TEAM SPECIFIC HUMAN CAPITAL AND PERFORMANCE

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Over the last 15 years, scholars of resource-based view (RBV) have highlighted the role of human capital (HC) as a key factor explaining why some firms outperform others (Acedo, Barroso, & Galan, 2006; Barney, 1991; Barney, Wright, & Ketchen, 2001; Coff, 1999). HC resources, however, raise a number of challenges for firms wishing to create a position of sustainable competitive advantage. First, HC resources may be difficult to protect, as individuals have relative freedom to move between rivals (Hatch & Dyer, 2004). Second, for HC to lead to sustainable performance differences for teams requires the presence of isolating mechanisms (Rumelt, 1984), which may include specificity, causal ambiguity, social complexity and path dependency (see: Ambrosini & Bowman, 2010; Dierickx & Cool, 1989; Lippman & Rumelt, 1982; Reed & DeFillipi, 1990). By definition, such isolating mechanisms protect HC resources from appropriation or imitation, making empirical assessment of their importance problematic (Ambrosini & Bowman, 2001; Godfrey & Hill, 1995; Lockett & Thompson, 2001; Rouse & Dellenbach, 1999).

Perhaps unsurprisingly, given the issues raised above, recent meta-analyses indicate that evidence of the resource-performance relationship is less than conclusive (Barney & Arikan, 2001; Crook, Ketchen, Combs & Todd, 2008; Newbert, 2007) with Newbert's (2007) meta-analysis providing specific evidence of the relationship between HC and performance being equivocal in nature. We suggest that such equivocality may arise from extant studies employing variables that are analytically convenient but are not the most salient ones from a HC perspective (See: Lockett, Thompson & Morgensen, 2009, for a RBV perspective), and the dominance of cross-sectional study designs that do not allow for resource-accumulation processes to play through into performance enhancements. In this paper we address these

concerns by focus on the isolating mechanism of the specificity of HC, employing Becker's (1962) distinction between general and specific HC, and utilizing a panel data design.

Following the lead of Chellemi and Gui (1997) and Huckman and Pisano (2006), we focus on the role of team specific HC (henceforth TSHC) in shaping team performance. TSHC constitutes the skills and knowledge that individuals develop through interacting with one another, and is most valuable when employed in the team context in which it was developed (Blair, 1999). As such, TSHC is a particularly interesting resource for RBV scholars because it is path dependent in nature, being a unique and valuable skill that is developed over time (Coff, 1999; Grant, 1996; Penrose, 1959). Furthermore, in contrast to general human capital, TSHC is tied semi-permanently to a team and is thus very difficult to trade or exchange without loss of value (Chi, 1994).

Drawing on the work of Berman et al. (2002) and Huckman, Staats and Upton (2009), who differentiate between the different roles individuals may perform in a team, we contribute to RBV and HC theory by conceptualizing TSHC as a multi-dimensional concept. Specifically, we delineate two dimensions of TSHC, Team Member TSHC and Team Manager TSHC, and then develop the following arguments about their interrelationships with team performance. First, team members develop Team Member TSHC through their tenure with a team, which we argue has a positive effect on team performance. Second, managers develop Team Manager TSHC through their tenure with a team, which we suggest positively moderates the relationship between Team Member TSHC and team performance. By separating out the effects of Team Member TSHC and Team Manager TSHC we are able to explore how managerial tenure influences team performance, and how changes in managers may reduce the positive performance effects of Team Member TSHC. In doing so, we are able to advance scholarship of RBV and HC by examining the conditions under which

important firm-specific resources are developed, and with what performance effects. Furthermore, we are also able to advance prior research on the relationship between managerial tenure and performance that does not account for the quality of HC (see: Hughes, Hughes, Mellahi & Guermat, 2010).

We test our model using a ten-year panel of football organizations competing in the English Premier League (EPL). Adopting a panel data approach, we are able to overcome the limitations of cross- sectional studies that do not capture the lagged effects of investments in HC, or changes in performance over time from a build-up of superior HC. Our approach enables us to capture the effects of TSHC as it is developed over time, and/or destroyed, through changes to team members and the team manager over time.

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A central quest for scholars of the RBV has been to link sustainable performance differences to resource endowments (Hatch & Dyer, 2004). A key resource of any organization is HC, which we conceptualize employing Becker's theory of HC (Becker, 1962 & 1975). The HC of an individual is determined by their knowledge, skills, and abilities (Schultz, 1961), and may be accumulated via work, education and other activities and habits (Becker, 1962; 1975). HC may be viewed as consisting of a hierarchy of skills and knowledge with varying degrees of transferability across contexts (Castanias & Helfat, 1991). Becker (1993) argues that the most influential theoretical concept in HC analysis is the distinction between general and specific HC. General HC is independent of any context, and can be transferred effectively across organizations or teams. Specific HC relates to skills and knowledge that are less transferable between contexts, and have a much narrower scope of applicability (Gimeno, Folta, Cooper & Woo, 1997).

The notion of specific HC has traditionally been related to the firm, and employed by economists to examine the remuneration implications of individuals developing either general and/or firm specific HC (Addison & Siebert, 1979). Following the lead of Chillemi and Gui (1997), who developed the notion of TSHC as a non-material asset derived from customs developed by the individuals in a team, we focus on TSHC and examine its performance effects. In doing so we acknowledge that individuals in a team may perform different roles (Berman et al., 2002; Huckman et al., 2009) and delineate two different dimensions of TSHC: Team Member TSHC and Team Manager TSHC. We expand on these ideas below.

Team Member TSHC

Team Member TSHC is developed through the tenure of a team member with a team, which may arise in three main ways. First, over time specific training can be implemented that will hone the skills of the individual so that they are better suited to their organization. Team-specific training will lead to the development of Team Member TSHC, which are the skills and knowledge that will have the highest value within their current team (Klein, Crawford & Alchian, 1978; Mahoney & Pandian, 1992). Second, over time team members will become better able to understand how the organization functions, their role within the team, and how to achieve their performance objectives accordingly. Accordingly, team member tenure will enhance their Team Member TSHC, enabling team members to act in a more coordinated manner (Moreland, Argote & Krishnan, 1998). Third, team member tenure will increase their interactions with the "network of workers" in the team (Mailath & Postlewaite, 1990). Over time, through shared learning within the team, team members will be able to share knowledge about "whom to contact about particular problems that may arise and they know the strengths and weaknesses of their co-workers" (Mailath & Postlewaite, 1990, p. 369-70). Also, repeated interactions and shared learning about other

team members will enhance the levels of trust in team (see: Granovetter 1985; Uzzi 1997; McEvily, Perrone & Zaheer, 2003), which will facilitate knowledge flows across team members.

