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# The Baby Club: Paternity and Performance in a High-Pressure Setting

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## ABSTRACT

We offer new insights into fatherhood by asking if the onset of paternity changes workplace productivity. We do this in the well-monitored and high-pressure setting of professional football using a novel dataset that matches 115 birth disclosures to the performance of 96 players. Our empirical approach involves specifying a performance equation for a suite of match-level performance statistics and estimating OLS and Poisson fixed-effect panel regressions. We find a negative correlation between fatherhood and collaborative performance as measured by expected assists—a player's ability to create goalscoring opportunities. We also report negative effects for the perinatal period for expected assists and passing measures. There is no evidence of performance changes resulting from expectancy news. As negative performance effects are observed in a context of 'superstar wages', this raises concerns for high-pressure labour markets where workers are remunerated less but have low uptake of leave entitlements or where paternity leave is culturally taboo.

## 1 | Introduction

A recognised branch of research considers how parenthood has important consequences for individuals and, more broadly, the family unit (Becker 1991; Lazear 1989; Willis 2000). Paternal effects are well documented. Various outcomes have been studied, most notably earnings premia (Glauber 2018), career advancement (Johnsen, Ku, and Salvanes 2023), impacts to well-being (Mangiavacchi, Piccoli, and Pieroni 2021), health effects (Kim 2024), peer effects (Dahl, Løken, and Mogstad 2014) and family involvement/interaction levels (Rossin-Slater 2017). This paper offers a new direction and contributes to an interdisciplinary literature on the effects of paternity. We study a heretofore empirically unexplored question—does workplace productivity change with the onset of paternity? To address this, we draw on a novel performance dataset from elite professional footballer in Europe, an established domain to study labour market issues (see Simmons 2022). This is a high-pressure and competitive labour market where workers are closely monitored and one where there is almost no uptake of leave entitlements despite statutory rights.[1]

Studying work responses after the onset of fatherhood is important. Interdisciplinary evidence shows that becoming a father is one of life's most challenging transitions—it represents a significant inflection point for physical and mental health markers, with both positive and negative psychological impacts (Genesoni and Tallandini 2009; Saxbe, Rossin-Slater, and Goldenberg 2018; Torche and Rauf 2021). Various accounts document this (mixed) emotional shock; fatherhood can bring optimism, pride and higher life satisfaction, in addition to increasing confidence (Baldwin and Bick 2018). Simultaneously, fatherhood is associated with stress, relationship strain, anxiety, fatigue and sleep disruption (Philpott et al. 2019; Moran et al. 2021). Recent evidence suggests that the cognitive changes accompanying fatherhood are significant—becoming a father can alter brain structure (Horrell, Acosta, and Saltzman 2021; Saxbe et al. 2023). Given the range of effects, understanding productivity changes is important, especially when paternity leave is an issue relevant to all labour markets and when organisations seek to implement specific policies to address this.

As the consequences of fatherhood can vary, we refrain from committing to a hypothesis regarding the expected changes in workplace performance. It is plausible to form broad theoretical priors—fatherhood could lead to both positive and negative performance effects depending on the task. We also proceed by assuming that any performance changes will be short-lived. Consequently, our empirical focus is on productivity over a short-term window rather than throughout an entire career and focusses on the performance of the father only.[2] While the dataset we construct allows us to conduct innovative research, there are constraints on our analysis that necessitate several assumptions. These are often due to unobservable characteristics associated with birth. Furthermore, it is only possible to observe fatherhood and not those unaffected (i.e., data for non-fathers are private and unobtainable), meaning we have no access to 'untreated' observations. As such, we conduct standard correlational research (within-sample) and estimate fixed-effect panel regression models. Although these data limitations impose bounds on the work, we can explore the sensitivity of the primary results by evaluating the perinatal period—the time leading up to and shortly after birth. We can also consider an auxiliary question by evaluating the effect of information of birth expectancy, an event that could trigger simultaneously mixed emotions.

Our questions and dataset are not only novel but can also offer practical contributions. Our findings have implications for talent management, the strategic deployment of human capital and paternity policy formation. This is important as paternity will always be a recurring personal reason to abstain from work. Albeit an exceptional labour market, we find some evidence of adverse performance effects. This carries a message for other high-pressure industries where paternity leave is not utilised or under-utilised by workers.

The paper continues as follows. The next section offers a summary of the interdisciplinary findings concerning the effects of fatherhood. Section 3 details our dataset, and Section 4 outlines the methods and approach. Section 5 presents the results, and Section 6 concludes the paper.

