individual talent. Snaps-per-game, as universal reflections of playing time across the different phases of play (offense, defense, and special teams), and total snaps played prior to transferring were also collected from PFF. This was done to quantify players' experience levels and capture the extent to which coaches had found enough utility in their performances to grant them playing time.

Social Network Analyses

Social network analysis, or structural analysis, is a method that examines the relationships (edges, ties, or connections) between members (nodes or vertices) of a network (Otte & Rousseau, 2002). The method identifies the ties that connect nodes and focuses on the characteristics of those ties. A tie between two nodes can formally be identified as an ordered pair (i,j) where node i is the initial node of the connection and node j is the final node. A network is labeled as being "directed" if connections between i and j (e.g., between FBS conferences or teams) have a defined direction (e.g., players moving from one node to another). Social network analysis has previously been used in a variety of settings, including college sports, where Pifer et al. (2021) constructed a social network analyzing NCAA Division I men's basketball transfers in the pre-portal era.

One of the primary outputs of a social network analysis is a graph that visualizes the nodes as circles and the ties as a series of lines called edges. These graphs can be presented in various forms, but the Fruchterman-Reingold format was utilized in this study. This format is frequently used to visualize network structure through an algorithm that places highly connected nodes more centrally and closer together and less connected nodes further toward the outside of the graph; essentially, it treats the network like a "spring" that pulls more connected nodes together and repulses less connected nodes apart (Hansen et al., 2020). A series of indicators can subsequently be calculated in relation to the graph to quantify the structure and cohesion of the network's ties and the roles being played by specific nodes. Using functions from the *igraph* package in R Statistical Software version 4.4.1 (Csárdi et al., 2025), this study produced Fruchterman-Reingold graphs for effective FBS transfers and calculated the following indicators:

- Degree (In-Degree, Out-Degree, and Total-Degree) Centrality: a count of the number of edges (transfers) flowing into (in-degree) and out of (out-degree) a node; the total-degree centrality for a given node is simply the sum of its in-degree and out-degree measures. These measures were synonymous with the transfer volumes of each conference and team.
- Assortativity Coefficient (r): a Pearson correlation coefficient ranging from -1 to 1 that is positive if nodes of a similar (total) degree tend to connect with one another and negative if they do not; values close to 0 suggest little to no relationship.
- Density (D): an indicator of the general level of connectedness in the network. It is the ratio of the number of observed edges in the network to the highest number of possible edges in the network. A higher density ratio

suggests the network is more cohesive and connected; note that the network of FBS teams does not include loops, whereas the conference network does include loops (i.e., nodes that connect to themselves via within-conference transfers), making this measure more relevant to the team-level networks.

- Eigenvector Centrality (x): measures the centrality of a node in proportion to the sum of the centralities of the other nodes to which it is connected. The metric ranges between 0 and 1, with higher values suggesting a node is more influential to the network based on its connections to other influential nodes.
- Authority Score: a generalization of eigenvector centrality in directed networks that is proportional to the sum of the hub scores of nodes that point to a node; it is normalized to range between 0 and 1, with higher values suggesting a conference or program is a more popular destination for arriving transfers (Kleinberg, 1999).
- Hub Score*:* a generalization of eigenvector centrality in directed networks that is proportional to the sum of the authority scores of nodes that a node points to; it is normalized to range between 0 and 1, with higher values suggesting a conference or program sees players transfer to more popular destinations (Kleinberg, 1999).
- PageRank (PR): a metric quantifying the relative prominence of a node based on the volume and quality of its incoming connections. It was originally developed by Google to rank web pages, but in this context, PageRank values reflect the probability (ranging from 0 to 1) that a node (school or conference) will be "visited" by a player randomly navigating the transfer network.
- Modularity (Q): a measure of network structure quantifying the divisible strength of a network into smaller modules or sub-networks (Ji et al., 2015); generally, values closer to 1 suggest stronger modular structures are present within the overall network, although values falling within the range of 0.3 to 0.7 are understood to signify the existence of meaningful sub-networks inside a larger network (Girvan & Newman, 2002). Given the limited number of nodes and the presence of loops in the conference networks, this indicator was only applied to the team-level network analyses.

Through these methods and metrics, the transfer networks in FBS football were able to be characterized in a way that more objectively reflected the influences, connections, and interactions of specific conferences and teams during the transfer portal era. In total, four distinct network graphs—two related to the networks for all effective transfers at the conference and team levels and two more for the transfer of blue-chip prospects between conferences and teams—were created. The networks for the subsets of blue-chip transfers were constructed to better isolate the movement of highly perceived talent through the transfer portal. The degree-centrality measures provided estimates for the volume of transfers flowing between conferences and schools, and the corresponding adjacency matrix precisely quantified the

interconnectedness of specific nodes. Due to conference realignment, some teams appeared in multiple conferences over the timeframe; however, transfers were aggregated at the conference level based on which conference the team was a member of at the time of the transfer.

Following the network analyses, a series of descriptive statistics analyzing which FBS conferences and teams experienced net gains or losses in the transfer portal, as related to the mean talent and experience levels of incoming and outgoing transfers, were calculated as supplements to the information communicated through the social network graphs and indicators. The standard deviations and Gini coefficients (ranging from 0 = perfect equality to 1 = perfect inequality) of incoming and outgoing talent within the different conferences were also estimated as measures of transfer-talent dispersion, and the highest and lowest ranked teams in terms of the mean talent levels of the arriving and departing transfers were used to portray the range of transfer talent within each conference.

Results

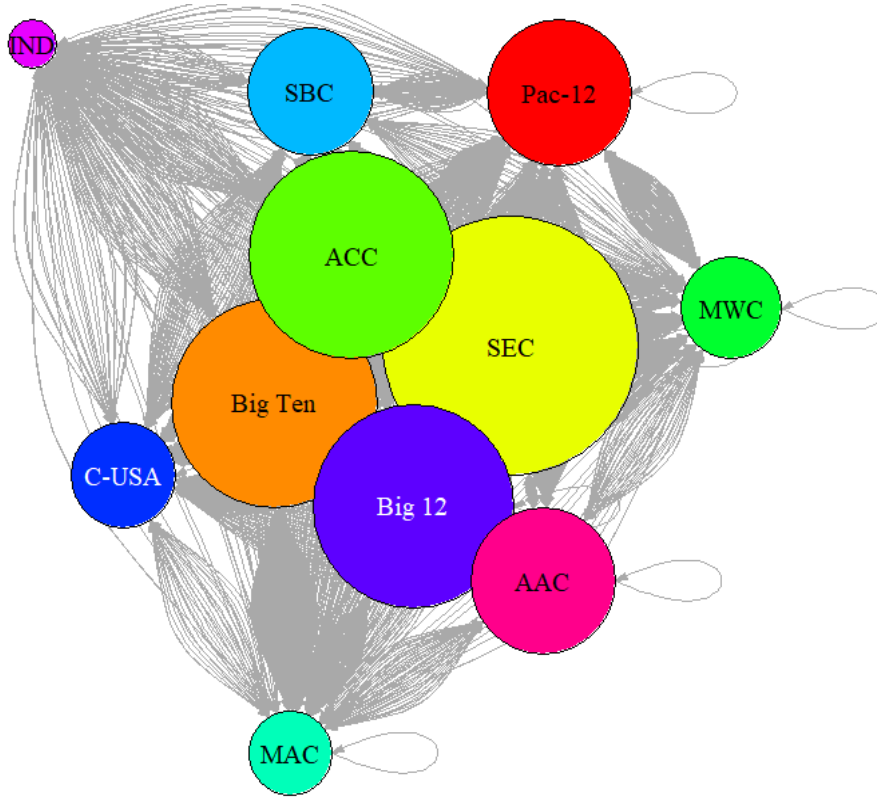
The graphs coinciding with the social network analyses conducted across the FBS conferences are portrayed in the Fruchterman-Reingold format in Figure 1 (all intra-FBS transfers) and Figure 2 (blue-chip transfers). The in-degree, out-degree, and total-degree indicators of centrality are provided in Table 1, which also includes a column displaying the net flow (i.e., the difference between the number of inflows and outflows) of transfer volume within each conference. Table 2 shows the eigenvector, authority score, hub score, and PageRank indicators for each FBS conference, as well as the networks' density and assortativity values. Table 3 is an adjacency matrix that tabulates the number of transfers between specific conferences. In all three tables, measures from the blue-chip network appear bracketed in parentheses next to the corresponding metrics from the full network.

Conference-Level Social Network Analyses (All Transfers)

Starting with the full network for effective FBS portal transfers, Figure 1 shows the autonomous, "Power Four" (Atlantic Coast Conference (ACC), Big Ten, Big 12, and SEC) conferences have frequently been situated at the heart of college football's transfer network during the transfer portal era. The number of edges (transfers) flowing in and out of the nodes and the sizes of the nodes, which are scaled to reflect total-degree centrality, show how critical these conferences have been to transfer-athlete movement. The Pac-12, which was considered part of a larger "Power Five" grouping of autonomous conferences during the sample's timeframe, showed signs of being distinctly less involved in the FBS transfer network. In fact, Table 1 and Table 2 show the American Athletic Conference (AAC), which recently changed its name to the American Conference, ranked higher than the Pac-12 in terms of total-degree centrality (761 to 757), eigenvector centrality (x = 0.559 to 0.492), and PageRank centrality (PR = 0.107 to 0.077) over this time. The more peripheral conferences in the network include many mid-major, non-autonomous leagues like the

Mid-American Conference (MAC) and Mountain West Conference (MWC), as well as the independent programs (IND) that were not official members of a conference. Overall, the network had a slightly positive assortativity value (r = 0.064) that alluded to a very minor tendency for like-degree conferences to engage in transfers.

