

Firms' responses to changes in frictions in related human capital factor markets

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Abstract

Research Summary: Strategic human capital scholars suggest that firms' human capital rents are greater when labor market frictions are more prevalent. Taking this argument further, we suggest that when frictions for one type of human capital decrease, firms are motivated to place greater emphasis on human capital that is interdependent in production where frictions are unchanged. Empirically, we exploit an exogenous institutional change in the National Football League to demonstrate that coaching (managerial) dismissal and replacement is more likely to occur (and is influenced by a wider variety of information) after frictions for player (production worker) human capital decrease. Our findings suggest adding a new dimension—tradeoffs between related labor market segments—to the scholarly conversation about how firms manage their human capital (and other resources) strategically.

Managerial Summary: We often point to the existence of labor market frictions for different types of human capital as reasons why firms would emphasize one type of human capital over another. But changes in frictions in markets for related human capital, the present focus, can influence this decision as well. In particular, our study demonstrates that when the NFL implemented free agency and a salary cap in the market for player talent in 1993, limiting the ability of teams to stockpile talented players, NFL teams

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responded by increasing their emphasis on coaching talent in the production of wins. This increased emphasis manifested in more frequent coaching dismissals and a greater influence of different types of information on the desirability of replacing a team's head coach after 1993.

KEY WORDS

executive dismissal, managerial human capital, resource-based view, strategic factor markets, strategic human capital

1 | INTRODUCTION

Strategy scholars increasingly focus on how firms can gain competitive advantage by leveraging frictions in human capital factor markets (see Brymer, Chadwick, Hill, & Molloy, 2019; Coff, 1997; Coff & Kryscynski, 2011; Mackey, Molloy, & Morris, 2014). Indeed, some observers argue that market frictions underlie all strategic phenomena (cf. Mahoney & Qian, 2013). How firms respond to frictions in those markets therefore becomes critical in explaining cross-firm differences in human capital rents (Chadwick, 2017). Human capital can serve as a means of competitive advantage when supply-side mobility barriers hamper workers from leaving their firms (Peteraf, 1993) or when demand-side frictions inhibit firms from freely hiring workers (Campbell, Coff, & Kryscynski, 2012).

The human capital factor market consists of many distinct market segments where frictions vary. These labor market segments can be interrelated as a consequence of interdependence between different types of workers in production. For example, “star” investment analysts make contributions to firm production interdependent with talented support staff (Groysberg, 2012), revealing both as necessary inputs to production. While strategic human capital (SHC) scholars readily acknowledge human capital interdependence of this kind, SHC has largely overlooked the corresponding relatedness between market segments and its implications.

In this article, we examine how changes in market frictions pertaining to production workers impact how organizations use managerial human capital. When supply-side labor market frictions allow firms to acquire and accumulate production worker human capital at rates below its use value, firms can generate rents from this talent (Chadwick, 2017). But if those frictions decrease, the market for that factor becomes more competitive, thus reducing firms' rents from production worker human capital (Peteraf, 1993). In such a circumstance, we posit that a firm will increase its emphasis on *managerial* human capital, which is fundamentally interdependent with that of production workers, resulting in greater frequency of managerial dismissal and replacement as a consequence.

Managers create value for a firm on their own merits (Holcomb, Holmes, & Connelly, 2009) and by coordinating firm resources effectively (e.g., Kor & Mahoney, 2005). This latter role is particularly important when firms hold similar quality stocks of resources (Holcomb et al., 2009; Sirmon, Gove, & Hitt, 2008). Specific to human capital, we posit that managers are especially impactful drivers of differences in firm performance when production employees have fewer mobility barriers, as new employees must be assimilated, integrated, and

coordinated more frequently, and cross-differences in the quality of firm workforces are harder to maintain. Firms thus become more reliant on managers to orchestrate talent as a means of differentiating them from their competitors (Holcomb et al., 2009).

But accurately observing the use value of managerial human capital *ex ante* poses a distinct challenge, and causal ambiguity often exists with respect to the capabilities most relevant to managerial quality, even after hiring. These ambiguities reflect inherent frictions in the managerial human capital market segment that create and maintain cross-firm variance in managerial quality (Holmstrom, 1982). These ambiguities induce firms to pursue an “organizational adaptation” approach to finding managerial talent, wherein firms believe that managers reveal their quality over time as they serve and replace them when they perceive that a new manager can more effectively influence future performance (Shen & Cho, 2005). Consistent with managerial dismissal scholars, we argue that an increase in managerial importance to strategic differentiation will manifest itself in more intensified organizational search for effective managers. Given the organizational adaptation approach to sourcing managerial talent, more frequent dismissal and replacement become a fundamental indicator of this intensified search. We further draw on the managerial dismissal literature to argue that when the dismissal decision becomes more consequential, organizational evaluators will increase their reliance on certain objective types of information in making this decision.¹

Our study contributes to research on strategic factor markets (SFM) within the resource-based view (RBV) by illustrating how factor markets for complementary resources operate when frictions for one type of resource change. We answer recent calls for research focusing on market frictions (e.g., Mahoney & Qian, 2013) by showing how changes in frictions influence firm behavior and operational strategies. Finally, we contribute to research on managerial turnover by illustrating that exogenous regulatory changes affect managerial dismissal by increasing organizational evaluators' focus on managers' importance. Guided by SFM and managerial dismissal concepts, we test our hypotheses on dismissal of head coaches in the National Football League (NFL) over 28 seasons surrounding an institutional change that affected labor markets for production workers (players) and managers (head coaches).

2 | THEORETIC VIEWS ON STRATEGIC FACTOR MARKETS AND HUMAN CAPITAL

Strategy researchers have linked the concepts of human capital and competitive advantage largely based on theoretic descriptions of strategic factor market competition. In factor markets, firms acquire key resources that become inputs to (rather than outputs of) their production of goods and services. RBV scholars argue that firms achieve competitive advantage based on the unique resources that firms possess (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). Firms acquire resources in factor markets at prices reflecting their economic value unless a firm has better information about a resource's use value, is somehow luckier or more privileged in resource acquisition or retention, or can generate greater use value from resources (Adegbesan, 2007; Barney, 1986). Market traits that create such conditions serve as “imperfections” or “frictions.” RBV scholarship is the study of how factor market frictions influence a firm's ability to generate rents from resources and capabilities (Peteraf, 1993).

¹In our empirical context, the NFL, the decisions to retain or replace a head coach lies in team owners and their representatives (e.g., GMs), whom we label as “organizational evaluators.”

Human capital, definable as individuals' knowledge, skills, abilities, and other attributes, both inherent and acquired (Ployhart & Moliterno, 2011), constitutes one such resource. SHC scholars have frequently used a factor market frictions lens to articulate how superior human capital helps firms attain competitive advantages (Campbell et al., 2012; Hatch & Dyer, 2004; Hitt, Bierman, Shimizu, & Kochhar, 2001; Ployhart, Nyberg, Reilly, & Maltarich, 2014). For example, a large share of the SHC literature explores how firm-specific human capital allows firms to derive economic rents (Hatch & Dyer, 2004), as workers cannot readily sell such services to other employers in the labor market. Firm specificity can enable firms to garner greater value from human capital than it costs, at the margin; specificity thus becomes a potentially significant factor market friction. Campbell et al. (2012) describe a variety of labor market frictions that firms might leverage.

SHC research on worker mobility also takes a strategic factor market perspective by describing the effects of "poaching" human capital from competitors (Groysberg, 2012). Gardner (2005), for example, demonstrated that firms' responses to competitors' attempts to poach their employees depend on the value and transferability of human capital. Recent executive human capital research has assumed a strategic factor market framing as well. For example, Mackey et al. (2014) demonstrated that general (portable) human capital more likely becomes a source of rents when it is scarce in the executive human capital market. Brymer et al. (2019) also applied factor market frictions concepts in their discussion of human capital acquisition "pipelines."

Despite the theoretical importance of strategic factor markets to competitive advantage, few existing studies have examined how strategic factor markets change (Maritan & Peteraf, 2011). The majority of existing research (including in SHC) focuses on how firms gain advantages within a specific factor market (Makadok & Barney, 2001) or acquire bundles of resources (Amit & Shoemaker, 1993), but not how these markets adjust when industry-wide frictions change—particularly when it occurs in a *related* factor market. We target the confluence of these two research gaps: labor market segment relatedness and exogenous changes in strategic factor market frictions.