Drawing on Berman et al. (2002), we suggest that an important component of Team Member TSHC will be tacit knowledge, which may play an important role in sustaining performance advantages for a firm because it is socially complex, and by definition, difficult to imitate (Reed & DeFellippi, 1990; Barney, 1991; Nonaka, 1991; Grant, 1996). Hence, Team Member TSHC is particularly relevant from a RBV perspective because it is a resource that can only be developed over time within a specific team context, which prevents rivals from being able to imitate this team-specific resource in the short run (Cappelli & Singh, 1992; Mahoney & Pandian, 1992; Mahoney, 1995; Penrose, 1959; Prescott & Visscher, 1980; Teece, Pisano, & Shuen, 1997). In addition, Team Member TSHC cannot be transferred across teams because it is specific to the team context in which it was developed (Williamson, 1979; Mahoney & Pandian, 1992). We suggest, therefore, that the Team Member TSHC holds the potential for teams to generate sustainable performance advantages, and will have a positive effect on team performance. Hence:

H1: Team Member TSHC will be positively related to team performance.

Team Manager TSHC

A number of key authors in the field argue that codified and tacit knowledge are not, and should not, be treated as separate entities (see: Polanyi, 1966; Ravetz, 1971; Collins, 1974; Gelwick, 1977). Nonaka attests to the close link between both types of knowledge arguing that organizational knowledge is created through a continuous dialogue between codified and tacit knowledge (Nonaka, 1994, p. 14). The dichotomy between codified and tacit

knowledge, therefore, may be problematic since it is rare that a body of knowledge can be completely transformed into a codified form without losing something. As such, most forms of knowledge are by definition, a mixture of codified and tacit (Johnson, Lorenz and Lundvall, 2002).

We argue that team managers play a key role in imparting codified knowledge to team members, and also shaping the way in which team members develop tacit knowledge, in a number of different ways. The notion that managers play a key role in shaping the resource-base of the firm, through the accumulation and deployment firm resources, is central to much RBV scholarship (Amit & Schoemaker, 1993; Augier & Teece, 2008; 2009; Collis & Montgomery, 1995; Teece, 2007). A manager's ability to shape the firm's resource base to enhance performance, however, will depend on their HC. We suggest that as a team manager's tenure increases they will be better able to learn about their organizations, and to refine their strategic approach so that it better aligns with their environment (Hambrick & Fukutomi, 1991; Henderson et al., 2006; Miller & Shamsie, 2001). An important element of learning requires team managers to make effective assessments of team members, and their suitability for enacting the team's desired strategy, which will be revised over time. As a consequence, Team Manager TSHC will enhance a team manager's ability shape the HC of their teams, with associated performance benefits, through the accumulation and deployment Team Member TSHC.

In terms of the accumulation of resources, as Team Manager TSHC increases, a team manager will be better able to determine the types of individuals they wish to attract, which will enable them to better align their organizations to their environment (Hambrick & Fukutomi, 1991; Henderson et al., 2006; Miller & Shamsie, 2001). Drawing on the "attraction-selection-attrition" model (Schneider, 1987; Schneider, Goldstein & Smith, 1989),

as Team Manager TSHC increases they will be better able to shape their team's HC profile, through the mechanisms of "attraction-selection-attrition", to fit with their strategy for the firm.

In addition to "attraction-selection-attrition", managers can help develop team members TSHC through shaping the training of team members (Chellemi & Gui, 1997; Mailath & Postlewaite, 1993; Huckman & Pisano, 2006). Team managers play a key role in fostering a learning environment, with high performing teams commonly being explicitly managed to promote learning Edmonson, Bohmer and Pisano (2001) of codified and tacit knowledge. As a manager's tenure increases they will be better able to align their organizations to their environment (Hambrick & Fukutomi, 1991; Henderson et al., 2006; Miller & Shamsie, 2001), of which developing and tailoring training programmes for team members to develop Team Member TSHC will be a key component of executing strategy.

Turning now to the deployment of resources, managers' deployment of HC may have important performance effects, even controlling for the quality of HC involved. We suggest that the better informed a manager is about the HC resources at their disposal, the more able they will be to deploy the HC resources in an effective manner. As Team Manager TSHC increases with tenure, managers will be more informed about the HC resources at their disposal, which will enhance their ability to deploy them effectively (Cool & Dierkix, 1989; Dierickx & Cool, 1989; Reed & DeFillippi, 1990).

Based on the accumulation and deployment mechanisms of the RBV outlined above (Amit & Schoemaker, 1993; Augier & Teece, 2008; 2009; Collis & Montgomery, 1995; Teece, 2007), we argue that Team Manager TSHC will positively moderate the relationship between Team Member TSHC and team performance.

H2: The relationship between Team Member TSHC and team performance will be positively moderated by Team Manager TSHC.

DATA AND METHOD

The professional team sports industry provides an excellent research site for investigating managerial phenomena (see: Kiedel, 1984; 1987; Pfeffer & Davis-Blake, 1986; Staw & Hoang, 1995; Wright, Smart & McMahan, 1995), and specifically RBV and the various components of knowledge-based competitive advantage (Berman et al., 2002). The data-rich nature of the professional team sports industry enables researchers to easily identify and measure organizational performance, and the stock of experience of senior managers (i.e. head coaches) and other key employees (i.e. players) (Kahn, 2000). The extreme intensity and directness of competition in both the production and market processes suggests that competitive advantage may be difficult to create and sustain in professional team sports. Therefore, professional team sports provide a very rigorous context for testing our hypotheses on the crucial role of TSHC in driving organizational performance.