Figure 1
FBS Transfer Portal Conferences Network (All Effective Transfers)



Note. Node size is scaled by total-degree centrality.

Table 1

Degree Centrality Measures for FBS Conferences in the Transfer Portal (2019-2024)

Conference	In-Degree		Out-Degree		Total-Degree		Net	
AAC	483	(65)	278	(27)	761	(92)	205	(38)
SBC	419	(28)	241	(17)	660	(45)	178	(11)
C-USA	343	(29)	207	(20)	550	(49)	136	(9)
MWC	304	(41)	228	(20)	532	(61)	76	(21)
MAC	233	(15)	206	(21)	439	(36)	27	(-6)
IND	135	(17)	120	(18)	255	(35)	15	(-1)
Big 12	518	(87)	532	(85)	1050	(172)	-14	(2)
Pac-12	333	(87)	424	(103)	757	(190)	-91	(-16)
ACC	474	(91)	595	(101)	1069	(192)	-121	(-10)
Big Ten	455	(116)	626	(125)	1081	(241)	-171	(-9)
SEC	548	(190)	788	(229)	1336	(419)	-240	(-39)

Note. Values in parentheses reflect blue-chip (four-star and five-star) transfers only.

The authority and hub scores, combined with the in-degree and out-degree centrality measures, reveal directional flow across the network's members. The SEC ranked highest in terms of hub score (1.000) and authority score (1.000), two indicators that reinforced its central role as a key sender and receiver of talent to and from prominent conferences. The other Power Four conferences were similarly situated in the top five for both authority and hub score while ranking just behind the SEC in total transfer (total-degree) volume. The Pac-12 was ranked fifth among FBS conferences for hub score (0.460) but eighth for authority score (0.546) behind the AAC (0.880), Sun Belt Conference (SBC; 0.686), and Conference USA (C-USA; 0.564). This suggests that, relative to the other conferences, the Pac-12 was more involved in the disbursement of transfers to authoritative conferences and less involved as a recipient. The AAC's authority score of 0.880 ranked top among the non-autonomous (Group of Five) conferences and second in the entire FBS; however, its hub score of 0.330 ranked sixth in the FBS. Regarding the net volume of transfers across FBS conferences, the SEC ranked last after seeing 240 more athletes depart than arrive, while the AAC was the biggest beneficiary with a net of 205 transfers during the observed timeframe. Following the SEC, the other autonomous conferences were also net losers in terms of transfer volume; conversely, every Group of Five conference experienced net gains, witnessing more arrivals than departures.

Table 2
Social Network Indicators for FBS Conferences in the Transfer Portal (2019-2024)

Conference	Eigenvector	PageRank	Authority	Hub
AAC	0.559 (0.251)	0.107 (0.080)	0.880 (0.370)	0.330 (0.141)
ACC	0.756 (0.443)	0.107 (0.117)	0.836 (0.437)	0.716 (0.445)
Big 12	0.715 (0.402)	0.122 (0.117)	0.849 (0.412)	0.632 (0.389)
Big Ten	0.752 (0.530)	0.101 (0.145)	0.788 (0.577)	0.735 (0.485)
C-USA	0.389 (0.137)	0.087 (0.043)	0.564 (0.185)	0.251 (0.092)
IND	0.173 (0.076)	0.041 (0.031)	0.215 (0.084)	0.141 (0.069)
MAC	0.311 (0.096)	0.060 (0.030)	0.393 (0.078)	0.247 (0.109)
MWC	0.342 (0.128)	0.073 (0.054)	0.465 (0.193)	0.252 (0.070)
Pac-12	0.492 (0.366)	0.077 (0.111)	0.546 (0.392)	0.460 (0.348)
SBC	0.467 (0.115)	0.104 (0.042)	0.686 (0.148)	0.297 (0.083)
SEC	1.000 (1.000)	0.122 (0.229)	1.000 (1.000)	1.000 (1.000)
Assortativity	0.064 (-0.02)			
Density	35.08 (6.33)			

Note. Values in parentheses reflect network for blue-chip (four-star and five-statransfers only.

Table 3

Adjacency Matrix for FBS Conferences in the Transfer Portal (2019-2024)

From/To	Pac-12	Big Ten	SEC	ACC	MWC	MAC	SBC	C-USA	Big 12	IND	AAC
AAC	12 (1)	16 (5)	49 (11)	21 (2)	16 (0)	22 (1)	45 (0)	34 (1)	40 (6)	7 (0)	16 (0)
ACC	28 (6)	67 (17)	79 (30)	74 (9)	29 (4)	38 (0)	72 (8)	50 (6)	61 (11)	22 (3)	75 (7)
Big 12	42 (12)	48 (13)	64 (25)	48 (7)	46 (1)	26 (1)	63 (3)	46 (2)	51 (8)	14 (0)	84 (13)
Big Ten	42 (12)	77 (23)	78 (23)	82 (16)	33 (5)	67 (7)	39 (4)	43 (3)	68 (16)	25 (5)	72 (11)
C-USA	12 (1)	13 (1)	30 (8)	30 (3)	9 (0)	7 (0)	28 (2)	16 (1)	29 (2)	11 (2)	22 (0)
IND	11 (3)	18 (3)	7 (2)	20 (5)	7 (0)	8 (1)	13 (0)	10 (2)	14 (2)	2 (0)	10 (2)
MAC	11 (3)	37 (3)	24 (8)	21 (3)	13 (0)	13 (0)	18 (0)	17 (0)	31 (3)	6 (0)	15 (1)
MWC	35 (7)	22 (4)	12 (1)	8 (1)	31 (2)	9 (0)	20 (0)	18 (0)	52 (3)	8 (0)	13 (2)
Pac-12	77 (22)	44 (12)	32 (12)	40 (13)	83 (20)	11 (1)	21 (3)	20 (2)	41 (10)	19 (3)	36 (5)
SBC	5 (0)	23 (3)	33 (5)	31 (6)	7 (0)	10 (0)	30 (0)	30 (0)	28 (3)	8 (0)	36 (0)
SEC	58 (20)	90 (32)	140 (65)	99 (26)	30 (9)	22 (4)	70 (8)	59 (14)	103 (23)	13 (4)	104 (24)

Note. Values in parentheses reflect blue-chip (four-star and five-star) transfers.

The adjacency matrix in Table 3 provides further information on conference-to-conference movement. From this, it is apparent that within-conference transfers occurred quite frequently. The most frequent effective transfer occurred between SEC schools (n = 140). Outside of transfers between fellow independent schools (n = 2), the fewest portal transfers moved from the SBC to the Pac-12 (n = 5). This points to another trend of the portal, a proclivity for transfers to occur between leagues with similar geographic centers. For instance, the most Pac-12 transfers left for the MWC (n = 83), and the most MAC transfers left for the Big Ten (n = 37). Across the board, the SEC was the most popular destination for transfers from the AAC (n = 49) and ACC (n = 79), while the SEC and ACC were tied as the most popular destination for C-USA transfers (n = 30); the ACC was also the most frequent recipient of FBS transfers from the Big Ten (n = 82) and independent programs (n = 20). Elsewhere, the AAC received the most transfers from the Big 12 (n = 84) and the SBC (n = 36), while the Big 12 received the most Mountain West Conference (MWC) exports (n = 52).

Conference-Level Social Network Analyses (Blue-Chip Transfers)

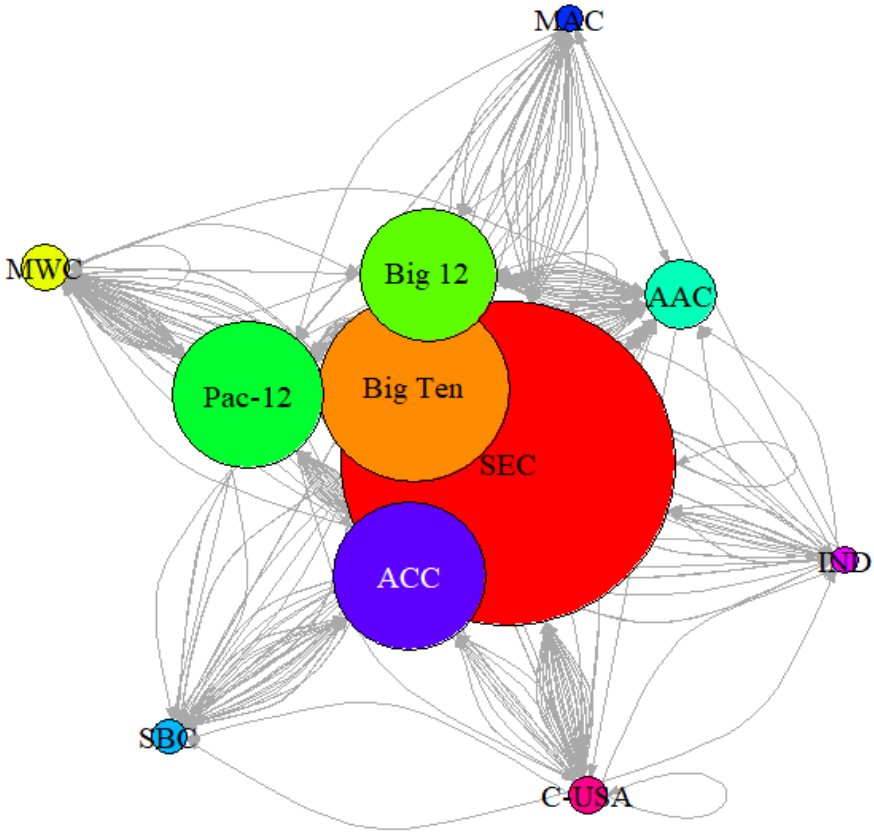
The picture changed slightly when reducing the overall sample of effective transfers to those who were four- or five-star prospects, though many of the observed shifts were exaggerations of trends noticed in the larger network. Graphically, Figure 2 shows the nodes representing the FBS conferences became even more dispersed, with the non-autonomous leagues being further repulsed to the network's boundaries and the SEC, Big Ten, and ACC becoming further entrenched as focal points at the network's center. The network indicators in Table 2 provide further evidence of these trends as the SEC ranked first in eigenvector centrality (x = 1.000) and PageRank (PR = 0.229), followed by the Big Ten (x = 0.530; PR = 0.145), ACC (x = 0.443; PR = 0.117), Big 12 (x = 0.402; PR = 0.117), and Pac-12 (x = 0.366; PR = 0.111).