2.1 | Strategic factor market relatedness and human capital interdependence

SHC discussions of human capital and firm performance implicitly assume that human capital market segments function independently, an ironic contrast to the growing emphasis in SHC on productive interdependence between human capital types. In principle, two human capital market segments may be related either because firms use the two types of labor as substitutes (they can replace each other in production) or interdependently (both are essential to production because they perform different necessary functions). Our analysis combines these two conditions. We examine the implications of relatedness that exist because two types of human capital are essential to production, while acknowledging a degree of substitutability between them. Consequently, the proportions of each type required for optimal production are not fixed across producers, but rather can be modified to adjust to contingencies.²

²Complementarities occur when the joint use of types of human capital increase the total returns to both (Milgrom & Roberts, 1992). Complementarity is a growing theme in SHC research (e.g., Chadwick, 2017) and has been noted in factor market research (e.g., Adegbesan, 2007), but the existence of this type of interdependence is not requisite to this article's arguments.

Many production settings involve imperfect substitutability and interdependence between workers from different labor market segments. For example, nurses and physicians perform different roles in the production of patient care. Without the contributions of both, the quality of patient care would decline; at the same time, because they have different skill sets, their contributions are not perfect substitutes. Thus, setting aside regulatory restrictions, it would be unwieldy, if not impossible, to use teams composed solely of nurses or solely of doctors to deliver patient care. However, at less extreme levels of emphasis on one or the other type of worker, a degree of functional overlap between these two groups allows health care providers flexibility in deciding on the proportions of inputs from nurses and physicians they can use to produce patient care.

This productive interdependence between workers ties together how firms participate in their respective labor market segments. Frictions in certain markets can affect how firms emphasize a particular type of human capital. Some of the differentiation between the roles of nurses and physicians, for example, reflects regulation, a labor market friction. If the government broadened the tasks that nurses can perform, the friction reduction could cause employers to shift some emphasis away from physicians and toward nurses, who are generally cheaper to employ. But given the imperfect functional substitutability between the two, one would not expect employers to use only doctors or nurses in care-giving. Physicians and nurses still must work together, but the optimal proportions of each do not remain fixed. Furthermore, the degree of flexibility to trade off these two human capital inputs also depends on the type of patient care in question—that is, the interdependence is contingent on the production function.

2.2 | Interdependent contributions of managerial and production worker human capital

The RBV suggests that contingent on contextual factors, resources differ in their contributions to firm performance (Barney, 1991; Peteraf & Barney, 2003). As Lepak and Snell (1999) and others have noted, not all employees contribute to firm performance in the same way. Accordingly, we posit that managerial and production worker human capital exerts imperfectly substitutable, interdependent effects on production (cf. Adner & Helfat, 2003). Production worker human capital allows the performance of the essential tasks of the firm's value creation process, while managerial human capital coordinates, motivates, and supports those tasks. In the context of a firm's production function, production workers *directly* contribute to production, while managers primarily contribute *indirectly* (cf. Adner & Helfat, 2003; Penrose, 1959). Exogenously altered frictions in the labor market for one of these human capital types thus plausibly influence how firms approach the employment of the other type—particularly as they respond to subsequent changes in the relative prices of the two inputs.

This interdependence clearly exists in the NFL, where players are production workers who contribute directly to producing team wins and head coaches are managers who help players become more effective at contributing to wins.³ These contributions are partially substitutable in that superior players can overcome coaching weaknesses through on-field performance, while superior coaches can overcome player weaknesses by orchestrating them (e.g., game

³In discussing our empirical context, we refer to production workers and managers as players and coaches, respectively. We return to the production workers and managers terminology when discussing our arguments theoretically.

planning for an opponent) more effectively. Optimal performance most likely occurs when both groups make their best contributions. Thus, production worker (player) and managerial (coaching) human capital inputs make distinct, interdependent, but not identical contributions to firm (team) production (e.g. Holcomb et al., 2009; Penrose, 1959).

Because teams can alter their mix of player and coaching talent, they can attempt to maintain a given (existing) level of on-field performance (wins), or possibly even increase their performance, in response to changing competitive conditions in the relevant human capital markets, contingent on the relative unit prices and contributions of the two inputs to production. In turn, producing wins in the NFL fuels the generation of revenue. In this respect, winning and optimizing profitability, with respect to factors that players and coaches can control, are aligned.⁴ Thus, the interdependence between worker and managerial human capital in production links how firms approach these labor market segments. In the next section, we theorize as to how changes in factor market frictions for production worker human capital can influence how firms approach evaluating and acquiring their managerial human capital.

2.3 | Central hypothesis: Implications of segment relatedness for strategic factor market trade in managerial human capital

Our hypotheses draw upon two streams of research. The first pertains to our discussion of relatedness between strategic factor market segments, which leads to our proposition that changes in frictions in one segment alter how firms emphasize and approach competition in a related segment. For our central hypothesis, we argue that changes in frictions for production workers will increase firm emphasis on managerial human capital, manifesting itself in a higher likelihood of managerial dismissal and replacement. Accordingly, the second research stream we draw upon pertains to managerial dismissal.

As noted earlier, the ability of firms to garner rents based on human capital depends on the existence of frictions in its associated labor market segment. Absent frictions, the cost of human capital will equal the value the human capital creates (Barney, 1986; Chadwick, 2017). Other things equal, more severe frictions in one factor market will induce firms to emphasize that resource over others, given the proportionally greater opportunities for rents that such frictions enable (cf. Barney, 1986; Chi, 1994). Logically, then, when frictions in a factor market dissipate, opportunities to accrue rents from that resource decline (Barney, 1986; Peteraf, 1993). Consequently, *changes* in the degree of emphasis placed on one type of resource relative to other resources may be driven by *changes* in another factor market's frictions, rather than the absolute amounts of frictions present in each market segment.

Specifically, we propose that when frictions in the market for production workers decrease, firms increase their emphasis on managerial human capital for three reasons. First, as we have argued above, managerial human capital can partially substitute for production worker human capital (Holcomb et al., 2009). Thus, changes in frictions that reduce the ratio of use value to cost for production workers (i.e., increase cost of production worker human capital) reduce the rents to investments in production worker human capital. The magnitude of the tradeoff between managerial and production worker human capital depends on their degree of functional substitutability, which varies with the

⁴NFL franchises have many revenue sources, including tickets, game day revenue (e.g., parking), and sponsorships. The head coach does not directly produce these revenue streams but does impact them indirectly, through on-field wins.

characteristics of the firm's production function. Second, when a reduction in frictions increases the efficiency of the market for production workers, such workers (particularly workers with more general human capital) should move more readily between firms. Firms then face an increased dispersion of production worker human capital across employers and more frequent workforce churn (Barney, 1986); in turn, increased churn can decrease coordination between production workers and other resources and amongst production workers themselves.

Third, in the wake of these changes, managerial human capital becomes a more important differentiator. When production workers churn more frequently, coordination and integration of production workers, rather than production worker human capital itself, drive a larger share of cross-firm differences in human capital rents. That is, firms will rely more heavily upon managers to effectively identify, integrate, and coordinate production worker human capital (Penrose, 1959; Peteraf & Barney, 2003; Tripsas, 1997). Consistent with this argument, Holcomb et al. (2009) found that managerial human capital can create rents more readily when other resources are more evenly dispersed across firms. In the NFL, the implementation of free agency raised the unit price of player talent, while the salary cap legislated a maximum and common total amount that teams could pay players. These changes could be expected to lead NFL teams to increase their emphasis on the other key input of the win production function, managerial talent, creating empirically observable consequences for managers.

An increased focus on managerial human capital in production could result in higher compensation for managers, an increased focus on assessing and potentially replacing the manager, or both. We suggest two important reasons why managerial dismissal and replacement is an appropriate indicator of this greater emphasis. First, significant variation exists among managers in their ability to create value through resource orchestration (Sirmon, Hitt, Ireland, & Gilbert, 2011), but the key characteristics of successful managers are typically causally ambiguous. Indeed, how managers influence production worker effectiveness is difficult to define or observe (Adner & Helfat, 2003) and is often context specific (Holcomb et al., 2009). Second, managers' contributions to firm performance are difficult to disentangle from other resources' contributions (Holmstrom, 1982). For instance, in the NFL context, it is difficult to disentangle the effects of players from coaches on the team's ability to produce wins.