Empirical context

Our empirical context, the EPL, is the top professional football league in England, and arguably globally, as measured in terms of revenues, which stood at £3.26bn for the 2013-2014 season, up from 29% during 2012/2013.[1] The EPL is also an interesting context due to the highly flexible labour market for football players. The system of free agency, introduced following the landmark Bosman ruling by the European Court of Justice in 1995, has led to all players having unrestricted mobility between teams when their current contract expires. The increased fluidity of the labour market, post Bosman, has contributed to a rapid rise in the

[1] See: http://www2.deloitte.com/uk/en/pages/press-releases/articles/annual-review-of-football-finance-2015.html). Also, The recent television deal will increase EPL revenues from £3.08 for 2013/2014 to for £5.136bn for live Premier League TV rights for 2016-17 (http://www.bbc.co.uk/sport/0/football/31386483 accessed 02/02/2016).

wages as players are now better able to appropriate the full economic value associated with their HC. In effect, the players with more valuable stocks of HC command higher wages and so only the richest teams can afford to employ the best players. As a result, although large sums of money have been attracted to the EPL through media rights deals principally with satellite TV company, BSkyB, the money flows straight through the game to the players (Conn, 2005).[2]

If professional sports leagues were characterised by financial determinism, with sporting outcomes entirely dictated by who paid the highest wages and attracted the players with the most valuable HC, then leagues would become totally predictable and lose the uncertainty of outcome that is such a crucial value driver (Rottenberg, 1956). Both anecdotal and statistical evidence suggests that the wage bill is not the only determinant of sporting success (Gerrard, 2006). In England, and also across the world, football is replete with examples of clubs that have become very successful with modest wage bills (e.g. Wimbledon FC; see: Crabtree, 1997) as well as clubs that have been spectacularly unsuccessful with very large wage bills (e.g. Leeds United FC; see: Rostron, 2004).

Given the rapid rise in wages, it is becoming increasingly important that football organizations look for new ways to generate performance advantages as opposed to merely buying success. Interesting parallels have occurred in other sporting contexts, for example, the concept of sabermetrics (i.e. the application of data analytics to baseball) through "Moneyball: The art of winning an unfair game" (Lewis, 2004). Citing how management used new performance metrics to seek out previously undervalued players and then shaped them

[2] Alan Sugar (Tottenham's chairman from 1991-99) said many years ago at a Premier League meeting, "Gentlemen, it doesn't matter whether the television company gives us £3m or £33m, we'll piss it up the wall on wages." (http://www.guardian.co.uk/football/blog/2010/jan/10/portsmouth-wages-waste-of-money accessed 02/02/2016)

into a team, Lewis argues that although team success can be bought it can also be made. Wolfe, Wright and Smart (2006) suggest that Moneyball holds potentially interesting insights for scholars with an interest in competitive advantage.

Sample and Data

Our data consists of a panel of ten seasons, 1996/97 - 2005/06, of the EPL. Since 1995 the EPL has consisted of 20 teams each season, therefore, our sample comprises 200 observations. Each team plays every other team home and away during the season to give a 380-game total league schedule with each team playing 38 games. Teams are awarded 3 points for a win, 1 point for a tied game and no points for a loss. The championship is awarded to the team with most points with goal difference and goals scored used if two or more teams are tied with the same points. Unlike the North American major leagues, there are no post-season domestic playoffs in the EPL although the final standings do determine entry to European tournaments in the following season. The bottom three teams are relegated to the Football League, the next tier in the pyramid structure, at the end of each season and replaced by three promoted teams. Over the sample period, 35 different teams played in the EPL. We contend that a merit-hierarchy sports league with promotion and relegation such as the EPL maximises innovation and effort incentives for both strong and weak teams and hence provides a better research site for investigating the impact of HC effects on team performance rather than leagues in which membership is fixed between seasons with no promotion-relegation system.

All of our data is archival and is compiled from published sources (i.e. various editions of the Sky Sports Football Yearbook). Consistent with the practical criteria outlined by Godfrey and Hill (1995) and Berman et al. (2002) for a useful data set, we contend that our data source is appropriate for a number of reasons. First, the data provides a clear and objective

measure of the performance of a team. Second, data is provided on all of the players in a team, and also the larger squad. The squad sizes in our sample varied from 35-55. For every team and year data are available for every player. Third, the measures are consistent across all the time periods in our sample. Finally, the use of survey-based methods is infeasible for a data set that incorporates individual level data every year for nearly one thousand individuals, both players and managers, over a ten-year period.

Dependent Variable

Team Performance. Our measure of team performance is defined as the total number of points gained by the team during the season divided by the maximum attainable points. In the case of the EPL, the maximum attainable points per season during the sample period is 114. In Guest's (1997) terms, our measure is a "hard performance" measure, based on operational performance. We employ such a measure because it best reflects Coff's (1999) notion of value creation, and is not subject to the problems of value appropriation that affect financial measures of performance.

Model variables

Both of our model variables are team-level constructs, which measure the extent to which team members and the team manager have developed human capital that is specific to the team. Consistent with Becker's (1962 & 1975) definition, we follow the lead of Berman et al. (2002) and Huckman and Pisano (2006) in employing individual's experience with a team as a means of constructing our measures of TSHC.

Team Member TSHC. Following Berman et al. (2002) we measure Team Member TSHC as the weighted average of players' total number of career league experiences for their current team at the start of the season. We have weighted by current league starting appearances which is more appropriate in football with only a maximum of three player substitutions in a

game. We use the log transformation in order to improve the diagnostic properties of the estimated models.

Team Manager TSHC. We measure Team Manager TSHC as the head coach's total number of games in charge at his current team (including previous spells) at the start of the current season using 1992, the year in which the EPL was formed, as the base year. Again we use the log transformation to yield the best diagnostic statistical estimates, specifically Ln(1 + Team Manager TSHC) to avoid the problem of Team Manager TSHC having a zero value when a new head coach has been appointed prior to the start of the new season.

*Team Member TSHC * Team Manager TSHC*. In modelling the cross product we allow for the interaction between Team Member TSHC and Team Manager TSHC. The inclusion of the cross product, along with the separate linear effects of Team Member TSHC and Team Manager TSHC, allows us to examine the possible performance effects of previously accumulated Team Member TSHC when a new team manager is appointed with zero previous experience with the team. We define the cross product as Team Member TSHC * [1 + Team Manager TSHC] using log transformations of the two components.