Unlike the network containing all effective transfers, each of the Group of Five conferences, including the AAC (x = 0.251; PR = 0.080), ranked behind the Power Five for eigenvector centrality and PageRank. This also held true in a directional sense for the authority and hub scores, as each autonomous conference scored higher in both categories relative to the non-autonomous conferences. Overall, the blue-chip network remained dense (D = 6.33), albeit to a relatively lesser degree than the full network. The assortativity value also turned negative (r = -0.02), suggesting blue-chip transfers occurred less frequently between conferences that were engaged in a similar volume of transfers; however, the value's proximity to zero implies such a trend remained very weak.

Lastly, Table 3 shows that, outside intra-SEC transfers, the SEC and ACC were the most frequent exchangers of top-tier talent in the portal (n = 56), while--excluding the independents--several conferences (e.g., the MWC and SBC, MAC and SBC, and SBC and AAC) failed to exchange a single blue-chip talent between them. Relative to the other FBS conferences, Table 1 confirms the SEC both secured (n = 190) and lost (n = 229) the highest number of blue-chip transfers in the portal, with the most frequent destination for its top transfers being other SEC programs (n =

Figure 2

FBS Transfer Portal Conferences Network (Blue-Chip Transfers)



Note. Node sizes are scaled by total-degree centrality.

65). Apart from the Pac-12, every other autonomous conference lost at least as many four- and five-star transfers to the SEC as were exchanged between its own member schools. The AAC, MAC, and C-USA also yielded more blue-chip transfers to SEC programs than to programs in any other conference. Table 1 reinforces these findings, showing the net losses assumed by many of the autonomous conferences when it came to transfer volume in the entire network either shrank dramatically or turned into net gains when analyzed through the blue-chip network.

Conference-Level Descriptive Statistics

The degree centrality measures (counts) presented in Table 1 allow the proportions of effective transfers who moved across and within the broader categories of autonomous and non-autonomous conferences to be calculated. These proportions

show 38.47% of total effective transfers moved between programs in autonomous conferences, 31.38% moved from autonomous to non-autonomous conferences, 13.78% moved between non-autonomous conferences, and 16.37% left non-autonomous conferences for teams in autonomous leagues. This corresponds with 55.08% (45.7%) of players who had been at autonomous (non-autonomous) conferences leaving for programs in other autonomous (non-autonomous) conferences. Furthermore, approximately 25.66% (18.46%) of autonomous to autonomous (non-autonomous to non-autonomous) effective transfers stayed within the same conference (e.g., SEC to SEC or AAC to AAC).

Table 4 presents a shift from the volume-based measures of transfer movement to FBS conferences' average gains and losses in relation to the 247 ratings, PFF ratings, total snaps, and snaps per season of their incoming and outgoing transfers. Beginning with the 247 ratings assigned as measures of player quality at recruitment, the AAC (0.013) is seen, on average, to be the biggest net beneficiary, followed by the Pac-12 (0.011), Big 12 (0.009), ACC (0.008), and SEC (0.007). The Big Ten (0.002), while still positive, ranked lowest among autonomous conferences for the net mean 247 ratings of its transfers. That said, the average level of talent being acquired in the Big Ten and other Power conferences was higher than the talent being gained by the mid-majors. The MAC (-0.002), C-USA (-0.004), and SBC (-0.005) were all net losers in relation to the average 247 ratings of their incoming and outgoing transfers. The standard deviations of the 247 ratings for incoming players in each conference, which are presented in Table 5, further showed the MWC ($\sigma = 0.081$), C-USA ($\sigma = 0.079$), MAC ($\sigma = 0.078$), SBC ($\sigma = 0.075$), and AAC ($\sigma = 0.074$) had the widest dispersions in arriving talent, while transfers to the Big 12 ($\sigma = 0.063$), Big Ten ($\sigma = 0.063$), Pac-12 ($\sigma = 0.060$), SEC ($\sigma = 0.059$), and ACC ($\sigma = 0.054$) had more concentrated 247 ratings. Likewise, relatively wider variation was generally observed in the 247 ratings of the smaller conferences' outgoing players.

Shifting to PFF ratings that provided more updated measures of talent relative to the 247 ratings, the Power conference members were further identified as net beneficiaries of the portal system. The autonomous conferences led the FBS with the highest mean PFF ratings for incoming transfers and stood as the only conferences with mean advantages in this measure. The SEC was particularly opportunistic, acquiring players who were, on average, two PFF rating points better than those it lost. The Big Ten and Pac-12 were not far behind, but the independent schools and all mid-major conferences were typically at a net disadvantage for PFF rating. The flow of experience, as measured by the mean total snaps played and snaps per season of the incoming and outgoing transfers, told a similar story; that is, the Power Five—led by the SEC and Big Ten—tended to be net beneficiaries of playing experience, while the non-autonomous Group of Five conferences regularly lost experience. Table 5 shows transfers in and out of the autonomous conferences, apart from the Big Ten (in) and Big 12 (out), tended to have lower standard deviations, while the non-autonomous leagues, especially for incoming transfers, displayed higher variation in their transfers' ratings; in addition, the dispersion of ratings for outgoing players was

Table 4

Mean Transfer Portal Talent and Experience Flow across FBS Conferences (2019-2024)

μ 247 Rating				μ PFF Rating			
Conf	Gained	Lost	Net	Conf	Gained	Lost	Net
AAC	0.842	0.828	0.013	SEC	64.198	62.152	2.046
Pac-12	0.863	0.852	0.011	Big Ten	63.492	61.739	1.753
Big 12	0.856	0.848	0.009	Pac-12	63.516	61.836	1.680
ACC	0.863	0.855	0.008	ACC	63.512	62.367	1.141
SEC	0.875	0.868	0.007	Big 12	63.404	62.847	0.564
MWC	0.828	0.822	0.006	IND	61.659	62.565	-0.906
IND	0.837	0.832	0.005	MWC	61.601	62.915	-1.314
Big Ten	0.863	0.861	0.002	C-USA	61.694	63.840	-2.146
MAC	0.820	0.822	-0.002	AAC	61.156	63.660	-2.518
C-USA	0.824	0.828	-0.004	SBC	61.457	64.432	-2.975
SBC	0.822	0.827	-0.005	MAC	60.627	63.670	-3.043

μ Total Snaps				μ Snaps per Season			
Conf	Gained	Lost	Net	Conf	Gained	Lost	Net
SEC	805.43	451.34	354.09	SEC	289.96	163.90	126.06
Big Ten	737.06	461.42	275.64	Big Ten	266.29	163.40	102.89
Big 12	779.72	546.21	234.79	Big 12	279.85	202.92	76.93
Pac-12	755.29	558.67	196.62	ACC	265.61	198.45	66.68
ACC	785.02	629.24	155.24	Pac-12	250.71	197.21	53.50
IND	550.65	649.75	-99.10	IND	187.47	235.40	-47.93
AAC	475.12	804.88	-332.23	AAC	174.41	277.90	-104.35
MWC	440.25	796.92	-356.67	MWC	158.38	310.31	-151.93
C-USA	424.53	941.84	-517.31	MAC	143.27	323.23	-179.96
SBC	434.37	967.90	-533.53	C-USA	161.93	365.62	-203.69
MAC	426.54	1023.73	-597.19	SBC	160.51	367.21	-206.70

Note. Sub-tables are arranged in descending order by the *Net* column.

relatively wide in the SBC (σ = 6.700), MAC (σ = 6.714), and C-USA (σ = 6.692).

The Gini coefficients presented in Table 6 quantify the distribution of transfer talent entering and exiting each conference by their 247 star ratings. Group of Five conferences recorded higher volumes of incoming transfers, particularly among unranked, 2-star, and 3-star players, with lower Gini values indicating relatively even distributions. Conversely, incoming 4- and 5-star transfers were less common and more highly concentrated, especially in C-USA and the MAC. Autonomous confer-

ences saw more frequent departures of 3-, 4-, and 5-star players, while non-autonomous conferences recorded more unranked outflows. These unranked departures were unevenly distributed, with elevated Gini values in the AAC, C-USA, and SBC.