These significant *ex ante* information asymmetries increase the chance of adverse managerial selection (Zajac, 1990; Zhang, 2008), while *ex post* causal ambiguities mean that mistakes in attributions regarding managerial quality also occur (Shen & Cho, 2005; Zhang, 2008); that is, such ambiguities create frictions in the managerial labor market that are hard to dispel (Holmstrom, 1982). Crucially, organizational evaluators are also risk averse and therefore tend to be less concerned about mistakenly replacing good managers (false negatives) than with the risks of continuing to employ poor managers (false positives), when other, untested, and potentially better options are available on the managerial labor market (Fredrickson, Hambrick, & Baumrin, 1988).

As managerial dismissal scholars have observed, these characteristics induce evaluators to pursue an "organizational adaptation" approach to finding managerial talent, wherein managers are frequently replaced as firms search for new managers who can better optimize future performance (Shen & Cho, 2005). Turnover occurs when evaluators believe the opportunity in drawing from the pool of replacement managers exceeds the benefits of continuing to employ the current manager (Zajac, 1990; Zhang, 2008). Such turnover may occur even when an

organization's current performance looks favorable if an alternative manager is seen as offering the possibility of even greater performance.⁵

To summarize, we posit that evaluators will more quickly dismiss managers when they increase their emphasis on strategic differentiation through managerial (rather than production worker) human capital. This increased managerial emphasis, along with evaluators' risk aversion and the causal ambiguity regarding managerial contributions, make evaluators less patient with managers because they judge the perceived "ceiling" of the existing manager's "upside" as both more apparent and overly costly at the margin, while viewing the higher "upside potential" of a replacement as less constrained. The greater the emphasis on managers in production, the greater the likelihood that evaluators' risk aversion will prompt them to opt for a new draw from the pool of replacement managers.

This proposition lies at the heart of managerial dismissal research, reflecting the "organizational adaptation" perspective documented in that literature (e.g., Kaplan & Minton, 2012). The novel part of our argument is the proposition that friction reductions in the factor market for a different, interdependent type of human capital can drive that increased emphasis. In short, greater emphasis on differentiation through managers makes evaluators more willing to use dismissal as a check on the accuracy of their assessments of a new manager's potential. The apparent opportunity costs of retaining the incumbent become higher as managers become more important to performance. Therefore we hypothesize:

Hypothesis 1 (H1). *Ceteris paribus, within a given firm, a manager's odds of dismissal increase when market frictions in the factor market for production worker human capital decrease.*

2.4 | Contingency hypotheses: The influence of information on managerial dismissal

Consistent with the arguments above, we hypothesize that various contingencies that predict dismissal generally will become more influential as changes in frictions increase organizational evaluators' emphasis on replacing the current manager (Banker & Datar, 1989; Davila & Venkatachalam, 2004). These factors serve as information for evaluators when making that judgment. Importantly, previous researchers have established that such information influences evaluators' views of their managerial alternatives under uncertainty rather than of the quality of their current manager in absolute terms—a subtle but vital distinction. This is the common element that unites the moderation hypotheses. In this study, we consider five types of information previously identified by managerial dismissal scholars that are particularly pertinent to the managerial replacement decision in the NFL setting: current period organizational performance, the difficulty of the competitive context, the quality of an organization's production worker human capital, and the manager's reputation and firm tenure (Banker & Datar, 1989; Bushman, Dai, & Wang, 2010; Davila & Venkatachalam, 2004).

⁵In contrast, given information asymmetries about managerial quality, investing in managerial talent alone (such as by paying higher salaries) is unlikely to enhance production. Increasing the unit price of managerial talent will not ensure a greater return, especially given declining organizational confidence in the incumbent. Assuming the firm already pays competitive managerial wages, organizational evaluators will focus on their other available action area, managerial dismissal.

2.4.1 | Current performance

The first contingency is current firm performance: Given low organizational performance, evaluators may conclude that a replacement manager might improve that performance (Wade, Porac, Pollock, & Graffin, 2006). Organizational evaluators commonly assume that current period performance is a reasonable predictor of a manager's expected future performance (Fredrickson et al., 1988), such that strong current performance motivates a more positive appraisal and managerial retention (e.g., Fee & Hadlock, 2004). On the other hand, relatively weak organizational performance encourages dismissal, a judgment in favor of replacement made more likely in the presence of causal ambiguity and evaluators' risk aversion.

As articulated heretofore, a more competitive market for production worker human capital should increase the importance of managerial human capital to variance in firm performance (Holcomb et al., 2009). Consequently, we expect that the influence of current organizational performance on managerial dismissal will be more pronounced when those frictions decrease; that is, finding an alternative manager will seem to have greater import, further decreasing a firm's patience with poor performance and prompting search for a replacement manager:

Hypothesis 2a (H2a). *Ceteris paribus, within a given firm, higher levels of current firm performance more strongly decrease a manager's odds of dismissal when market frictions in the factor market for production worker human capital decrease.*

2.4.2 | Competitive context

We suggest that the difficulty of the firm's competitive context also influences evaluators' willingness to replace a manager, even if such competition is only weakly linked to managerial efforts. Evaluators may find a replacement manager to be more attractive in environments with strong competitors, as this will suggest that potential replacements potentially drawn from the pool of *competitors'* managers may be of higher quality (cf. Kaplan & Minton, 2012). Again, this dynamic makes the most sense vis-à-vis evaluations of the relative attractiveness of hiring a replacement manager; competitive context might be a *mitigating* factor in an *absolute* evaluation of managerial quality. We posit that when managers increase in importance to firm production, evaluators will make more use of information on the difficulty of the competitive context, as the decision to retain or dismiss a manager takes on higher stakes. Thus, we expect that a reduction in production worker human capital market frictions, coupled with a stronger competitive context, will encourage managerial dismissal:

Hypothesis 2b (H2b). *Ceteris paribus, within a given firm, a more difficult competitive context increases a manager's odds of dismissal when market frictions in the factor market for production worker human capital decrease.*

2.4.3 | Production worker human capital

Given finite resources, firms face tradeoffs between investments in production worker versus managerial human capital. In the NFL, prior to changes in player human capital markets that

made stockpiling talent much more difficult, investments in player human capital were limited only by club resources and owners' commitment to use them. Further, factor market frictions such as restricted free agency enabled teams with superior player rosters to perpetuate their competitive advantages.

Removing production worker market frictions increases the unit price of those workers, thus reducing the incremental value of investments in production workers and increasing the incentive for firms to invest in managerial human capital. Moreover, in the NFL context, a salary (player payroll) cap explicitly limits overall investments in production worker human capital. Firms in this changed environment thus find it harder to maintain higher-quality player workforces relative to competitors. Somewhat paradoxically, then, we expect that when firms possess superior production worker human capital under these circumstances, they will more readily change their current managers. That is, given the reduction in production worker market frictions, evaluators will be more impatient to find a manager who can optimally organize talent when they have superior production worker human capital because such advantages are seen as less sustainable:

Hypothesis 2c (H2c). *Ceteris paribus, within a given firm, higher levels of production worker human capital more strongly increase a manager's odds of dismissal when market frictions in the factor market for production worker human capital decrease.*

2.4.4 | Managerial reputation

Evaluators regard a manager's reputational capital—reflective of past accomplishments—as an important input when setting expectations of potential future contributions to firm performance relative to replacements (Fee & Hadlock, 2004; Wade et al., 2006). Third party certifications by expert external assessors also can provide reputational endorsements of the manager's potential future performance (Schepker & Barker, 2018; Wade et al., 2006). Thus, when the existing manager has a favorable reputation that has been built over time, evaluators will view dismissal as relatively more risky with respect to future firm performance, independent of current firm performance. Thus, we anticipate that higher levels of managers' reputational capital will be associated with a lower likelihood of dismissal.

In parallel with our earlier logic, when getting the managerial choice "right" increases in importance, we expect that evaluators' use of managerial reputation to inform their dismissal decision will increase. Thus, we hypothesize that given reduced frictions in the production worker human capital market, managerial reputation will more strongly discourage managerial dismissal:

Hypothesis 2d (H2d). *Ceteris paribus, within a given firm, a more positive managerial reputation more strongly decreases a manager's odds of dismissal when market frictions in the factor market for production worker human capital decrease.*

2.4.5 | Managerial tenure

Extant research suggests that the likelihood of dismissal increases with managerial tenure (Kim, 1996). Because firms initially observe managerial talent imperfectly, managers commonly

enjoy a “honeymoon period” when evaluators refrain from making final judgments of managerial potential. As observations of managerial behavior accrue, evaluators’ views of that potential evolve, and the chances of dismissal rise concurrently as some managers are judged to be unfit, relative to alternatives (Shen & Cho, 2005). With time, evaluators also may come to perceive managers as “stale in the saddle” (Miller, 1991) to the extent that their knowledge appears obsolete and their relationships with production employees wear thin.