Control variables

General HC. The principal measure of *General HC* used in this study is defined as a club's total annual wage costs divided by the annual league average to remove inflation effects. There are no reliable publicly available data on player wage costs in European professional team sports. A club's total wage costs can be sourced from its audited company accounts and, given that player wages are the dominant component of total wage costs, it has generally been accepted that total wage costs provide a good proxy for player wage costs. Total wage costs have been used in the analysis of the relationship between team

performance and player quality in English professional football by, for example, Szymanski and Smith (1997) and Szymanski and Kuypers (1999).

Age. In addition to total wage costs, we also include the weighted average of player age at the start of the season, weighted by current league starting appearances, as an additional measure of general HC. We also include the squared term, *AgeSq*, to allow for any quadratic effects, particularly the possibility that veteran players may receive a higher proportion of their remuneration for their off-the-field activities such as image rights which would imply that total wage costs may be less reliable as a proxy for the stock of general HC related to on-the-field sporting performance.

Experience. We have also included an experience variable to further control for general HC. *Experience* is defined as the weighted average of the players' total career league appearances for all professional football clubs, weighted by current league starting appearances. We use the log transformation to ensure the best diagnostic properties for the estimated models. As with the age variable and for similar reasons, we also allow for a quadratic effect by the inclusion of the squared term, *ExperienceSq*. The quadratic effects for both age and experience are found to be statistically significant in the final estimated models. There was no evidence of a statistically significant quadratic effect for total wage costs and so no squared term for this variable is included in the reported estimates. We also investigated the inclusion of various measures of the general HC of the head coach but all were found to be very highly insignificant statistically and were excluded from the final reported estimates.

Dynamics. When undertaking sensitivity analysis on the robustness of the reported estimates, we consider the effects of using a dynamic specification to capture the time dependency of team performance arising from the effects of organizational capital. We

include two dynamic variables, *Past Performance*, defined as team performance in the previous season and *Promoted*, which is a binary variable taking the value of unity when a team is newly promoted from the lower division, and zero if the team played in the EPL in the previous season.

Diversity. In our sensitivity analysis we also include two additional control variables, *Age Diversity* and *Experience Diversity* to capture the possible effects on team performance arising from the heterogeneity of the general HC across team members. Both variables are measured by the respective standard deviation of player age and experience at the start of the current season weighted by current league starting appearances.

Model Specification and Estimation

In order to test our hypotheses we estimated four models starting with the linear and quadratic general HC and control variables in model 1, introducing Team Member TSHC in model 2, and the moderating effect of Team Manager TSHC on the relationship between Team Member TSHC and Team Performance in model 3. Finally, in model 4 we present a team-specific fixed effects analysis, utilizing the panel structure of our data set, to deal with the potential problems of residual autocorrelation and the mis-attribution of organizational capital effects to the shared experience of team members and the team manager. We employed model 4, our preferred model, to test our theoretical model.

Residual autocorrelation can be the result of a dynamic mis-specification problem. In essence, we need to disentangle the causal relationship between the shared experience (which is the result of team stability) and performance. Simply stated, shared experience may lead to enhanced team performance which, in turn, may lead to greater shared experience as the management try to keep together a successful team. Interestingly, Berman et al. (2002) find the existence of residual autocorrelation but interpret this as an

estimation problem requiring the use of a different estimation method. An alternative interpretation of residual autocorrelation is as evidence of a dynamic mis-specification problem requiring a change in the model specification such as the inclusion of lagged effects (Hendry, 1980). We investigate the possibility of dynamic mis-specification, as detailed below, given that there are good theoretical grounds for expecting a feedback effect from team performance on shared experience.

In addition to addressing the issue of residual autocorrelation, any model of team performance needs to acknowledge that knowledge does not only reside at the level of the individual, but may also be embedded in an organization. We suggest that such knowledge constitutes organizational capital, which is the knowledge that is preserved within organizations as individuals "come and go" (Daft & Weick, 1984: 285). Organizational capital includes codified experience residing within and utilized through databases, patents, manuals, structures, systems, and processes (Youndt, Subramaniam & Snell, 2004).

Interestingly, issues of dynamic mis-specification and organizational capital effects are potentially related as organizational capital effects can create a dynamic interdependency in team performance across time periods. Specifically, if organizational capital changes slowly over time its impact on performance will be relatively constant over the short and medium term, thereby creating a tendency towards organizations replicating performance in the future periods. Hence, residual autocorrelation may be the consequence of a failure to include organizational capital as an explanatory variable. Utilizing the panel nature of our data set in model 4, estimating a fixed effects model, we can address the issues of dynamic mis-specification and organizational capital simultaneously. The fixed effects coefficients are a proxy for a team's organizational capital, which vary between teams but are assumed to be relatively fixed from year to year for each team. Statistically the fixed-effects approach

yielded the better goodness-of-fit and diagnostic properties for our panel data as compared to a lagged variables approach.

In order to establish the robustness of our fixed effects results in our preferred model 4, we also report four additional estimated models. Models 5 and 6 report the results when the time dependency of team performance is modelled using a dynamic specification. In model 5 the two dynamic variables, *Past Performance* and *Promoted*, are included with no fixed effects. Model 6 includes both team-specific fixed effects and team-specific past performance effects using generalized method of moments (GMM) estimation. Model 7 extends model 6 by including two additional controls, *Age Diversity* and *Experience Diversity*, to allow for the possible performance effects of the heterogeneity of general HC across team members. Finally model 8 considers the possibility that our TSHC variables are partially endogenously determined to the extent that members and managers of successful teams are more likely to be retained, creating the possibility of a feedback effect from team performance to TSHC. We report the instrumental-variable (IV) estimates for model 7 with general HC (i.e. wages) and the TSHC variables treated as endogenous.

Four diagnostic tests are quoted for all of the estimated models – a normality test which can be indicative of outliers and general model miss-specification, White's test for heteroscedasticity, the Ramsey RESET test for general model mis-specification, and the AR(1) test for first-order residual autocorrelation (adjusted for the panel structure of the data).