Team-Level Social Network Analyses (All Transfers)

The social network analysis conducted on all effective transfers between distinct FBS programs is presented in Figure 3. Table 7 shows the degree centrality measures for the 15 highest and lowest ranked programs by net volume, and Table 8 contains the social network indicators for the 15 highest and lowest ranked programs by eigenvector centrality. While 133 teams composed the nodes in this network, those on the perimeter are easy to identify as being less involved. Two military schools (e.g., Army and Navy) are positioned on the outside, as are several programs (e.g., Kennesaw State University and Sam Houston State University) that were only in the FBS for a condensed portion of the examined timeframe. The University of Colorado (n =149), Arizona State University (n = 129), Ole Miss (n = 123), University of Louisville (n = 120), Florida State University (n =120), and University of Southern California (n = 120) had the highest total-degree centralities, meaning they were most heavily involved in the team network.

Table 5

Dispersion Measures for Transfer Portal Talent Within FBS Conferences (2019-2024)

In	σ 247	High 247	μ	Low 247	μ	σ PFF	High PFF	μ	Low PFF	μ
AAC	0.074	UCF	0.879	East Carolina	0.812	6.409	Cincinnati	66.471	UTSA	59.419
ACC	0.054	Clemson	0.960	Wake Forest	0.835	5.998	California	65.649	Clemson	51.759
Big 12	0.064	Texas	0.890	Kansas State	0.828	6.131	Colorado	65.018	Utah	60.078
Big Ten	0.063	Oregon	0.907	Northwestern	0.817	7.016	Oregon	68.470	Illinois	59.590
C-USA	0.079	Marshall	0.881	Rice	0.772	6.337	New Mexico St.	64.257	UTSA	59.635
IND	0.065	Notre Dame	0.877	Massachusetts	0.825	7.223	Notre Dame	66.111	New Mexico St.	55.120
MAC	0.078	Northern Illinois	0.852	Ohio	0.787	6.523	W. Michigan	63.269	C. Michigan	57.398
MWC	0.081	San Diego State	0.853	San Jose State	0.794	6.243	Utah State	63.152	Hawaii	59.912
Pac-12	0.060	UCLA	0.878	Arizona	0.828	6.093	UCLA	65.532	Arizona	61.356
SBC	0.075	Coastal Carolina	0.839	La.-Monroe	0.783	5.944	James Madison	64.767	La.-Monroe	59.466
SEC	0.059	Texas	0.909	Vanderbilt	0.824	5.996	Texas	66.799	Mississippi St.	62.599
Out	σ 247	High 247	μ	Low 247	μ	σ PFF	High PFF	μ	Low PFF	μ
AAC	0.073	UTSA	0.893	Navy	0.722	6.262	Rice	67.215	East Carolina	60.459
ACC	0.063	Clemson	0.888	Boston College	0.826	5.826	Wake Forest	66.074	Stanford	60.132
Big 12	0.069	Oklahoma	0.875	Kansas	0.802	6.805	Oklahoma	65.957	Arizona State	59.551
Big Ten	0.060	Ohio State	0.885	Rutgers	0.826	6.322	Washington	64.841	Rutgers	59.478
C-USA	0.065	UAB	0.885	UTSA	0.750	6.692	Sam Houston St.	69.850	UTSA	59.831

IND	0.076	Notre Dame	0.868	Liberty	0.750	5.004	Army	68.020	Massachusetts	60.097
MAC	0.078	Ball State	0.858	E. Michigan	0.792	6.714	Miami (OH)	66.546	Akron	58.494
MWC	0.081	San Diego St.	0.866	Nevada	0.789	6.333	Hawaii	64.657	Colorado State	60.881
Pac-12	0.074	USC	0.886	Washington St.	0.824	6.109	Oregon State	64.216	Colorado	59.800
SBC	0.069	Louisiana	0.871	South Alabama	0.776	6.700	James Madison	68.546	Southern Miss	59.752
SEC	0.067	Alabama	0.885	Mississippi St.	0.846	6.511	Oklahoma	65.698	Kentucky	59.856

Note. The table is split to display metrics for incoming (top) and outgoing (bottom) transfers; columns show the standard deviations of the 247 ratings (σ 247) and PFF ratings (σ PFF) for incoming/outgoing transfers in a conference and which teams in each conference averaged (μ) the highest and lowest rated incoming/outgoing transfers according to 247 rating and PFF rating.

Table 6

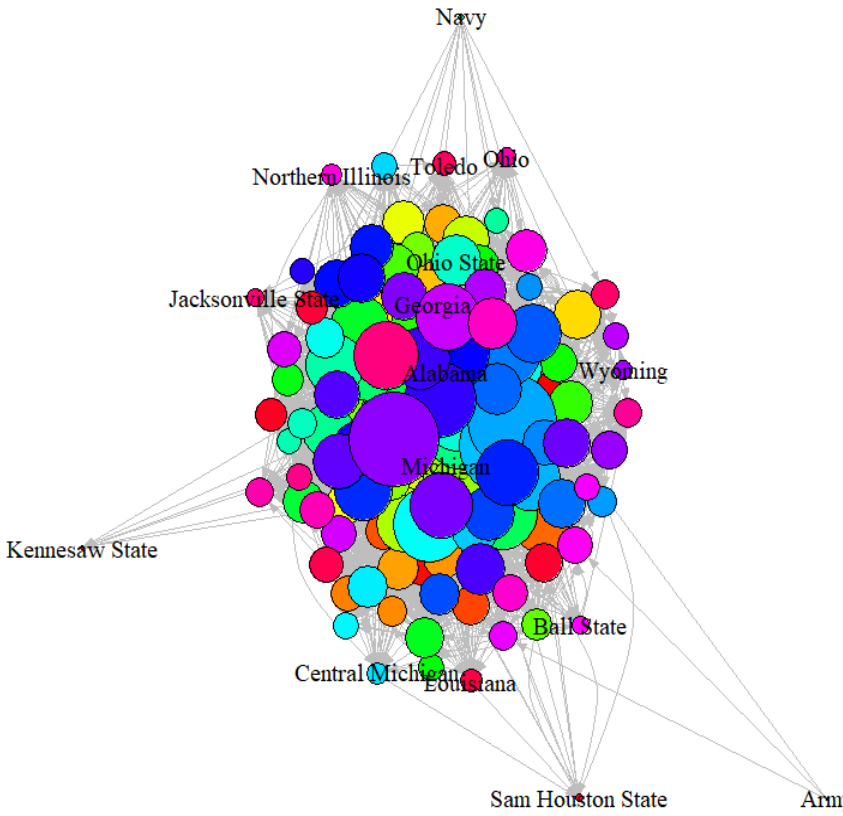
Star Rating Counts and Concentrations of Incoming and Outgoing Transfers within FBS Conferences in the Transfer Portal (2019-2024)

	NR	Gini	2-Star	Gini	3-Star	Gini	4-Star	Gini	5-Star	Gini
AAC	34 (18)	0.364 (0.739)	30 (35)	0.438 (0.454)	354 (197)	0.262 (0.330)	63 (27)	0.408 (0.431)	2 (0)	0.875 (N/A)
ACC	10 (26)	0.695 (0.594)	23 (17)	0.517 (0.611)	350 (452)	0.326 (0.307)	90 (97)	0.486 (0.471)	1 (4)	0.941 (0.778)
Big 12	22 (29)	0.622 (0.544)	23 (18)	0.548 (0.643)	386 (400)	0.241 (0.278)	83 (83)	0.449 (0.506)	4 (2)	0.861 (0.895)
Big Ten	14 (21)	0.484 (0.558)	29 (21)	0.531 (0.659)	296 (459)	0.345 (0.236)	111 (120)	0.301 (0.418)	5 (5)	0.811 (0.856)
C-USA	27 (8)	0.472 (0.792)	37 (42)	0.546 (0.455)	250 (137)	0.290 (0.433)	28 (20)	0.579 (0.706)	1 (0)	0.947 (N/A)
IND	5 (7)	0.433 (0.518)	17 (20)	0.382 (0.625)	96 (75)	0.406 (0.515)	17 (18)	0.500 (0.861)	0 (0)	N/A (N/A)
MAC	21 (15)	0.447 (0.406)	26 (44)	0.497 (0.371)	171 (126)	0.258 (0.160)	15 (21)	0.626 (0.369)	0 (0)	N/A (N/A)
MWC	28 (21)	0.370 (0.519)	22 (26)	0.281 (0.552)	213 (161)	0.208 (0.164)	41 (20)	0.266 (0.464)	0 (0)	N/A (N/A)
Pac-12	8 (24)	0.479 (0.451)	24 (18)	0.569 (0.417)	214 (279)	0.278 (0.145)	84 (100)	0.258 (0.268)	3 (3)	0.861 (0.861)
SBC	34 (13)	0.387 (0.621)	44 (38)	0.455 (0.391)	313 (173)	0.254 (0.211)	28 (17)	0.505 (0.559)	0 (0)	N/A (N/A)
SEC	15 (36)	0.471 (0.410)	16 (12)	0.648 (0.615)	327 (511)	0.277 (0.160)	180 (217)	0.260 (0.307)	10 (12)	0.588 (0.760)

Note. Star rating counts and Gini coefficients for outgoing transfers are bracketed by parentheses.

Figure 3

FBS Transfer Portal Teams Network (All Effective Transfers)



Note. Node sizes are scaled by total-degree centrality; national champions and the bottom 10% of teams for total-degree centrality are labeled.