When firms increase their emphasis on managerial contributions, the apparent opportunity cost of continuing to employ a “stale” manager will also become more consequential to evaluators, making a replacement appear more attractive. Further, when production worker human capital churns more rapidly, resource orchestration becomes more critical, making stale, longer-tenured managers more likely to propagate rather than mitigate core rigidities (Leonard-Barton, 1992). Thus, given reduced frictions for production worker human capital, greater emphasis on managerial human capital should increase the positive association of longer managerial tenures with dismissal:

Hypothesis 2e (H2e). *Ceteris paribus, within a given firm, higher levels of manager tenure more strongly increases a manager’s odds of dismissal when market frictions in the factor market for production worker human capital decrease.*

3 | METHODS, EMPIRICAL SETTING, AND DATA

In this study, we apply a logistic discrete-time maximum likelihood event history analysis to model the hazard of NFL head coach dismissal. This method divides each coach’s event history into one or more time units (coach-seasons), each of which constitutes an observation. Event history analysis is appropriate for a data set in which the dependent variable captures a discrete event (i.e., coach termination) and a number of independent variables update across coach-seasons within a coach’s tenure with a team (coaching spell). The analytic procedure corrects for autocorrelation across coach-seasons.

The predictions related to the role of informational inputs motivate both our empirical approach and affect the interpretation of results. Relative performance evaluation theory (e.g., Kaplan & Minton, 2012) posits that evaluators weigh performance against expectations that can vary from firm to firm, even in the same industry. In practice, these performance standards (or aspirations) become difficult to observe and thus measure; such unmeasured differences in aspirations can mitigate the direct effects of current performance on managerial dismissal in cross-firm analyses. Moreover, experience shows that varying performance standards across firms also make it difficult to find statistically significant interactions between current firm performance and other sources of managerial information and in managerial dismissal models, despite the intuitive appeal of such. Therefore, our reasoning in relation to contingent informational inputs emphasizes their *direct effects* on the decision by evaluators to move on from their existing managers rather than employing them as moderators of the main effect of current performance.

Accordingly, we examine “within-firm” changes in the likelihood of managerial dismissal, with firm fixed-effects accounting for organization-specific variation, including the emphasis placed on coaches and standards of performance, that remain constant over the observation period. Results from a Hausman test of the consistency of coefficients from random effects and fixed effects models indicate the appropriateness of using fixed effects ($\chi^2 = 36.11$,

$p = .01$). Consequently, coefficients in our analysis should be interpreted to indicate the likelihood of coach termination in a given period for a given team relative to that likelihood for the same team in another part of the observation period.

3.1 | Advantages of studying human capital market segments in the NFL setting

We place our study in the U.S. National Football League (NFL). Production worker human capital in the NFL takes the form of the 53 players who make up a team's roster during a season. Player human capital has a direct impact on an NFL team's on-field performance (cf. Wright, McMahan, & McWilliams, 1994), as the knowledge, skills, abilities, and other characteristics of players are employed to influence the outcomes of the games they play. The head coach's human capital (managerial human capital) complements player human capital in ways that are consistent with our theoretic description of relatedness above.

NFL teams' identification, acquisition, and effective deployment of players require coach managerial expertise (Holcomb et al., 2009; Tripsas, 1997). NFL head coaches develop customized game plans and build multi-season plans and styles for strategic management of player human capital (cf. Cappelli & Crocker-Heftner, 1996). One can thus view NFL coaching as a form of managerial resource orchestration. As described above, player human capital functions as a direct input to on-field production, while coaching human capital affects production indirectly. This suggests that coaching human capital complements, but imperfectly substitutes for, player human capital. Moreover, observers note that NFL teams take the organizational adaptation approach to head coaches, selecting them in a trial-and-error process aimed at acquiring optimal coaching human capital (cf. Shen and Cho, 2005).

The paper takes advantage of an exogenous shock to the NFL's player human capital market to test our hypotheses. Unrestricted free agency was implemented prior to the 1993 season, while a salary cap was instituted prior to 1994. The salary cap mandates that a team's total expenditure on player human capital cannot exceed a league-legislated maximum in a given year. Free agency allows eligible players to sell their services to any team. Prior to the 1993 season, player human capital was heterogeneously distributed across teams and largely immobile due to a lack of unrestricted free agency (Larsen, Fenn, & Spenner, 2006; Rosen & Sanderson, 2001).⁶ In this period, teams willing to spend resources on player human capital could trade with less wealthy teams for valuable players (Rosen & Sanderson, 2001). The absence of free agency and a salary cap meant that teams with greater financial resources could have persistent advantages in acquiring and stockpiling player human capital over teams with fewer resources. Additionally, teams could retain player human capital at market-suppressed salaries to appropriate monopsony rents, due to the lack of player recourse (cf. Barney, 1986).

Free agency, however, increased the unit cost of player human capital as more teams bid competitively for free agents, particularly for star veteran players, who could then appropriate more of their use value from firms (Leeds & Kowalewski, 2001). Furthermore, the salary cap limited overall spending and thus reduced resource-rich teams' advantages in stockpiling player human capital relative to less wealthy teams. The salary cap also mandated that clubs spend a *minimum* amount on player human capital. Consequently, player talent has become more

⁶The NFL had "Plan B" free agency before the 1993 season, but very few players were able to take advantage of it, such that NFL observers consider "real" or unrestricted free agency to have begun with the 1993 season.

widely dispersed throughout the league from 1993 onward (Larsen et al., 2006; Rosen & Sanderson, 2001), although the institution of free agency and the salary cap did not eliminate cross-team player talent heterogeneity completely.⁷

At the same time, no salary cap exists for NFL coaches, and no external changes were imposed on the coaching human capital factor market. Thus, one potential NFL team response to the implementation of a salary cap and free agency in the player market was to increase their investments in and emphasis on coaching human capital. Anecdotal evidence suggests that NFL salaries for coaches and players have increased significantly since 1993, but more so for coaches.⁸ In 1990, only two NFL head coaches earned more than \$1 million per year, with the highest paid coach receiving \$1.4 million (Bricker, 1992). By 2012, NFL head coaches earned more than \$2.5 million on average and the highest paid coach earned more than \$7.5 million per year (Dosh, 2012), a sevenfold increase for coaches at the top of the salary distribution. In contrast, the average annual NFL player salary in 1992 was \$496,300, with the highest salary standing at \$4,443,000 (Stellino, 1992). By 2011, NFL players on average made \$1.9 million annually, with a maximum annual salary of \$18 million, a fourfold increase at the top.

NFL teams have always regarded player and coaching human capital as key inputs. As player human capital became more evenly dispersed after the change in market frictions that reduced teams' ability to accumulate and preserve player human capital, coaching human capital should have become more influential with respect to producing wins (cf. Holcomb et al., 2009), prompting a greater emphasis on coaching human capital. This would lead NFL teams to increase their active participation in the related market for coaching human capital. It is important to note that we investigate reductions in frictions rather than the elimination of frictions from either human capital market. It would be difficult to identify a human capital market that does not have any meaningful friction (cf. Chadwick, 2017).

Of course, other actors in NFL clubs also influence wins, most obviously general managers (GMs) who help determine which players to add to and remove from the team roster. GMs also influence when head coaches are dismissed and choose their successors. Most of this activity occurs during the NFL off-season. As such, we treat GM capabilities and activities as essentially exogenous to the actions and performance of head coaches in the production of on-field wins, which in turn directly influences their empirically observable dismissal outcomes. Given firm fixed effects and covariates, we believe that omitting analysis surrounding GMs does not introduce bias with respect to our research question and empirical investigation. Nevertheless, how teams changed their treatment of GMs after free agency is a natural extension of the logic in the paper which we return to in the discussion section.

3.2 | Data and variables

The observation period for this study is NFL seasons from 1979–2006. Our data, gathered from numerous online sources and from the *NFL Record and Fact Book*, encompass an equal number of seasons occurring before (1979–1992) and after (1993–2006) the institution of NFL free

⁷Other arrangements in the NFL also affect the heterogeneity of teams' player human capital. For example, the draft assists poor performers, as picks are allocated in reverse order of team success in the prior season. Over time, this can reduce cross-team variance in player talent. However, the draft was unchanged during our sample period and draft considerations are not pertinent to our arguments about the implications of changes in factor market frictions.