RESULTS

Table 1 provides the descriptive statistics and correlation matrix for selected variables. The descriptive statistics for the experience and TSHC variables are reported without the log transformation. The simple correlation coefficients show that general HC measured by relative wage costs has the highest degree of linear association with team performance,

reflecting the strength of financial determinism in English professional football. This reinforces the belief that the players' labour market is highly efficient in reflecting general HC in player wage valuations and, as a consequence, validates the use of relative wage costs as the principal means of controlling for general HC effects. Both team member TSHC and manager TSHC are positively related correlated with team performance, at .43 and .39 respectively. It should be noted that the correlation coefficient indicates a potential multicollinearity problem with high correlation between the age and experience variables. However, this multicollinearity has limited impact on our results since age and experience are control variables and not a central focus of this study. In any case the estimated coefficients for these variables show a reasonable degree of stability and are statistically significant in most of the estimated models. The data set includes a well-known "outlier", Sir Alex Ferguson, the long-serving head coach of Manchester United, the most successful team in the EPL. The empirical results change little, however, when Sir Alex Ferguson is excluded from the sample. Indeed the impact of both Team Manager TSHC and the cross product increases slightly in absolute terms. If anything Ferguson's managerial longevity and success masks the impact on performance of managers with much shorter periods of tenure.

-- INSERT TABLE 1 ABOUT HERE --

OLS regression results are reported in Table 2 – models 1 to 3. Model 1 shows that all the *General HC* variables are statistically significant at the 1% level and jointly explain 63.3% of the variation in *Team Performance*. The quadratic effects for both *Age* and *Experience* are statistically significant. *Age* is found to have an inverted U-shaped relationship with *Team Performance* with the marginal effect of an increased average age in the team diminishing and then becoming negative. This is consistent with the suggestion that total wage costs

may be less reflective of on-the-field sporting ability for older players. The Experience effect exhibits a U-shaped relationship with *Team Performance*.

-- INSERT TABLE 2 ABOUT HERE --

Model 2 introduces *Team Member TSHC*, which has a significant positive impact on *Team Performance*, supporting H1. In addition, and for the purpose of robustness, we modelled *Team Member TSHC* in quadratic form to test for the potential that its performance benefits would diminish with cumulative experience (Wright 1936; Dutton & Thomas 1984; Adler, 1990; Argote et al. 1990). We found no evidence that this was the case, the *Team Member TSHC* quadratic term being highly insignificant.

In model 3 we include the moderating effect of T*eam Manager TSHC* on the relationship between *Team Member TSHC* and *Team Performance*. The inclusion of the cross product term renders the effects of *Team Member TSHC* and *Team Manager TSHC* negative, and the cross product term is positive and statistically significant at the 5% level, supporting H2. Interestingly, the inclusion of the interaction term allows for the possibility of the negative effects on *Team Performance* caused by manager/employee succession that reduces *Team Member TSHC* and/or *Team Manager TSHC* to low levels. In all three estimated models the AR(1) diagnostic test statistic is statistically significant indicating the presence of residual autocorrelation.

Model 4, our preferred model, employs team-specific fixed effects to deal with the related problems of residual autocorrelation and the potential effect of organizational capital (which may consist of practices such as talent management programmes), which is accomplished as the AR(1) diagnostic test statistic becomes statistically insignificant. The estimated fixed effects are reported in Table 3. In model 4, team member TSHC and manager TSHC both have negative effects and the cross product has a positive effect and is

dominant. At mean values of *Team Member TSHC* and *Team Manager TSHC* the marginal impacts are both positive. *Team Member TSHC* and *Team Manager TSHC* only have negative impacts overall (including the cross product effect) when their values are low. Specifically *Team Member TSHC* has a negative effect overall only when *Team Manager TSHC* is less than 79.2 (around two playing seasons); *Team Manager TSHC* only has a negative impact overall when *Team Member TSHC* is less than 38.1. For analytical clarity we graphically represent the moderating relationship in Figure 1, showing the effect of *Team Manager TSHC* on the overall marginal impact of *Team Member TSHC* (i.e. both the linear and cross-product effects) at three different levels of *Team Member TSHC*: low (= 20), moderate (= 65), and high (= 165). Figure 1 shows that the moderating effect of *Team Manager TSHC* is greatest at low levels of *Team Member TSHC*. At high levels of *Team Member TSHC* there is little variation on the marginal impact of *Team Member TSHC* from the moderating effect of *Team Manager TSHC*.

-- INSERT TABLE 3 ABOUT HERE --

-- INSERT FIGURE 1 ABOUT HERE --

In Table 4 we report the impact on league points of a two standard deviation increase in all of the general and team-specific HC variables as presented in model 4. The impact of a two standard deviation increase in wage costs is 9.1 points, the equivalent of three additional wins. The result slightly exaggerates the impact of *General HC* on (sporting) performance given that, as discussed above, wage costs include remuneration for image rights (i.e. non-sporting performance) and hence are likely to overstate the sporting contribution of older, more experienced and better known players. After correcting for the effects of age and experience the overall impact of the increase in general HC is 7.2 points which represents 71.9% of the total impact of 9.9 points. The TSHC variables contribute 2.8

points (28.1%) to the total impact but this is a net contribution. The positive impact of the cross product is 16.4 points, more than twice the impact of general HC.

-- INSERT TABLE 4 ABOUT HERE --

In Table 5 we report the results of the sensitivity analysis of our basic TSHC model of team performance. In model 5 fixed effects are replaced by the two dynamic variables, which are both statistically significant and also resolve the residual autocorrelation problem. Importantly, there is very little impact on the estimated coefficients for the TSHC variables when switching from a fixed-effects specification in model 4 to the dynamic specification in model 5. In model 6 we allow for team-specific dynamics as well as team-specific fixed effects. In this specification there is no need to separately allow for promotion effects, which are now highly insignificant and fully captured by the team-specific dynamics. Again using a dynamic specification resolves the residual autocorrelation problem and, crucially, has very little impact on the magnitude of the TSHC effects. Model 7 extends model 6 by including two additional diversity variables as controls. *Age Diversity* has a positive and significant effect on *Team Performance* whereas *Experience Diversity* has a negative but insignificant effect. Controlling for diversity effects leads to a greater absolute effect on *Team Performance* from both *General HC* and TSHC compared to model 6 while reducing the absolute linear and quadratic effects of average experience. In addition, the two diversity variables jointly resolve the residual non-normality problem that arose in model 6 from the use of team-specific dynamics. This specification provides some insight into the trade-off faced when new team members are introduced whose *General HC* is towards the extremes in the team particularly as regards age. New team members, either young players or veterans, may compensate for the negative performance effects of lowering *Team Member TSHC* by enhancing performance through a positive effect of greater team diversity.