The national championship teams during the portal era—University of Georgia (x = 0.587; PR = 0.003), University of Michigan (x = 0.432; PR = 0.005), University of Alabama (x = 0.703; PR = 0.005), and Ohio State University (x = 0.49; PR = 0.004)—were also positioned closer to the graph's center. These programs ranked in the top 40 of the FBS for eigenvector centrality, but they were relatively low on the list for PageRank. Texas State University (PR = 0.017), Ole Miss (PR = 0.017), University of Louisville (PR = 0.017), University of Colorado (PR = 0.016), and University of Houston (PR = 0.015) had the highest PageRank values, suggesting FBS transfers were more likely to move to these schools via the portal. The University of Colorado also had the highest eigenvector centrality (x = 1.000), a measure that further reflected its heavy involvement in the transfer portal over this time. Overall, the teams in the network were only sparsely connected, with a density score

of 0.242 implying less than 25% of the possible connections existed. Furthermore, the network's assortativity (r = 0.051) indicated only a faint tendency for the more portal-involved programs to engage in transfers with one another.

Regarding the directional flow of transfers across FBS programs, Southern Methodist University (SMU) possessed the highest authority score (1.000), and the University of Miami (Fla.) had the highest hub score (1.000). The University of Colorado was highly ranked across both indicators, with an authority score of 0.897 (second in the FBS behind SMU) and a hub score of 0.948 (third in the FBS). The University of Alabama (0.995), University of Georgia (0.838), Ohio State University (0.62), and University of Michigan (0.6) ranked in the top 25 for hub score, identifying these championship programs as prominent suppliers of transfer talent for teams acquiring players through the portal; however, they ranked 79th, 89th, 87th, and 111th, respectively, in authority score. By net volume, the University of Georgia (n = -46) lost the most players to the portal, with the University of Alabama (n = -44) and Clemson University (n = -41) also losing a relatively high number of transfers compared to those they gained.

On the receiving end, the University of Houston (0.763), Arizona State University (0.699), University of Louisville (0.68), Florida State University (0.672), and Ole Miss (0.671) followed SMU and the University of Colorado as the programs ranked highest in authority score. Volume-wise, SMU was the biggest net-beneficiary in the portal, bringing in 51 more effective transfers than it lost. Kennesaw State University (0.036), Stanford University (0.023), Clemson University (0.006), Navy (0.000), and Army (0.000) rounded out the bottom of the list with the lowest authority scores. Two of these teams, Kennesaw State University (0.000) and Army (0.023), further featured alongside Ball State University (0.094), University of Texas at San Antonio (UTSA) (0.058), and Sam Houston State University (0.011) at the bottom of the rankings for hub score. Table 9 provides a snapshot of the more common transfers in the total network for effective transfers, with many of the top connections involving programs in closer geographic vicinities (e.g., Ole Miss to the University of Southern Mississippi, University of Oregon to University of Nevada, University of Nevada to Colorado State University, Florida State University to Florida Atlantic University, University of Louisville to University of Cincinnati, University of North Carolina to East Carolina University, University of Texas to SMU, and Texas Tech University to University of Houston). However, the modularity score (Q = 0.137) suggests it was

Table 7

Degree Centrality Measures for Select FBS Programs in the Transfer Portal (2019-2024)

Program	In-Degree	Out-Degree	Total-Degree	Net
SMU	72 (10)	21 (2)	93 (12)	51 (8)
Texas State	66 (3)	19 (2)	85 (5)	47 (1)
Charlotte	61 (10)	18 (1)	79 (11)	43 (9)
UTSA	44 (4)	5 (3)	49 (7)	39 (1)
Houston	64 (4)	34 (7)	98 (11)	30 (-3)
Louisiana Tech	41 (2)	14 (2)	55 (4)	27 (0)
Southern Miss	32 (1)	7 (0)	39 (1)	25 (1)
Memphis	48 (6)	24 (3)	72 (9)	24 (3)
Marshall	46 (5)	24 (1)	70 (6)	22 (4)
Tulane	38 (6)	16 (2)	54 (8)	22 (4)
Arkansas State	42 (4)	20 (0)	62 (4)	22 (4)
Massachusetts	47 (2)	26 (0)	73 (2)	21 (2)
UCF	55 (11)	34 (6)	89 (17)	21 (5)
USF	46 (7)	26 (2)	72 (9)	20 (5)
South Alabama	33 (1)	13 (2)	46 (3)	20 (-1)
West Virginia	40 (4)	62 (9)	102 (13)	-22 (-5)
Florida	38 (15)	60 (20)	98 (35)	-22 (-5)
Maryland	23 (11)	46 (10)	69 (21)	-23 (1)
LSU	34 (16)	57 (23)	91 (39)	-23 (-7)
Notre Dame	21 (9)	49 (17)	70 (26)	-28 (-8)
Ohio State	20 (11)	48 (16)	68 (27)	-28 (-5)
Texas	27 (14)	55 (13)	82 (27)	-28 (1)
Penn State	17 (5)	46 (14)	63 (19)	-29 (-9)
North Carolina	24 (4)	57 (9)	81 (13)	-33 (-5)
Michigan	19 (8)	54 (23)	73 (31)	-35 (-15)
Texas A&M	25 (10)	63 (16)	88 (26)	-38 (-6)
Stanford	2 (0)	40 (10)	42 (10)	-38 (-10)
Clemson	1 (1)	42 (14)	43 (15)	-41 (-13)
Alabama	24 (14)	68 (35)	92 (49)	-44 (-21)
Georgia	17 (12)	63 (27)	80 (39)	-46 (-15)

Note. Table is split to show the 15 highest (top) and lowest (bottom) ranked teams by *Net* volume; values in parentheses reflect blue-chip (four-star and five-star) transfers.

Table 8

Social Network Indicators for FBS Programs in the Transfer Portal (2019-2024)

Program	Eigenvector	PageRank	Authority	Hub
Colorado	1.000 (0.389)	0.016 (0.013)	0.897 (0.501)	0.948 (0.164)
Arizona State	0.862 (0.422)	0.013 (0.011)	0.699 (0.346)	0.859 (0.233)
Florida State	0.849 (0.632)	0.012 (0.018)	0.672 (0.899)	0.853 (0.223)
USC	0.811 (0.847)	0.010 (0.022)	0.653 (0.649)	0.795 (0.616)
Louisville	0.806 (0.230)	0.017 (0.010)	0.680 (0.423)	0.742 (0.098)
Miami	0.802 (0.594)	0.011 (0.017)	0.538 (0.645)	1.000 (0.314)
Ole Miss	0.789 (0.657)	0.017 (0.031)	0.671 (1.000)	0.739 (0.209)
Arkansas	0.781 (0.608)	0.013 (0.016)	0.562 (0.885)	0.919 (0.190)
Oklahoma	0.763 (0.700)	0.012 (0.025)	0.544 (0.476)	0.874 (0.465)
Auburn	0.712 (0.313)	0.011 (0.017)	0.488 (0.168)	0.833 (0.259)
Alabama	0.703 (1.000)	0.005 (0.012)	0.272 (0.609)	0.995 (1.000)
SMU	0.686 (0.232)	0.014 (0.011)	1.000 (0.316)	0.291 (0.037)
Houston	0.677 (0.219)	0.015 (0.005)	0.763 (0.150)	0.480 (0.154)
Florida	0.675 (0.526)	0.008 (0.019)	0.453 (0.470)	0.809 (0.350)
Tennessee	0.658 (0.547)	0.007 (0.018)	0.435 (0.549)	0.792 (0.280)
Toledo	0.208 (0.076)	0.004 (0.005)	0.258 (0.097)	0.114 (0.007)
Bowling Green	0.206 (0.078)	0.005 (0.003)	0.161 (0.034)	0.181 (0.076)
Rice	0.202 (0.027)	0.004 (0.005)	0.193 (0.045)	0.197 (0.000)
E. Michigan	0.189 (0.012)	0.005 (0.002)	0.153 (0.000)	0.170 (0.016)
Wyoming	0.186 (0.067)	0.003 (0.002)	0.104 (0.000)	0.224 (0.086)
Iowa	0.181 (0.084)	0.003 (0.005)	0.110 (0.103)	0.225 (0.053)
Northern Illinois	0.171 (0.007)	0.003 (0.004)	0.078 (0.004)	0.245 (0.000)
C. Michigan	0.170 (0.077)	0.003 (0.003)	0.107 (0.050)	0.203 (0.060)
Jacksonville St.	0.158 (N/A)	0.004 (N/A)	0.151 (N/A)	0.114 (N/A)
Ohio	0.151 (0.025)	0.004 (0.002)	0.079 (0.000)	0.189 (0.031)
Ball State	0.142 (0.017)	0.004 (0.002)	0.123 (0.000)	0.094 (0.019)
Sam Houston St.	0.061 (N/A)	0.004 (N/A)	0.072 (N/A)	0.011 (N/A)

Navy	0.056 (N/A)	0.001 (N/A)	0.000 (N/A)	0.108 (N/A)
Kennesaw State	0.031 (N/A)	0.003 (N/A)	0.036 (N/A)	0.000 (N/A)
Army	0.014 (N/A)	0.001 (N/A)	0.000 (N/A)	0.023 (N/A)
Assortativity	0.051 (-0.0004)			
Density	0.242 (0.048)			

Note. Table is split to show 15 highest (top) and lowest (bottom) ranked teams by *Eigenvector;* values in parentheses reflect the network for blue-chip (four-star and five-star) transfers only.

difficult to identify any consistent sub-networks within the network at large.