⁸Information on salaries for NFL coaches over the sample period is unavailable for a majority of coaches. Requests to the NFL and the NFL Coaches' Association for access to more complete coach salary data went unanswered.

agency. Each observation represents a unique match of a season (or portion thereof, if less than a team's full season), team, and coach (hereafter, a "coach-season"), a total of 857 cases. Some head coaches served as mid-season, temporary replacements for dismissed coaches but were typically removed at the end of their partial seasons. As this type of coach-season is almost perfectly correlated with coach dismissal, we omit these observations. Additionally, some coaches have more than one head coaching spell in the observation period. The final data set thus consists of 821 cases based on 148 unique coaches and 192 distinct coaching spells. Of these coach-seasons, 392 cases come from the pre-free agency era and 429 cases come from the free agency era.

3.2.1 | Dependent variable

The dichotomous dependent variable capturing coach dismissal equals 1 if a team's head coach was terminated at the end of a given coach-season, and 0 otherwise. Our sample contains 168 coach turnover events, 73 of which occurred prior to and 95 after the institution of free agency in 1993. Thirty-five dismissals occurred in the middle of a season, at which point a given coach-season ends. Industry observers frequently argue that true voluntary turnover is exceptionally rare among NFL head coaches (e.g., Crouch, 2013), largely mitigating the possibility that this variable is capturing significant voluntary coach turnover.

3.2.2 | Independent variables

Free agency era equals one for coach-seasons occurring after the institution of NFL free agency in 1993 and zero for those occurring before that point.⁹ This variable captures the era in which market frictions for player human capital were significantly reduced. A positive coefficient would indicate a higher likelihood of coach dismissal in that era.

Team record is the proportion of games won under a coach in a given coach-season. For example, Dave Wannstedt has dismissed as head coach of the Miami Dolphins nine games into the 2004 season, when his record was 1–8 (thus, his winning percentage was 0.11 for his portion of the 2004 Dolphins season). We measure *competitive context* as the quality of a team's opponents based on those teams' cumulative win-loss percentage during the current coach-season. The quality of opposition provides a measure of the degree of competitiveness a firm faces in a given season. We removed the win/loss history of the focal team with its competitors, such that this variable captures the win-loss percentage of opponents against *other teams* in that coach-season. *Player human capital* is a count of the number of players a team had in the Pro Bowl, the NFL's all-star game, in a given season and serves as a measure of the quality of the team's production human capital. *Coach reputation* is represented by a cumulative count of the number of Coach of the Year awards the coach won with *the focal team* prior to a given coach-season (i.e., during the current coaching spell). Coach of the Year is awarded by journalists who cover the NFL and recognizes coaching accomplishment, contingent on the competitive difficulties and advantages faced by a head coach in a

⁹We also estimated specifications to examine the likelihood of turnover from 1994 onward, given that the salary cap was implemented in 1994, while free agency began in 1993. All results from these models were substantively similar to the results we report. We use the 1993 season for our cutoff since that was the first of two related removals of regulatory hurdles.

given season. Significant accomplishments by managers are seen to be a strong predictor of future performance by organizational evaluators and externally validate the executive (Milbourn, 2003; Wade et al., 2006). *Coach tenure* is the number of seasons that a coach has been in his current coaching spell as of an observed coach-season.

3.2.3 | Control variables

Our analysis controls for other variables that may influence managerial dismissal, including *coach age*, the number of different *types of coaching experience* that coaches had previous to their current NFL head coaching spell, and the number of NFL head *coaching openings* for the current season. *Types of coaching experience* is the sum of four dummy variable indicators of different types of previous experience that a head coach might have (college coaching assistant, college head coach, NFL coaching assistant, and NFL head coach), with a sample range from 0 to 4 for the cases from each head coach/coaching spell combination. *Coaching openings* is the number of head coach positions that were vacant during and in the offseason following a coach season and accounts for the possibility that other teams' decisions to dismiss coaches in a given season may influence a focal team's dismissal decision.

Controls also include dummy variables for the strike-shortened 1982 and 1987 seasons. Teams played fewer games in 1982 and 1987 (9 and 15, respectively) than in other seasons, possibly affecting how coaches were evaluated. We also control for the *salary cap maximum* in a given season and the team's *average player human capital*, as determined by data from Pro Football Reference (PFR). PFR reports a seasonal "Approximate Value" for every NFL player in every NFL season going back to 1960 to measure player performance. This score accounts for variance in a team's overall player human capital that is not captured by the Pro Bowl player human capital variable. We gathered data for all players for each team in a given coach season and used the average value of the Approximate Value score.

4 | RESULTS

Table 1 highlights several descriptive findings comparing data from the eras before and after free agency. Consistent with our theory, after free agency, average coach tenure decreases from 5.33 to 3.79 seasons, and we see more head coaching openings per season. Post-free agency, coaches also exhibit more types of experience but have fewer accumulated Coach of the Year awards during their spell with their current NFL team. In other words, while the same number of Coach of the Year awards were given out (one per NFL season) in each era, they are distributed more widely across coaches in the post-free agency era. This difference probably reflects shorter coaching tenures after free agency. Additionally, consistent with our arguments, GM tenure also decreases ($t = -3.72$) in the free agency era.

As a check on our theoretic expectations, we also compared data on a team's average player tenure, individual player tenure in the NFL, team-season player turnover, and number of players used per team-season, and examined differences pre- and post-free agency. In each case, we found differences across eras, such that players have shorter tenures with each team and in the NFL after free agency, while teams have higher player turnover and utilize more players per season. Together, the data imply that free agency coupled with the salary cap altered how NFL teams managed player and coach human capital. Overall, these univariate statistical

TABLE 1 Descriptive statistics for key variables in the study

	Full sample (n = 821)		Pre-salary cap (n = 392)		Post-salary cap (n = 429)		Test of mean differences T-statistic
	Mean	SD	Mean	SD	Mean	SD	
Coach dismissal	0.20	0.40	0.19	0.39	0.22	0.42	1.06
Coach age	50.65	6.78	50.27	6.23	50.99	7.24	-1.51
Types of coaching experience	2.35	0.85	2.27	0.84	2.41	0.86	-2.43
Coaching openings	6.04	2.17	5.21	1.86	6.79	2.15	-11.19
Free agency era	0.52	0.50	-	-	-	-	-
Team record	0.50	0.19	0.50	0.19	0.50	0.18	0.01
Competitive context	0.50	0.04	0.50	0.05	0.50	0.03	0.57
Player human capital	3.16	2.36	3.15	2.33	3.18	2.39	-0.22
Coach reputation	0.53	0.78	0.70	0.88	0.38	0.65	5.90
Coach tenure	4.53	4.41	5.33	5.32	3.79	3.20	5.08
Player tenure with team	2.00	0.62	2.34	0.59	1.69	0.46	-17.60
Player tenure in NFL	3.53	3.48	4.05	3.78	3.12	3.16	-12.97
Player turnover	20.80	6.53	18.51	6.56	22.88	5.75	10.17
Players used per season	56.79	4.71	55.22	5.24	58.21	3.63	9.57
GM tenure	6.89	7.09	7.85	6.93	6.02	7.13	-3.72
GM turnover	0.15	0.36	0.13	0.33	0.17	0.38	1.82

patterns conform to our expectations about how the salary cap and free agency influenced the use and dispersion of player human capital by NFL teams.

Table 2 reports bivariate correlations for variables in our analysis. For parsimony, we do not report correlations for team dummy variables.¹⁰ Coach dismissal is negatively correlated with team record, player human capital, and coach reputation. We also see a strong positive correlation between team record and both player human capital (ProBowl) and average player human capital. Teams with better performance are likely to be recognized as having higher levels of player human capital, making it important to control for team record when estimating if player human capital affects coach dismissal.

4.1 | Event history analysis

Table 3 reports coefficients from the logistic discrete-time maximum likelihood analysis, estimated with robust standard errors and team fixed effects. Positive coefficients indicate increased

¹⁰Year fixed effects were not included since time was captured in three ways: free agency era, strike season dummies, and coaching openings. We compared the model with these time-related variables to one using time fixed effects and ran a Hausman test, revealing no difference ($\chi^2 = 6.19, p = .72$). We also conducted a Hausman test examining consistency of coefficients across models with and without year dummies and found no difference ($\chi^2 = 3.60, p = .94$). Additionally, including year fixed effects eliminates between-year variance. As such, year fixed effects would likely misidentify the model's specification and, most importantly, render interpretation of the free agency era coefficient difficult, if not impossible (Bliese, Schepker, Essman, & Ployhart, 2020).