-- INSERT TABLE 5 ABOUT HERE --

Model 8 reports the results from using IV estimation to control for the possible endogeneity of the TSHC effects, with instruments constructed that include the remaining data collected on teams but not otherwise used in the reported models (specifically player career scoring rates and national team appearances, both levels and heterogeneity, supplemented by playing-season binary variables). Two key results emerge from model 8. First, the estimated effect of the control variable, general HC as measured by wage costs, is substantially reduced by more than tenfold after allowing for endogeneity. Second, and crucially, allowing for endogeneity using IV estimation leads to only small absolute effects on all three TSHC variables. Although we recognise the limitations of our IV estimates due to data constraints, they do nevertheless provide a clear indication that the direct effects of TSHC on team performance remain largely unaffected after eliminating any bias in the OLS estimates arising from dampening feedback effects. In contrast, the magnitude of the direct effect of team expenditure on *General HC* is progressively reduced, ultimately being rendered statistically insignificant in model 8 when allowing for dynamic interdependencies and possible endogeneity effects. The finding suggests that there is a strong feedback from team performance to wage expenditure via performance-sensitive revenues, such that high-spending teams that perform well are able to generate high revenues to maintain their high wage expenditures. However, this feedback process does not necessarily have the same impact on TSHC since high wage budgets allow teams to have a choice between retaining the *General HC* of their existing team or acquiring additional new *General HC* in the marketplace, with very different implications for the team's stock of TSHC.

In sum, the sensitivity analysis reported in Table 5 provides reassurance that the estimated TSHC effects are robust to alternative modelling solutions to: (i) the structure of

the time dependency of performance; (ii) the possible impact of *General HC* heterogeneity within teams; and (iii) the potential endogeneity of TSHC due to current team performance impacting on future retention and recruitment decisions for both team members and managers.

DISCUSSION AND CONCLUSION

In this paper we have developed and tested a model of two different dimensions of TSHC: team member and team manager. Drawing on data from a professional team sport, our findings indicate that *Team manager TSHC* positively moderates the relationship between *Team Member TSHC* and *Team Performance*. We believe that our work has important implications for scholars of the RBV and HC in terms of the potential sources of firm-specific competitive advantage.

Our findings attest to the importance of managerial tenure in both shaping and deploying the HC at their disposal. Employing the cross product we are able to demonstrate that the performance advantages that that stem from *Team Member TSHC* are contingent on the presence of *Team Manager TSHC*, which has important implications for managerial tenure. Specifically, our findings highlight that low levels of managerial tenure, which are associated with high managerial turnover, will have a negative effect on the relationship between *Team Member TSHC* and *Team Performance*. Hence, there is a real and significant performance implication to changing a manager, as reflected by the negative direct effects for *Team Member TSHC* and *Team Manager TSHC* when the cross product term is included. The negative effects arguably capture the impact of the disruption associated with changing a manager and/or high team member turnover.

Our findings have important implications for our understanding of how resources are developed, and their relationship with performance. To date the resource-performance

relationship has occupied a central position in RBV research (Hoskisson, Hitt, Wan & Yiu, 1999). However, recent meta-analyses of empirical studies indicate that evidence for this relationship is less than conclusive (Barney & Arikan, 2001; Crook, Ketchen, Combs & Todd, 2008; Newbert, 2007). We suggest that the equivocal nature of results may be due to previous studies not identifying the key resources that drive performance, i.e. the variables employed are analytically convenient but are not the most salient ones (Lockett et al., 2009). Consistent with RBV scholars, who have focused on capability development, we contend that managers play a key role in the process of capability development and deployment (Augier & Teece, 2008, 2009; Sirmon et al., 2007; Teece, 2007). As such, managers should be viewed as a key resource of the firm, and one that may enable the firm to develop performance advantages.

In addition, our findings have important implications for the management of teams and the development of HC that may lead to sustainable competitive advantage. In the professional sports industries, as well as commerce in general, organizations compete for the best talent. Where flexible labour markets exist, organizations will merely compete with one another and drive up the wages for workers, particularly when workers' skills are largely non-firm specific. In Coff's (1999) terms, the value created by workers through their general HC is likely to be appropriated by workers through wage bargaining over time. TSHC, in contrast, is more amenable to being appropriated by the firm, and may be viewed as an important source of sustainable competitive advantage because workers find it difficult to appropriate the returns to their TSHC (Coff, 1999; Mortensen, 1988a & 1988b; Rosen, 1988). As highlighted in the results section, we find that the performance impact from a two standard deviation shift in TSHC is greater, than that of *General HC*, where an organization has high *Team Member TSHC* and *Team Manager TSHC*. We suggest, therefore, that TSHC

may be an important concept for scholars of the RBV, as it may hold the promise for organizations to create sustainable performance differences, which they may appropriate to enhance their financial performance.

From a practitioner perspective, our work suggests that managers need considerable time before they can become effective in their new role; the positive effect of *Team Manager TSHC* on the relationship between *Team Member TSHC* and *Team Performance* occurring, on average, after two years of managerial tenure. Paradoxically, many EPL football organizations are not prepared to wait that long, with the average tenure of managers falling below 18 months in recent seasons (League Managers Association, 2010). Furthermore, the benefits of managerial tenure may be more limited when they join a team with high levels of *Team Member TSHC*, see Figure 1. We suggest that high levels of *Team Member TSHC* developed under a previous manager may lead to team members being more resistant to the adoption of new practices introduced by the new manager.

In addition to managerial tenure, our work raises important practitioner issues in relation to the turnover of personnel in a team. Replacing some team members and/or the manager may be one component of a strategy to improve performance in a failing work group, but it is no guarantee of future success. Any gain through new recruitment in terms of the stock of *General HC* within the work group will be, at least in part, offset by the reduction in the stock of TSHC and the inevitably difficulties in assimilating new members into the work group. Team turnover, therefore, should be viewed as a double-edged sword, particularly for high performing teams.