Table 9

Top Connections and Modularity Scores for FBS Programs in the Transfer Portal (2019-2024)

Top Connections (All; $n > 5$)			Top Connections (Blue-Chip; $n > 2$)		
From	*To*	*n*	*From*	*To*	*n*
James Madison	Indiana	12	Alabama	Texas	5
Miami	SMU	9	Alabama	Florida State	3
Ole Miss	Southern Miss	8	Auburn	Troy	3
Oregon	Nevada	8	Florida State	Marshall	3
Buffalo	Kansas	7	Georgia	Arkansas	3
Nevada	Colorado State	7	Louisiana	Florida	3
Alabama	Texas	6	Michigan	Charlotte	3
Arkansas	Colorado	6	Oklahoma	Arkansas	3
Florida State	Florida Atlantic	6	Oklahoma	USC	3
Louisville	Cincinnati	6	USC	Fresno State	3
North Carolina	East Carolina	6	USC	Illinois	3
Texas	SMU	6			
Texas Tech	Houston	6			
Modularity	0.137		Modularity	0.027	

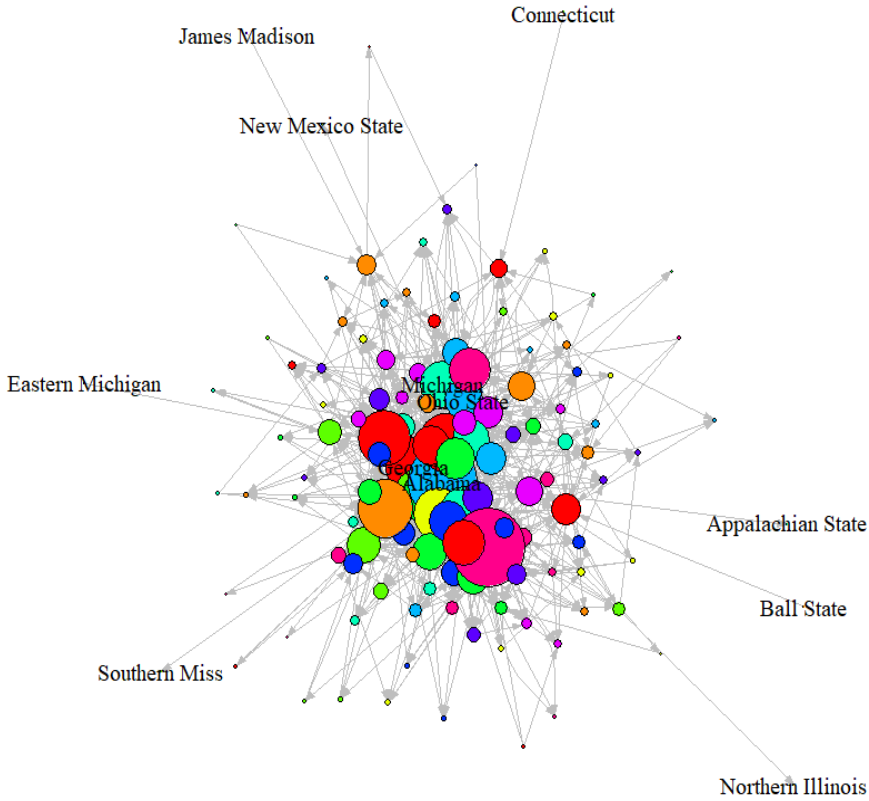
Team-Level Social Network Analyses (Blue-Chip Transfers)

The blue-chip, team-level network portrayed in Figure 4 provides further evidence of autonomous programs distinguishing themselves from the other FBS teams in the transfer portal when it came to their involvement with higher-rated players. The programs repulsed to the network's outer boundaries are all non-autonomous programs that were only sparsely connected to the rest of the blue-chip network.

The total-degree centrality measures for blue-chip transfers in Table 7 allude to this, showing most of these schools' transfer volumes consisted of players who were not blue-chip prospects. Meanwhile, the University of Georgia, University of Alabama, University of Michigan, and Ohio State University were situated nearer to the network's center with more frequent edges between them; however, just as it was in relation to the net-volume for all transfers, each of these four teams was at a net disadvantage for blue-chip transfer volume, losing 15, 21, 15, and five more elite players to the portal, respectively, than they gained through it.

Figure 4

FBS Transfer Portal Teams Network (Blue-Chip Transfers)



Note. Node size is scaled by total-degree centrality; national champions and the bottom 10% of teams for total-degree centrality are labeled.

Table 8 further shows many of the programs that were more central to the full network saw their roles diminish when the network was restricted to blue-chip transfers. The University of Colorado, for example, dropped from first to 21st in the rankings for eigenvector centrality (x = 0.389). Likewise, Arizona State University (x =

0.422) dropped from second to 17th, University of Louisville ($x = 0.230$) from fifth to 33rd, SMU ($x = 0.232$) from 12th to 41st, and University of Houston ($x = 0.219$) from 13th to 44th. Conversely, some of the more historically reputable programs, such as the University of Alabama ($x = 1.000$) and USC ($x = 0.847$), saw their centrality rise relative to the full network when only blue-chip transfers were counted. Though not pictured in Table 8, the same trend was observed in the increased eigenvectors of the University of Georgia ($x = 0.822$) and Ohio State University ($x = 0.497$). Holistically, the density indicator ($D = 0.048$) suggested the blue-chip network contained 4.8% of all possible directed transfer connections between teams, indicating a relatively sparse structure overall and in comparison to the full network. Additionally, the assortativity coefficient ($r = -0.0004$) maintained that there was little evidence of teams with similar total-degree centralities engaging in transfers with one another, implying a near-random and slightly disassortative pattern.

Lastly, the right-hand side of Table 9 shows the team-to-team connections that involved more than two effective blue-chip transfers. The most common move was from the University of Alabama to the University of Texas ($n = 5$). The University of Alabama appeared on the list a second time for having three players leave for Florida State University. The University of Oklahoma and USC were the other two programs that appeared twice on the list as primary exporters of blue-chip talent. Even so, the network's low modularity score ($Q = 0.027$) provided minimal evidence for the existence of sub-networks within the portal's overall structure; rather, an observable trend in this list is many of the transfers occurred between programs that had exchanged coaches or coordinators (e.g., Billy Napier moving from the University of Louisiana to the University of Florida, Lincoln Riley moving from the University of Oklahoma to the University of Southern California, Sam Pittman moving from the University of Georgia to the University of Arkansas, and Steve Sarkisian moving from the University of Alabama to the University of Texas), or between schools of relatively close geographic proximity (e.g., Florida State University to Florida Atlantic University and Auburn University to Troy University).

Team-Level Descriptive Statistics

The final inspection of transfer flow through the portal involved examining which teams achieved net advantages for talent and experience. Table 10 reveals Clemson University boasted the largest net advantage relative to the average 247 ratings for its incoming vs. outgoing transfers; however, the program's in-degree centrality measure in Table 7 shows the average for its incoming transfers was calculated from a single effective transfer. After this, the University of South Alabama, Northern Illinois University, Arkansas State University, and Temple University stood as the primary beneficiaries of 247-rated talent in the portal. On the other end, San Jose State University, Jacksonville State University, Northwestern University, Ohio University, and Ball State University, on average, experienced the largest net losses. In terms of the differences in PFF ratings, Northwestern University (3.578) rose to the top of the list, finishing second only behind the University of Kentucky (5.649)

as the biggest net-gainer of PFF talent. Three other schools from autonomous conferences, Stanford University (3.384), Vanderbilt University (3.242), and the University of Kansas (3.240), rounded out the top five as net beneficiaries of PFF-rated talent.

In a microcosm of what was seen at the conference level, the average flow of experience also tended to favor the more prestigious programs. The University of Michigan, University of Oregon, University of Notre Dame, University of Alabama, and Ohio State University all ranked among the top beneficiaries for total snaps or snaps per season gained. Ultimately, it was Stanford University that again benefited the most, acquiring transfers who averaged approximately 1,136 more total snaps and 406 more snaps per season relative to those who transferred out. At the bottom of the net experience and net PFF rankings were a consistent collection of programs from non-autonomous conferences. Central Michigan University, for example, was ranked in the bottom five across all three categories, while the University of Hawaii, Sam Houston State University, and the University of South Alabama ranked in the bottom five for two of the three categories.

Table 10

Mean Transfer Portal Talent and Experience Flow across FBS Programs (2019-2024)

	μ 247 Rating				μ PFF Rating		
Program	Gained	Lost	Net	Program	Gained	Lost	Net
Clemson	0.960	0.888	0.072	Kentucky	65.506	59.856	5.649
South Alabama	0.828	0.776	0.052	Northwestern	63.835	60.257	3.578
N. Illinois	0.852	0.802	0.050	Stanford	65.204	61.821	3.384
Arkansas State	0.833	0.783	0.050	Vanderbilt	64.517	61.276	3.242
Temple	0.835	0.787	0.048	Kansas	63.288	60.047	3.240
Marshall	0.833	0.825	0.008	Duke	62.710	63.205	-0.495
Connecticut	0.830	0.822	0.007	Washington St.	62.435	62.957	-0.522
LSU	0.885	0.878	0.007	Northern Illinois	61.697	62.361	-0.664
Pittsburgh	0.865	0.859	0.006	Utah	62.582	63.299	-0.717
TCU	0.864	0.858	0.006	Boise State	62.651	63.398	-0.747
San Jose State	0.794	0.843	-0.049	UTSA	59.557	65.455	-5.898
Jacksonville St.	0.801	0.850	-0.049	Texas State	60.848	67.018	-6.171
Northwestern	0.817	0.871	-0.054	Sam Houston St.	62.845	69.850	-7.005
Ohio	0.787	0.847	-0.060	C. Michigan	57.398	64.520	-7.122