TABLE 2 Correlations for key variables in the study

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Coach dismissal													
2. Coach age	0.16												
3. Types of coaching experience	0.04	0.42											
4. Coaching openings	-0.01	0.02	0.03										
5. 1982 season	0.04	-0.03	-0.04	0.17									
6. 1987 season	-0.06	0.02	-0.01	-0.34	-0.04								
7. Salary cap maximum	-0.02	-0.05	-0.03	-0.01	0.03	-0.03							
8. Average player human capital	-0.26	-0.05	-0.02	0.04	0.08	-0.18	0.02						
9. Free agency era	0.04	0.05	0.08	0.36	-0.20	-0.20	-0.02	-0.14					
10. Team record	-0.35	-0.06	-0.03	0.07	0.00	0.00	-0.01	0.82	0.00				
11. Competitive context	0.02	0.01	-0.05	-0.02	-0.04	0.02	-0.01	-0.04	-0.02	-0.05			
12. Player human capital	-0.20	0.02	0.07	0.05	-0.02	0.01	-0.02	0.67	0.01	0.70	0.02		
13. Coach reputation	-0.08	0.13	-0.04	-0.03	0.04	0.05	0.01	0.35	-0.20	0.35	-0.07	0.27	
14. Coach tenure	0.05	0.26	-0.16	-0.04	0.06	0.05	-0.02	0.20	-0.17	0.17	-0.04	0.11	0.62

Note: $n = 821$.

log odds of coach dismissal, but given fixed effects, these estimates hold *within teams over time* rather than between teams (Bliese et al., 2020; Certo, Withers, & Semadeni, 2017). A positive coefficient indicates that a higher value of the independent variable is associated with greater odds of coach dismissal, relative to the focal coach or a different coach for the same team with a lower value of the independent variable during the sample period. Model 1 reports the log odds of dismissal conditional on control variables only. Remaining models test the impact of our independent variables and their interactions with the variable of interest. All variables were standardized to reduce collinearity and ease interpretation.

In Model 1, coach age ($\beta = .47, p = .000$) is associated with higher odds of dismissal, while the 1982 ($\beta = 1.14, p = .04$) and 1987 seasons ($\beta = -2.57, p = .001$) are associated with higher and lower odds of dismissal, respectively. In Model 2, we examine the direct effects of our independent variables of interest. As hypothesized, the free agency era has a positive relationship with coach dismissal ($\beta = .55, p = .02$) in Model 2. Translating this coefficient into an estimated magnitude, a team's coach in the free agency era had odds of dismissal in a given observation year 1.73 times greater than a coach at the same team in the pre-free agency era, supporting Hypothesis 1. Given a sample observed probability of dismissal of 20%, this marginal effect implies a 10.23% increased likelihood of dismissal post-free agency (or an absolute change that is more than 50% of the baseline observed probability).

Also in Model 1, team record for the current coach-season is negatively related to coach dismissal ($\beta = -1.36, p = .000$), such that a coach with a record that is one standard deviation above the mean has odds of dismissal that are 0.26 times those of a coach at the same team with a record at the mean. Expressed another way, a coach 1 SD above the mean for team record has a probability of dismissal of 6.03%, which is 13.97% (or a decrease of 70%) lower than a coach for the same team at the mean team record. Coach tenure is significantly associated with increased odds of dismissal in this model as well ($\beta = .69, p = .02$).

Models 3–8 add interactions with the free agency era dummy to test whether the relationship of each variable of interest differs before and after the implementation of free agency. Models 3–7 add one of these interaction terms at a time to the baseline Model 2; Model 8 adds all interactions simultaneously. The substantive results from Model 8 do not differ appreciably from those in the preceding models; as this model is the most conservative in this set, we discuss our interaction results using these coefficients. In Model 8, the interaction between free agency era and team record fails to provide support for Hypothesis 2a ($\beta = -.29, p = .39$). It would be misleading, however, to conclude that current season performance was not an important determinant of coach dismissal. In log odds terms, the main effect of current-season winning percentage was one of the strongest determinants of coach dismissal. However, contrary to expectations, current season winning percentage is (roughly) an equally significant factor in determining coach dismissal across eras. That is, in the NFL, the pressure for coaches to win was comparably high both before and after the imposition of the salary cap and free agency.

For Hypothesis 2b, we argued that competitive context would have a stronger positive effect on coach dismissal in the free agency era. Model 8 illustrates such an interaction effect ($\beta = .54, p = .01$). Compared to a team's coach at the mean level of competitive context prior to free agency, a coach for the same team post-free agency who faces a competitive context that is one standard deviation lower has 1.37 times greater odds of dismissal. At the same time, a team's coach whose competitive context is one standard deviation above the mean has odds of dismissal that are 2.61 times higher than a coach of the team at the mean level of competitive context, pre-free agency. The odds of dismissal nearly double as the competitive context variable moves from -1 to $+1$ standard deviation after free agency. Figure 1 illustrates this effect,

TABLE 3 Logistic discrete time maximum likelihood event history analysis of coach dismissal

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	Coefficient	SE														
Coach age	0.47	(0.11)	0.26	(0.12)	0.27	(0.12)	0.24	(0.12)	0.27	(0.12)	0.25	(0.12)	0.27	(0.12)	0.29	(0.13)
Types of coaching experience	0.01	(0.12)	0.11	(0.13)	0.10	(0.13)	0.11	(0.13)	0.10	(0.13)	0.11	(0.13)	0.10	(0.13)	0.08	(0.13)
Coaching openings	-0.19	(0.11)	-0.16	(0.11)	-0.15	(0.11)	-0.16	(0.11)	-0.15	(0.11)	-0.16	(0.11)	-0.16	(0.11)	-0.15	(0.12)
1982 season	1.14	(0.54)	0.75	(0.57)	0.77	(0.61)	0.65	(0.61)	0.82	(0.62)	0.75	(0.58)	0.79	(0.57)	0.75	(0.61)
1987 season	-2.57	(0.79)	-1.60	(0.81)	-1.62	(0.82)	-1.58	(0.81)	-1.60	(0.84)	-1.59	(0.81)	-1.55	(0.79)	-1.48	(0.79)
Salary cap maximum	-0.04	(0.10)	-0.04	(0.10)	-0.04	(0.10)	-0.04	(0.10)	-0.05	(0.10)	-0.05	(0.10)	-0.07	(0.10)	-0.05	(0.11)
Average player human capital	-0.88	(0.12)	0.15	(0.21)	0.17	(0.21)	0.17	(0.21)	0.18	(0.21)	0.16	(0.21)	0.17	(0.20)	0.19	(0.21)
Free agency era	0.55	(0.23)	0.70	(0.27)	0.54	(0.23)	0.80	(0.27)	0.58	(0.24)	0.56	(0.24)	0.64	(0.24)	0.64	(0.29)
Team record	-1.36	(0.22)	-1.54	(0.28)	-1.36	(0.22)	-1.39	(0.23)	-1.36	(0.22)	-1.36	(0.22)	-1.36	(0.22)	-1.26	(0.29)
Competitive context	-0.06	(0.11)	-0.06	(0.11)	-0.23	(0.11)	-0.23	(0.11)	-0.06	(0.10)	-0.06	(0.11)	-0.05	(0.11)	-0.22	(0.11)
Player human capital	0.16	(0.17)	0.15	(0.17)	0.15	(0.17)	0.15	(0.17)	-0.31	(0.23)	0.14	(0.17)	0.13	(0.17)	-0.40	(0.22)
Coach reputation	-0.19	(0.19)	-0.18	(0.19)	-0.22	(0.20)	-0.22	(0.20)	-0.21	(0.19)	-0.28	(0.22)	-0.19	(0.20)	-0.00	(0.26)
Coach tenure	0.69	(0.19)	0.69	(0.19)	0.74	(0.19)	0.72	(0.19)	0.69	(0.19)	0.69	(0.19)	0.52	(0.20)	0.47	(0.21)
Team record × free agency era			0.31	(0.25)			0.52	(0.21)						-0.29	(0.33)	
Competitive context × free agency era														0.54	(0.21)	
Player HC × free agency era														0.80	(0.27)	
Coach reputation × free agency era														0.19	(0.26)	
Coach tenure × free agency era														0.48	(0.26)	
Constant	-2.00	(0.54)	-3.26	(0.94)	-3.37	(0.96)	-3.33	(0.94)	-3.45	(0.97)	-3.23	(0.98)	-3.39	(1.17)	-3.77	(1.18)
-2log likelihood	359.06		329.48		328.61		326.22		324.45		329.16		327.30		318.02	
Wald chi-square	112.36		147.91		144.91		145.28		146.19		153.06		150.41		151.85	
Pseudo R ²	0.14		0.21		0.21		0.22		0.22		0.21		0.21		0.24	

Note: $n = 821$ for full sample, 392 for pre-free agency, 429 for post-free agency. Dependent variable is coach dismissed (=1). Models estimated with robust standard errors and team fixed effects.

demonstrating that a coach has roughly similar odds of dismissal regardless of era when the competitive context lies below the mean. However, the probability of dismissal diverges at higher levels of competitive context: At larger values of competitive context, the log odds of a coach's dismissal post-free agency are higher, while in the pre-free agency era, they decline.