In terms of future research, we feel that there is a need for more work to examine the functioning of teams may influence the performance effects of the TSHC accumulated over time. First, we think it important to further examine the how the diversity within a team,

which will shape the context in which the team members interact with one another through different forms of conflict (affective and cognitive), may affect the relationship between TSHC and performance. Our results are indicative of a complex trade-off between *General HC* and TSHC, particularly when considering replacing team members (which reduces *Team Member TSHC*) and bringing in either young or veteran players who significantly increase the overall heterogeneity of the team's *General HC*, which can be performance-enhancing.

Second, in considering how teams function, we suggest that team sports offers an interesting window into the use of HRM practices (such as talent management systems) and how they may influence the accumulation and deployment of HC. Building on the work of Wright et al. (1995), scholars may wish to examine how different configurations of HRM practices may lead to the creation of team-specific HC, and its effects on performance.

Third, we feel that more work needs to be done to consider what may be an "optimal" level of team turnover, and how this may be influenced by the dynamics of a competitive environment. Given the highly fluid labour market (managers and players), and extreme competitive nature of the EPL, we wonder whether or not sufficient team stability can be achieved in order to drive success on the basis of TSHC.

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TABLE 1
Descriptive statistics and correlation matrix

Variable	Max Value	Min Value	Mean	S.D.	Coefficient of Variation	Correlation Coefficient (1)	(2)	(3)	(4)	(5)	(6)
Team Performance (1)	0.83	0.13	0.46	0.13	0.29	1.00					
General HC(2)	2.83	0.29	1.00	0.48	0.48	0.78	1.00				
Age (3)	30.87	22.67	26.97	1.24	0.05	-0.15	-0.23	1.00			
Experience (4)	330.30	125.30	213.40	35.70	0.17	0.02	-0.05	0.81	1.00		
Team Member TSHC (5)	167.80	20.40	65.90	25.12	0.38	0.43	0.40	0.09	0.31	1.00	
Team Manager TSHC (6)	506.00	0.00	100.95	91.80	0.91	0.39	0.33	-0.04	0.07	0.42	1.00

Note: Descriptive statistics and correlation matrix calculated before log transformation applied to experience and TSHC variables.

TABLE 2
OLS regression analysis of Team member TSHC, Team Manager TSHC and Team Performance

Dependent Variable: Team Performance	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Constant	7.82816* (4.027)	7.28415* (4.002)	8.46797 (3.915)	Fixed Effects
General HC	0.211712*** (0.01273)	0.202698*** (0.01335)	0.193762*** (0.01340)	0.0831337** (0.03262)
Age	0.397902*** (0.1485)	0.348685** (0.1492)	0.347184** (0.145)	0.306916* (0.1595)
AgeSq	-0.007591*** (0.002801)	-0.006618** (0.002817)	-0.006546** (0.002745	-0.006043** (0.003021
Experience	-4.91537*** (1.759)	-4.48882** (1.757)	-4.78194*** (1.715	-3.16645 (2.057)
ExperienceSq	0.471682*** (0.1667)	0.427628** (0.1667)	0.453988**** (0.1627	0.308645 (0.1950)
Team Member TSHC		0.0368178** (0.01777)	-0.0620405 (0.04013)	-0.0840025* (0.04559)
Team Manager TSHC			-.0867747** (0.03760)	-0.0699237 (0.04413)
Team Member TSHC * Team Manager TSHC			0.0228233** (0.009015)	0.0192120* (0.01074)
<u>Goodness of fit</u>				
s	0.08037	0.07970	0.07766	0.07455
R^2	0.63286	0.64084	0.66249	0.74439
F	66.88***	57.39***	46.86***	10.09***
<u>Diagnostics</u>				
Normality	1.3188	2.0405	2.1153	1.2052
Hetero	1.1246	1.0316	1.2044	1.2875
RESET	0.1618	0.0026	0.1466	0.6568
AR(1)	2.306**	2.108**	1.895*	0.512

***significant at 1% level; **significant at 5% level; *significant at 10% level; standard errors in parentheses (two-tailed test). s = standard error of regression; F = test of overall significance of regression (F one-tailed test); White test for heteroskedasticity (F one-tailed test); RESET test for specification errors (F one-tailed test); AR(1) test for autoregressive errors in panel data (F one-tailed test).

TABLE 3
Estimated Fixed Effects (Model 4)

Team	Fixed Effect	Ranking
Arsenal	5.04755	1
Chelsea	5.01315	2
Man Utd	5.01212	3
Liverpool	4.97846	4
Leeds Utd	4.92930	5
Wimbledon	4.92418	6
Aston Villa	4.91993	7
Southampton	4.91106	8
Newcastle	4.91041	9
Bolton	4.90222	10
Blackburn	4.90058	11
Ipswich	4.90055	12
West Ham	4.89233	13
Fulham	4.88946	14
Tottenham	4.88623	15
Birmingham	4.88356	16
Sheffield Wed	4.88323	17
Leicester	4.88282	18
Middlesboro	4.88214	19
Everton	4.87135	20
Wigan Ath	4.87047	21
Man City	4.85695	22
Derby Co	4.85653	23
Charlton	4.85419	24
Portsmouth	4.84766	25
Coventry	4.84658	26
Barnsley	4.80867	27
Bradford	4.80613	28
Sunderland	4.79862	29
Wolves	4.77513	30
Crystal Palace	4.77218	31
Norwich	4.76669	32
WBA	4.75889	33
Nottingham Forest	4.75140	34
Watford	4.71038	35

FIGURE 1
The moderating effect of Manager TSHC on the relationship between Team Member TSHC and team performance