Ball State	0.792	0.858	-0.066	Clemson	51.759	63.164	-11.404

	μ Total Snaps				μ Snaps per Season		
Program	Gained	Lost	Net	Program	Gained	Lost	Net
Stanford	2020.00	883.83	1136.18	Stanford	658.00	252.38	405.63
Notre Dame	1313.71	421.51	892.20	Oregon	402.29	110.84	291.45
Michigan	1148.47	256.89	891.58	Michigan	378.42	97.26	281.16
Iowa	1098.08	350.38	747.70	Ohio State	334.20	106.00	228.20
Oregon	1054.97	315.30	739.67	Alabama	350.67	125.87	224.80
California	626.63	707.06	-80.42	Oregon State	205.70	226.33	-20.63
Oregon State	543.50	625.93	-82.43	Appalachian St.	142.26	163.08	-20.83
James Madison	614.06	719.00	-104.94	Georgia Tech	176.53	201.97	-25.44
Georgia Tech	503.34	608.60	-105.26	Syracuse	207.65	236.61	-28.95
Colorado State	639.61	748.23	-108.62	California	219.15	256.42	-37.27
South Alabama	417.52	1215.46	-797.95	Jacksonville St.	175.67	460.33	-284.67
Hawaii	277.20	1099.46	-822.26	South Alabama	145.18	441.00	-295.82
Georgia State	330.97	1291.91	-960.94	Hawaii	97.18	399.00	-301.82
Ball State	248.00	1238.27	-990.27	C. Michigan	74.50	392.88	-318.38
C. Michigan	171.83	1280.06	-1108.23	Sam Houston St.	135.70	653.00	-517.30

Note. Sub-tables show the five top (white), middle (gray), and lowest (black) ranked programs by the *Net* column; programs had to have at least one transfer arrive and depart to be included.

Discussion

The transfer portal has remained an enigma across much of the college sports industry throughout its early years, drawing comparisons to the "wild, wild west" and receiving criticism for altering the competitive dynamics and culture of college athletics (Corr et al., 2024; Stahl, 2024; Weaver, 2021). This study, by comprehensively and quantitatively analyzing transfer portal trends, lent clarity to the system's structure and flow. Within both the conference and team networks, the social network and descriptive analyses indicated marquee conferences and programs occupied central roles in the facilitation of FBS transfers and were, on average, net beneficiaries of transfer talent and experience; however, the findings also revealed more nuanced

patterns, including greater variability in the talent ratings of Group of Five transfers, a tendency for rare high-end transfers in certain Group of Five conferences to be concentrated within a smaller number of programs, a notable prevalence of intra-conference transfers, and evidence that certain programs prioritized higher volumes of transfers or pursued athletes characterized by updated talent metrics. Altogether, this evidence holds a variety of implications for researchers and practitioners looking to advance theory or formulate best practices in the FBS and other college revenue sports impacted by the transfer portal.

Implications for Talent Acquisition

Stemming from the pervading logic that higher-quality player inputs lead to better athletic results for FBS teams (Dumond et al., 2008; Maxcy, 2013; Pifer & Huml, 2020), the findings of this study hold direct and indirect implications for a variety of constituents across the areas of talent acquisition, competitive dynamics, team culture, and player development in high-level college sport. To start, much of the practical discussion surrounding the transfer portal in its formative years has involved coaches highlighting challenges in sustaining player depth and maintaining consistent levels of performance in a market where player mobility has increased and direct payments to athletes are now permitted (Corr et al., 2024; Stahl, 2024). This study's findings showed elite, autonomous programs—while operating as central nodes in the movement of top-tier talent across the portal—were typically net losers in both total and blue-chip transfer volume; nonetheless, they often stood as net beneficiaries when it came to the average talent and experience levels of their arriving transfers, highlighting a propensity for teams to divest from larger quantities of lower-rated players (according to 247 and PFF) while investing in smaller numbers of higher-rated reinforcements.

Seeing as programs in the autonomous Power conferences frequently lost more players to the portal than they gained, the constant cycling of depth should prompt coaches to be proactive in obtaining suitable replacements through the portal or traditional recruiting outlets. Coaches have noted a plan is needed for managing the transfer system (Corr et al., 2024; Schrotenboer, 2024), and these findings reiterate the need for strategic roster optimization and proactivity in the portal as athlete turnover persists (NCAA, 2025). This is particularly true considering the asymmetries that emerged in the flow and concentration of talent between and within the autonomous and non-autonomous leagues. Findings were consistent with a transfer network in which higher-rated players made vertical moves from non-autonomous to autonomous programs or stayed within the Power conferences. FBS programs in the more prominent conferences used the portal to more precisely consolidate and upgrade higher-end talent, while non-autonomous Group of Five members acquired higher quantities of lower-ranked talent, often from less-prestigious institutions. This places an impetus on developing a proper strategy for recruitment through the portal, especially for programs in non-autonomous leagues where the distribution of blue-chip talent was relatively unequal across teams.

So, what strategies are available to teams with fewer resources? While many programs, particularly in the autonomous conferences, seem to be relying on the depth arriving from more prominent rivals, there were some anomalies in the transfer network that hinted at more pointed acquisition strategies. Northwestern University, for example, paradoxically seemed to be at a net disadvantage for 247 ratings while boasting a net advantage in its transfers' PFF ratings. Perhaps by utilizing data analytics and looking at ratings (like the PFF ratings) that contain more current and potentially more accurate information, teams can find inefficiencies in a market traditionally dominated by player values assigned at recruitment from high school (Maxcy, 2013). Intra-conference transfers among the Power conferences also occurred quite frequently, marking a key change from the prior era when such movements were impeded (Carrier & Edelman, 2024; NCSA, 2025). The SEC, for example, saw its member programs transfer more players within the conference than to any other league. Thus, to the extent that scouting and playing against players on a more regular basis provides additional information on a transfer's ability to succeed (Pifer et al., 2021), programs might be wise to pull talent from more familiar sources.

Likewise, struggling programs forced to hire a new coach might also be able to get better more quickly by signing coaches who can bring talented transfers with them, thereby avoiding an expected year-one drop (Pifer & Huml, 2020). This study's findings offered cursory support to prior research suggesting coaching changes play a significant role in transfer decisions (Pifer et al., 2021), as the transfer connections with the highest frequency typically involved the movement of a head coach or coordinator between programs (e.g., Curt Cignetti from James Madison University to Indiana University, Rhett Lashlee from the University of Miami to SMU, Steve Sarkisian from the University of Alabama to the University of Texas, and Lincoln Riley from the University of Oklahoma to USC). Other findings showed some of the largest net beneficiaries of PFF-rated transfers were teams like the University of Kentucky, Vanderbilt University, and the University of Kansas, which have historically ranked at or near the bottom of their respective conferences. In addition to their average gains in talent being better than their average losses, all three teams effectively used the portal to acquire transfer quarterbacks (Will Levis from Pennsylvania State University, Diego Pavia from New Mexico State University, and Jason Bean from the University of North Texas) who played key roles in seasons where they finished relatively higher in the standings. Given the noted importance of the quarterback position and the belief they can help teams improve more quickly (Dohrn & Lopez, 2022; Stahl, 2024), coaches could also benefit from prioritizing transfers at more critical positions. Even with key players likely to grow more costly in the era of NIL, comparatively lower-cost investments in areas such as data analytics, tactical development, and player scouting could help less prominent programs better identify and cultivate undervalued talent. Though further investigation is warranted, smaller programs might also find higher-quality high school recruits are now more attainable and affordable than they were prior to the portal, leading to a reallocation of resources back toward traditional recruiting efforts.

Implications for Competitive Balance, Team Culture, and Athlete Development

Initially, the finding that higher-rated transfers tend to be upwardly mobile while concentrating within a relatively narrow subset of FBS programs seems to align with concerns about emerging inequalities and the persistence of pre-existing power dynamics in the NCAA's revenue sports (Cali, 2014; Pitts & Evans, 2024; Stahl, 2024). This naturally leads to concerns regarding competitive parity in the FBS as stakeholders argue a transfer portal not tethered to further regulations will decrease competitive balance, outcome uncertainty, and the team stability needed to preserve fan interest, thereby harming the overall product (Cali, 2014; Carrier & Edelman, 2024). However, this study's findings indirectly reinforce the belief that the flow of talent is largely invariant to whether players have more control over the process or receive larger shares of revenue (Coase, 1960; Pitts & Evans, 2025; Rottenberg, 1956). Though future studies will need to validate such a claim through more direct empirical tests, the same dynamics witnessed in the pre-portal era appeared to be taking shape here; that is, the more prestigious programs offering greater exposure, better athletic opportunities, and access to top coaches and facilities seemed to be the same ones operating at the center of the transfer network. These competitive implications were further underscored by the network's low assortativity, modularity, and density values; collectively, these metrics indicated players were frequently exchanged between programs of differing quality, transfer movement was widespread, and substantive exchanges of talent were limited to a relatively low number of strategically positioned programs.