Hypothesis 2c suggests that higher levels of player human capital will be associated with higher odds of managerial dismissal, post-free agency. The findings in Model 8 support this hypothesis ($\beta = .98, p = .003$). Prior to free agency, a coach who had Pro Bowl talent one standard deviation above the mean had odds of dismissal 0.67 times that of a coach at the mean level. After free agency, however, a coach who had Pro Bowl talent 1 SD above the mean had dismissal odds 3.39 times *greater* than comparison coaches. Figure 2 graphically illustrates this pattern, showing that pre-free agency, the odds of dismissal were lower at higher levels of player human capital. After free agency, however, the odds of coach dismissal are greater at higher levels of player human capital. The results suggest that when market frictions allowed NFL teams to stockpile player human capital and appropriate monopsony rents, teams were less likely to dismiss coaches who had better player talent available. In contrast, given the reduction of those frictions for the post-free agency period, teams that had significant levels of player human capital were *more* likely to dismiss their head coaches.

One might be tempted to conclude from this result that NFL coaches in the free agency era should not try to develop better player talent, as this variable is associated with greater odds of coach dismissal. But player talent remains strongly associated with on-field production. Given the importance of a team's on-field performance to coach dismissal, it seems hazardous for coaches to choose not to develop player talent or for clubs to overlook coaches who have that ability. Indeed, in the modern era, NFL teams tend to make greater use of considerably younger, less expensive players (Allen, 2015), which places a premium on coaches' player development skills.

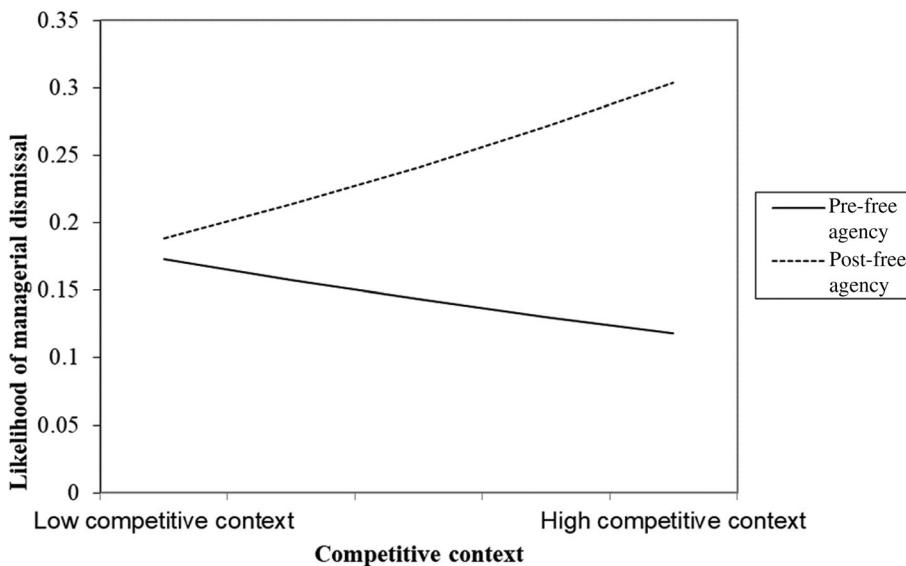


FIGURE 1 How the relationship between competitive context and coach dismissal differs across the pre-free agency and post-free agency eras

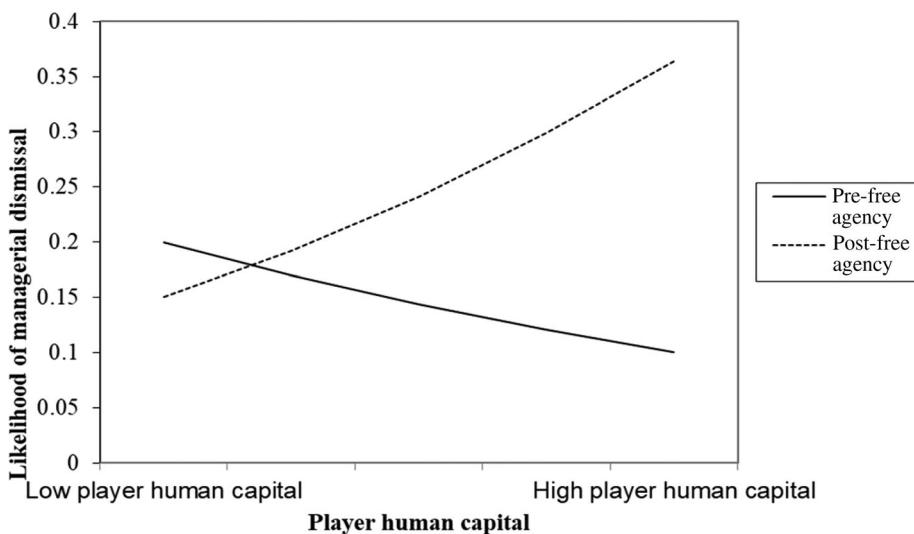


FIGURE 2 How the relationship between player human capital and coach dismissal differs across the pre-free agency and post-free agency eras

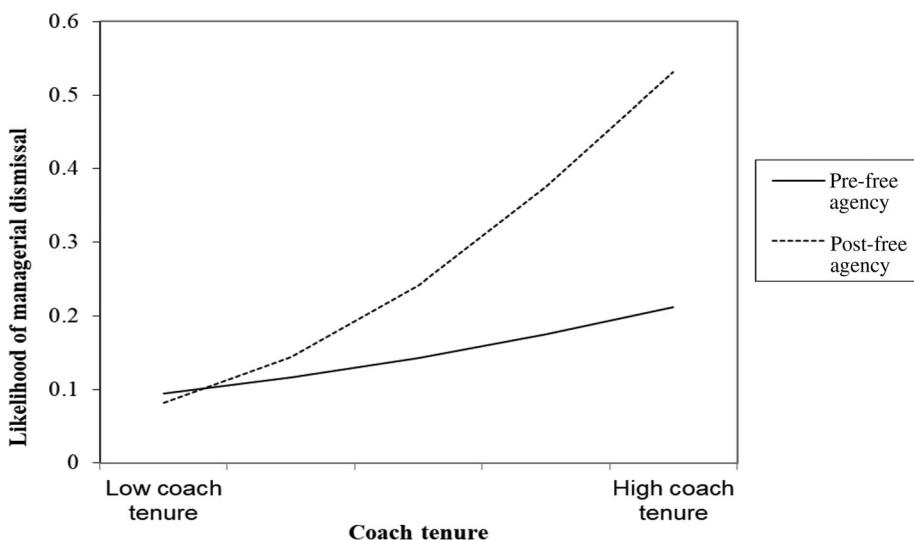


FIGURE 3 How the relationship between coach tenure and coach dismissal differs across the pre-free agency and post-free agency eras

Hypotheses 2d and 2e suggest that coach reputation and tenure also impact dismissal odds differently, post-free agency. Model 8 finds evidence of an interaction between free agency era and coach tenure ($\beta = .80, p = .03$) but no interaction with coach reputation, although the latter has the expected sign ($\beta = -.56, p = .20$). For tenure, a team's coach whose tenure was 1 SD above the mean had dismissal odds 1.60 times greater than that of a coach at the team at the mean level. Post-free agency, however, a team's coach one standard deviation above the mean of tenure had odds of dismissal 6.75 times higher than a comparable coach of the team. Figure 3 illustrates how higher levels of tenure are associated with greater odds of dismissal in

both periods but also that these odds are significantly greater after free agency. Thus, we find support for Hypothesis 2e, but not for Hypothesis 2d.

4.2 | Robustness checks

For robustness purposes, we conducted three additional analyses. First, we used comparative logistic regression following Hoetker (2007) to test whether coefficients differed across groups when splitting the sample on free agency era. All results were consistent with those reported. Second, we used Cox proportional hazards models. All results were equivalent to those reported, except that the interaction between team record and free agency era proved significant ($p = .04$). Third, we utilized a generalized linear mixed-effects random model. All results were the same as those reported.