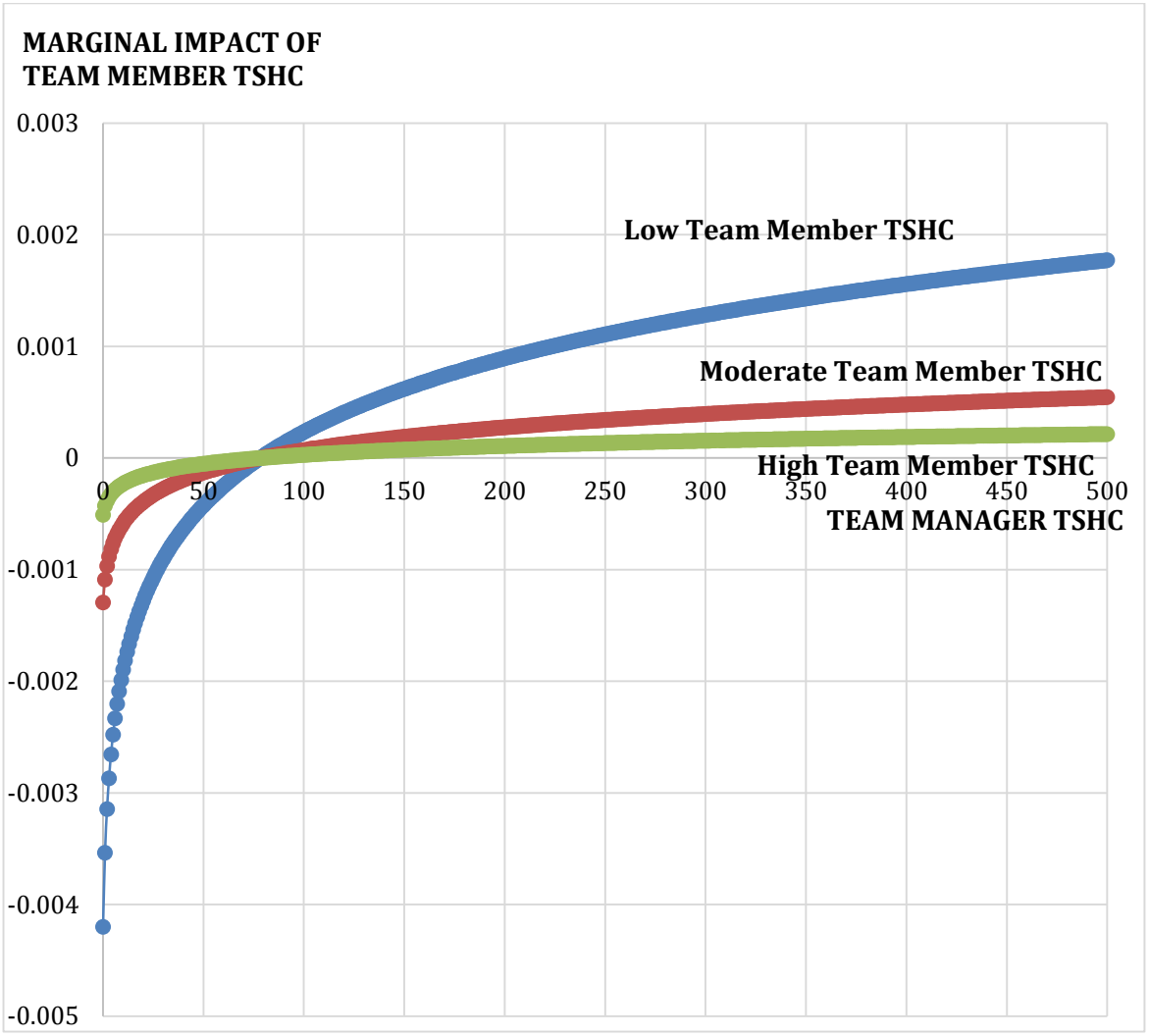

TABLE 4
Estimated Points Impact of a Two Standard Deviation in the Determinants of Team Performance

	Points Impact of Two Standard Deviation Increase
General HC	+9.098
Other General HC Controls	-1.946
Team Member TSHC	-5.428
Team Manager TSHC	-8.210
Team Member TSHC * Team Manager TSHC	+16.428
Total	**+9.943**

TABLE 5
Sensitivity Analysis of the Basic TSHC Model of Team Performance

Dependent Variable: TEAM PERFORMANCE	**Model 5**	**Model 6**	**Model 7**	**Model 8**
Constant	8.07738** (3.207)	Team-Specific	Team-Specific	Team-Specific
General HC	0.159454*** (0.01832)	0.038782 (0.04363)	0.067789* (0.03624)	0.0048812 (0.1988)
Age	0.335237*** (0.1043)	0.518752*** (0.1155)	0.506741*** (0.1140)	0.785007** (0.3174)
AgeSq	-0.006327*** (0.001975)	-0.010004*** (0.002251)	-0.009827*** (0.002236)	-0.0153275** (0.006381)
Experience	-4.58268*** (1.280)	-4.03749** (1.172)	-2.69130** (1.200)	-6.16286* (3.300)
ExperienceSq	0.435573*** (0.1225)	0.389337** (0.1561)	0.265103** (0.1123)	0.602171* (0.3201)
Team Member TSHC	-0.0685591* (0.03516)	-0.0839692** (0.03995)	-0.127782*** (0.03543)	-0.0766208 (0.2956)
Team Manager TSHC	-0.0833125*** (0.02688)	-0.0712257** (0.03559)	-0.0849367** (0.03436)	-0.0758929 (0.3244)
Team Member TSHC * Team Manager TSHC	0.0213962*** (0.006310)	0.0198131** (0.008480)	0.0235141*** (0.008451)	0.0268363 (0.07849)
Past Performance	0.187685* (0.1035)	Team-Specific	Team-Specific	Team-Specific
Promoted	-0.0593612** (0.03006)			
Age Diversity			0.0522372*** (0.009383)	0.0525390*** (0.01151)
Experience Diversity			-0.00132094 (0.001048)	-0.00188851** (0.0008666)
<u>Goodness of fit</u>				
s	0.07705	0.07348	0.06324	0.07390
R^2	0.67128	0.79910	0.85364	0.79999

F	38.60***	7.02***	9.85***	6.36***
Diagnostics				
Normality	2.0930	6.4361**	3.2322	3.2585
Hetero	0.7976	0.1892	0.1124	0.1607
RESET	0.0736	0.1184	1.4363	n/a
AR(1)	1.393	0.946	0.939	n/a

***significant at 1% level; **significant at 5% level; *significant at 10% level; standard errors in parentheses (two-tailed test). s = standard error of regression; F = test of overall significance of regression (F one-tailed test); White test for heteroscedasticity (F one-tailed test); RESET test for specification errors (F one-tailed test); AR(1) test for autoregressive errors in panel data (F one-tailed test).