Claims of the portal being harmful to competitive balance also operate under the potentially faulty assumption that parity has existed in the NCAA's revenue sports. An alternative view is these sports have been rather imbalanced for long periods of time (Peach, 2007). Even in prior historic instances where the availability of talent or athlete compensation was affected by changes like the G.I. Bill or the introduction of athletic scholarships, competitive balance in college football was largely unaffected (Salaga, 2015). Instead, what might be occurring is that which has been suggested by prior studies in the academic space and by coaches like Nick Saban in the practical realm (Cali, 2014; Juravich & Mills, 2017; Stahl, 2024); that is, programs previously ranking in the lower to middle portions of autonomous conferences might be improving by prizing away players who would have previously remained as role or depth players at bigger schools. In the old system, where access to playing talent was largely limited to high school recruits, marquee teams could stockpile talent and inhibit players with higher costs for switching programs. Now, the portal enables teams like the University of Kentucky and Vanderbilt University to sign players looking for an opportunity to showcase their skills in a new environment. To this end, the portal provides the added benefit of allowing college athletes to further develop in programs offering more suitable coaching situations, playing opportunities, and locations closer to home. Based on the prior literature, these players will likely experience boosts in their personal performances and playing time after transferring, while

simultaneously offering teams a viable alternative to traditional recruits (Dohrn & Lopez, 2022; Pifer et al., 2021).

Even so, the findings—in line with Juravich and Mills (2017)—subtly suggest the expanded labor pool could be concentrating the limited number of high-end transfers entering the Group of Five among fewer programs in those leagues. Barring a few exceptions, incoming and outgoing transfers in the non-autonomous conferences were more variable in quality relative to the autonomous conferences, where the transfers' talent ratings were less dispersed. Most non-autonomous, Group of Five conferences also experienced net gains in 3-star and lower-rated players, but net losses or minimal gains at the 4- and 5-star levels. In the rare instances when blue-chip players transferred to programs in non-autonomous conferences, the distributions were highly uneven, suggesting only a select number of programs benefited. To address the uneven distribution of high-end transfers within the Group of Five, conferences could implement talent equity initiatives, provide targeted support to programs that historically land fewer elite transfers, and advocate for greater transparency through the consistent tracking and reporting of transfer trends (e.g., annual reports on transfer movement and player ratings). In conjunction with these measures, widespread advocacy for the development and adoption of advanced scouting tools, targeted recruitment models, and player development initiatives could help ensure all FBS programs have the means to compete more efficiently and effectively.

Beyond competitive balance, the implications of transfer movements on programmatic culture and athlete development are likely to remain a topic of conversation across the industry (Corr et al., 2024; Schrotenboer, 2024; Stahl, 2024; Weaver 2021). Some concerns, such as the impacts of transferring on academic progress (Schrotenboer, 2024), are timely but outside the scope of this study. Similarly, direct financial payments for NIL were only made salient at the back end of the sampled timeframe (Pitts & Evans, 2024), meaning discussions on equitable and optimal payouts will need to be linked to future studies in this context. What this study's findings were able to reveal was that FBS athletes, perhaps not by their own choice (Weaver, 2021), were being cycled as commodities through the transfer market. This was particularly true among 3-star athletes and other fringe players who represented the most common forms of transfer capital. How coaches navigate the optics of quickly replacing players who have not immediately panned out, or of ostracizing players for simply entering the portal, remains a challenge (Corr et al., 2024; Stahl, 2024; Weaver, 2021).

To date, concern for the well-being of individual athletes has not always been a priority. As noted by one former Group of Five athletic director, "In all cases we've allowed our coaches to make that decision. In most cases, our coaches are saying, 'Once you enter that portal, see ya'" (Weaver, 2021, para. 5). Or, as Deion Sanders—who during the timeframe of this study coached a University of Colorado team with some of the highest authority and hub scores in the network—once said regarding players leaving his program through the portal, "What are we losing?" (Schrotenboer, 2024, para. 25). These mindsets capture a dynamic being witnessed at the top level wherein coaches are quick to move on to other targets once players have signaled

their intentions to leave. To this end, perhaps more of a concern should be placed on athlete-related implications amidst the rapidly changing rosters and cultures of the teams. Although this study was only able to analyze finalized, effective transfers, a high number of portal entrants appeared to have down-transferred to schools outside the FBS or been forced out of college football entirely. More information on these "forgotten" players could help inform the decisions of athletes contemplating portal entry (Schrotenboer, 2024; Weaver, 2021).

Lastly, while consistent player turnover might pose challenges to coaches wanting to instill a specific sense of culture within a team (Corr et al., 2024), these reshufflings might also allow more locker rooms to benefit from the addition of veteran players. Speaking to the human capital of transfer athletes in relation to high school recruits (Dohrn & Lopez, 2022), the former are expected to have a "maturity" factor that coaches can "lean heavily on" while using them as "voices" in the team (Pifer et al., 2021, p. 188). To some extent, and particularly as it relates to the effective transfers analyzed in this study, they have demonstrated the fortitude required to play at the FBS level. The portal also facilitates the alignment of coach and player preferences (Turcott & Pifer, 2018), an outcome that could help smooth over other difficulties as coach and player interests coalesce during the later stages of an athlete's career. Accordingly, the onus falls on both coaches and players to assess the mutual fit of a transfer in terms of its anticipated effects on team culture, tactics, and motivations that may affect future performance.

Limitations and Recommendations for Future Research

While this study contributes valuable insights into the structure and implications of intra-FBS football transfers, several limitations must be acknowledged. First, the dataset was restricted to effective transfers defined as intra-FBS transfers who appeared in at least one game for both their original and eventual programs. Although this approach ensured the observed transfers incorporated relevant measures of human capital and reflected complete pathways of player mobility for purposes of conducting the network analyses, it excluded a substantial proportion of entrants who never saw playing time after transferring. As a result, the analysis does not capture patterns among "non-effective" transfers, including players who went to non-FBS divisions or never received opportunities after entering the portal. Future studies could analyze this neglected segment of transfer athletes to provide a more complete view of transfer outcomes and attrition in the portal. In contexts where the data are accessible, forthcoming analyses could also analyze whether these same trends are observed in transfer portals outside of FBS football.

Second, although both conference and team-level networks were analyzed, the high number of teams and higher granularity in the team-level data limited some of the more micro-level implications. While this study's approach was able to identify macro-level trends across the FBS network, important intra-conference trends and variations remain open for further exploration. Notably, some programs within non-autonomous conferences (e.g., SMU through 2023) were highly active in the portal, while others remained relatively inactive. Even within some of the Power

conferences, there are instances of teams (e.g., University of Colorado) being more central to the transfer portal network than others. As such, future research could employ longitudinal, program-level models to assess institutional behaviors in the portal and their relationships to competitive balance (Juravich & Mills, 2017; Salaga, 2015), coaching turnover (Pifer & Huml, 2020), and access to NIL resources (Pitts & Evans, 2024). At the least, some of these programs could serve as viable case studies for researchers interested in the unique strategies and approaches being utilized by portal-active teams. The specific mechanisms driving these success stories, whether related to the targeting of transfer quarterbacks (Dohrn & Lopez, 2022) or the work of efficient coaches and tactical systems (Maxcy, 2013), remain open for exploration.

Third, this study does not include direct data on transfer motivations. While the structural patterns observed in the network analysis suggest coaching changes, personal opportunities, and institutional visibility may play important roles (Dumond et al., 2008; Mirabile & Witte, 2017; Nixon et al., 2021; Pitts & Evans, 2024), these inferences remain indirect. Survey-based or interview-driven research would allow scholars to assess the extent to which players are influenced by factors such as geography, NIL offers, relationships with coaches, or immediate playing time. In addition, while this study utilizes both pre-college talent indicators (i.e., 247 ratings) and more current performance metrics (i.e., PFF ratings and snap counts), it does not fully account for the role of position-specific value or team-system fit. A player with average aggregate ratings may provide disproportionate impact if they fill a critical need or occupy a high-leverage role within a particular scheme. Therefore, future research could further disaggregate transfer outcomes by player position and other factors (Dohrn & Lopez, 2022), enabling a more precise understanding of talent flow and returns on transfer investment.

Lastly, this study placed a strong emphasis on quantitative metrics such as network centrality and rating distributions that may not capture the lived experiences or adaptive strategies of players and coaches. Future research could further examine how programmatic culture (Corr et al., 2024), institutional support systems, and academic outcomes intersect with mobility patterns (Schrotenboer, 2024), particularly for athletes transitioning from lower-resource programs to higher-visibility institutions. Together, these limitations highlight opportunities for future research to generate additional insights that are applicable to college sports, the transfer portal, NIL, and more specific economic theories. By integrating additional datasets, qualitative insights, and more granular performance metrics, future scholars can develop a richer, more contextualized understanding of how the transfer portal is reshaping college football and the college-athlete experience.

Conclusion

This study analyzed 4,245 effective transfers that occurred between FBS programs during the formative years of the transfer portal with the objective of exploring (RQ1) which FBS conferences and teams were more or less influential within the transfer portal network and (RQ2) which FBS conferences and teams experienced net gains or net losses in relation to the volume, experience level, and talent level of

incoming and outgoing transfers. Social network analyses and descriptive statistics showed marquee conferences and programs were often central to the facilitation of elite talent through the transfer portal, and many of these autonomous institutions were, on average, net beneficiaries of the talent and experience being cycled through the system. While these findings generally coincide with the publicized assumptions of coaches, industry experts, and economists, more nuanced implications emerged from the findings that top transfer talent was typically less variable and less concentrated among Power Five (autonomous) programs relative to the (non-autonomous) Group of Five, intra-conference transfers were relatively prominent, and certain teams appeared to prioritize higher volumes of transfers or athletes with specific measures of talent. Going forward, researchers are invited to more precisely explore the effectiveness of teams' portal-based strategies on athletic performance, the impact of the portal on talent distribution and competitive balance, and the risks and benefits of the portal to athlete development and team culture.

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