5 | DISCUSSION

The current study exploits an exogenous institutional change in the NFL to demonstrate that changes in frictions in one human capital factor market segment influence firm activity in another, related human capital factor market segment. Specifically, we show how the institution of a salary cap and free agency affected how NFL teams approached coach dismissal decisions. Coaching tenures became shorter in the free agency era and the likelihood of coach dismissal increased significantly. Theoretically, our results suggest that managerial replacement constitutes a strategic human capital factor market option more likely to be utilized by firms when frictions in the market for interdependent production worker human capital are fewer. Thus, this finding adds a new dimension—tradeoffs between labor market segments—to the conversation about how organizations manage their human capital strategically.

Although the logic behind Hypothesis 2a had a sound theoretical foundation, our empirical results did not support it, suggesting that the emphasis on current firm performance is consistently strong in the managerial labor market independent of changes in production worker market frictions. On the other hand, support for our other additional hypotheses suggests that, as expected, NFL teams became more nuanced in their evaluative approaches to the coach dismissal decision in the post-free agency era. Specifically, our findings suggest that coaches, post-free agency, had greater odds of dismissal given more difficult competitive contexts, when their teams had higher levels of player human capital, and when they had coached their teams for a longer period of time. We also hypothesized that coaching reputation could buffer head coaches from dismissal, but we found no evidence of this effect, a result that was robust across a variety of alternative coach reputation measures (analyses not shown).

In sum, we expected that the greater emphasis teams place on coaching human capital after free agency to add to the importance of information evaluators use to decide whether to opt for a new manager. We find evidence of this, but not always in ways that we anticipated; the increased information employed by teams in their coach dismissal decisions are associated with *increases* teams' interest in replacing their current coaches. In other words, our evidence implies that NFL teams are quite risk averse in making coaching human capital decisions and that this effect is amplified when coach human capital becomes more highly valued, as we found no significant interactions with additional types of information that suggested *reductions* in the likelihood of coach dismissal in the free agency era.

Alternatively, rather than a consequence of NFL teams' increased emphasis on coaches, higher coach dismissal in the post-free agency era might plausibly reflect coach mal-adaptation as existing coaches and their franchises adjusted to a new operating environment. To examine this explanation for our results, we conducted a number of supplemental analyses (results available upon request). When we split the free agency period data into two separate periods and re-ran our analyses, results suggested that the likelihood of coach dismissal increased over time within this era regardless of the specific cut point imposed. We also find that our moderators (competitive context, player human capital, and coach tenure) have consistent relationships with coach dismissal in both the early and latter parts of the free agency era. Narrowing the focus to coaches whose tenures spanned the transition to free agency, we see some evidence that coaches who were employed at the time of that transition had a greater likelihood of termination in the free agency period. However, we continue to find a positive likelihood of dismissal in the latter part of the free agency period. Overall, these supplemental findings indicate a more compelling match to our paper's theoretic logic than to a "mal-adapted skill sets" explanation.

As noted earlier, while we focus on head coaches, one might wonder whether similar effects hold on the likelihood of dismissal for teams' general managers (GMs). As in the market for coaches, no salary cap exists in the market for team executives. The same reduction of frictions in the player human capital market associated with the institution of free agency and the salary cap might have motivated NFL clubs to place greater emphasis on GM human capital, as well. Consistent with this expectation (as noted in the descriptive statistics in Table 1), GM tenure is significantly lower in the post-cap era, and GM turnover occurs slightly more often.

To examine this question further, we replicated the analysis in Table 3, substituting GM data for variables reflecting information about head coaches (see Supporting Information for results). This analysis estimates that a given team's GM has 1.87 times greater odds of turnover following a season post-free agency than in the pre-free agency era. Additionally, the competitive context has a marginally positive moderating effect (other interaction effects were not significant). This supplementary analysis supports our core hypothesis: Teams alter the ways that they participate in the managerial human capital factor markets (for both coaches and GMs) following the institution of the salary cap and free agency, although it appears that teams do not use the same specific types of information to evaluate GMs.

5.1 | Limitations and broader repercussions

While we believe that our study provides insight into how changes in human capital factor market segments influence each other, we also note some limitations. In general, a professional sports context imposes homogeneity across organizations on key dimensions, which helps focus our analysis on the relationships of interest, but might also limit the generalizability of our findings. In the present context (cross-team variance in styles of play notwithstanding), the broad similarities between the ways that player HC and head coaching HC relate to each other within an NFL team's "wins production function" allow us to generalize across differences in how NFL teams utilize player and coaching human capital. The limitations to variance in this study mostly concern the process of generating wins and losses; their effect on managerial dismissal and production worker market frictions are much less pertinent, largely mitigating the vulnerability of our findings' generalizability.

Moreover, while institutionally imposed salary caps (and salary floors) like the NFL's are rare in the US outside of professional sports and government, they are not unknown in non-US countries.

Furthermore, resource constraints (such as in small, entrepreneurial firms) can function as de facto firm-specific salary caps, and such constraints are quite common. Of course, salary caps and salary floors constitute only one type of labor market friction. Other labor market frictions of many kinds (see Chadwick & Flinchbaugh, 2021, for an extended list) could have repercussions for related labor markets as well as for the labor market where they exist. For example, if labor market information asymmetries for pharmaceutical researchers became more difficult to resolve prior to hiring, firms might be more inclined to pursue different approaches to searching for new drugs that utilize other workers more, such as putting larger numbers of drugs into clinical trials sooner in the drug discovery process. To cite another example, if a firm's workforce unionizes, managerial discretion becomes more limited. In such a context, might firms become less sensitive to variance in managerial human capital? Similar questions could be asked of other types of labor market frictions, such as firm-specific human capital, monopsony markets, and labor market transaction costs.

A related question concerns the agency-theory/moral-hazard repercussions of our findings. Our results imply that managers may find it in their personal interests to limit cross-firm variance in the quality of production workers if this has a positive spillover effect on their (managers') compensation. This possibility poses little threat to the findings here. In the NFL, coaches did not drive the adoption of the salary cap and free agency, even though later cohorts of coaches benefitted monetarily from those changes. Rather, players' union leaders and team owners negotiated these changes. However, agency theory concerns related to moral hazard, quite prominent in executive dismissal research, are not likely to be as cleanly dissociated from opportunistic firm actions in other empirical contexts.

More broadly, our study suggests that a key dimension of strategic action is the relative emphasis that organizations, their managers, and their stakeholders place on different strategic factor markets, a currently under-researched topic. Resource orchestration scholars (e.g., Sirmon et al., 2011) describe managerial actions to acquire and utilize resources as affecting the scope (or breadth) of the firm, through different levels (depth) of the firm, or with respect to the firm's life cycle. How the management of factor markets fits into the orchestration paradigm remains unclear, but scholars might reasonably add orchestration across factor market segments as an additional dimension of strategic action.

Indeed, the reasoning of this article could extend to other strategic resources. Scholars have often made the argument that inherent features of strategic resources such as intangibility cause factor market frictions. Both resource-based theory and strategic positioning research explore how the structures of factor markets and of product markets can give rise to further opportunities for firms to accrue rents. Other things equal, more significant frictions for one type of resource would induce firms to favor that resource over others that it employs (cf. Barney, 1986; Chi, 1994). For example, Peteraf and Reed (2007) demonstrated that airlines that had additional constraints on operational discretion imposed on them (what routes they could fly) shifted some of their strategic focus to non-regulated choices (e.g., service quality) in pursuit of competitive advantage. This article's arguments add nuance to this perspective by introducing production interdependence, complementarities, and imperfect substitutability as key factors determining how firms juggle their strategic emphasis on different resources.

6 | CONCLUSION

The inherent complexity of human capital markets present opportunities to pursue our research question and extend this inquiry, including applications to factor markets for other

types of strategic resources. How organizations make tradeoff decisions across factor markets, however, remains an under-researched topic. Moreover, other characteristics in addition to factor market frictions may influence the relative emphasis that organizations place on factor markets. For the present, this study opens a door for a new set of questions in the burgeoning SHC research stream: relatedness of labor market segments. The “labor market” is neither a uniform aggregation across all types of human capital nor a series of unrelated market segments. To the extent that relatedness matters in other strategic factor markets, shifting factor market tradeoffs may be a widespread phenomenon. Thus, ongoing advances in strategic factor market theory can enhance our theoretic understanding of SHC, and vice versa.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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