## 2 | The Impact of Paternity

While granular explorations of performance effects after the onset of paternity are absent from the literature, general labour supply and work-related impacts of paternity have been examined. For example, past research has shown that short leave periods have no persistent effect on labour supply or labour market participation (Joseph et al. 2013; Tamm 2019). Studies have also shown that fathers act differently to non-fathers with respect to work choices; Eggebeen and Knoester (2001) provide evidence that fathers with dependent children worked more hours per week than non-fathers. The evidence suggests that additional work is often exchanged for leisure hours, and the onset of paternity leads men to increase their rate of asset accumulation (Knoester and Eggebeen 2006; Dew and Eggebeen 2010). Qualitative evidence also suggests that one's work–home–life balance is an important consideration for fathers' decisions immediately after the birth of a child (St John, Cameron, and McVeigh 2005).

A larger body of research exists on the physical and mental health effects of parenthood. Family commitments can affect participation in physical activity and most of the evidence suggests that children reduce the likelihood of participation (Ruseski et al. 2011; Downward, Lera-López, and Rasciute 2014; Hallmann et al. 2017).[3] Specific to fatherhood, past studies have tended to explore general paternity effects rather than focussing on industry-specific applications. Pot and Keizer (2016) reviewed research on physical health, finding that fatherhood negatively impacts overall moderate to vigorous physical activity, with this decrease being more pronounced among fathers with young children. For example, a typical negative physical effect is sleep disruption (Burgard and Ailshire 2013). Despite the decline in physical activity, fathers still however have a greater life expectancy than non-fathers (Modig et al. 2017).

From a psychological perspective, Moran et al. (2021) provide an overview of the mixed mental health effects of fatherhood. There can be many positive emotional implications, but the fear of childbirth can be a significant and distressing experience for expectant fathers. Other specific psychological issues related to fatherhood have been explored. For example, postnatal depression is not exclusive to mothers (Singley and Edwards 2015). Additionally, a distinct branch of the psychological literature debates sympathetic pregnancy, also known as Couvade syndrome, a disputed condition where fathers mimic psychological symptoms of the mother, possibly due to joint hormonal changes (Kazmierczak et al. 2013).

The (psycho)biological adaptions associated with fatherhood are not trivial. Paternity is associated with hormonal changes in males and represents a key cognitive phase for adult neural plasticity. Regarding hormonal effects, fathers exhibit lower testosterone levels (Grebe et al. 2019). 'Paternal hormones' associated with nurturing increase in men postpartum, such as oestradiol (Edelstein et al. 2015), oxytocin (Gordon et al. 2010) and prolactin (Hashemian, Shafigh, and Roohi 2016). Recent evidence suggests that changes take place at a cognitive level, with cortical structural differences observed in males after becoming fathers (Martínez-García et al. 2023; Saxbe et al. 2023). Saxbe et al. (2023) present evidence of changes in the left hippocampus in human males, with increases in left hippocampal volume predicting lower postpartum testosterone.

Although our labour market context is one of extreme wages (see Scarfe, Singleton, and Telemo 2021 for a recent overview), where workers have ample financial supports to alleviate stressors associated with lifestyle changes, various media accounts still document the benefits and challenges of fatherhood. During interviews, professional footballers have commented on how parenthood has increased their sense of maturity but changed their perspective on the importance of their career (Juventus.com 2023; Sky News 2024). Anecdotally, players have also attributed performance declines to fatherhood (Graham 2024). Professional football is also an industry known for considerable travel. Personal accounts confirm the test of managing work and family life due to this travel requirement (Easterby 2019). Finally, interviews with players have shed light on the implicit expectation that paternity leave is not taken—players' have reported that there is an anticipation of an almost immediate return to work given the competitive nature of the labour market (Hodges 2024).

## 3 | Data

### 3.1 | Birth Data

We manually tracked 115 births through publicly available social (media) disclosures from 2017 to 2023, collecting observations when information became public knowledge.[4] The most common data source was social media (70% via Instagram/Twitter), which included personal disclosures from players and/or partners or official club (birth congratulations) statements. The remaining observations were collected from conventional media sources (20%) and from private information attained on training omissions subsequently made public by 'fantasy football' enthusiasts (via Reddit.com). Approximately 75% of the observations are verifiable from birth pictures posted online shortly after the birth.

We matched the births to 96 outfield players.[5] All fathers were contracted to clubs in elite leagues in five European countries (England, Spain, Germany, Italy and France). We recorded the date of birth, sex, birth type (single or twin birth) and whether the player was a first-time father. We also identified if the birth occurred during the off-season (holiday period) to account for pre-season effects and significant match timing lags.

Plausible concerns regarding representativeness or the selective nature of the data are worth addressing. First, we are confident the sample is characteristic of the population of elite footballers and encompasses a range of talent (i.e., one may be concerned that star players or extraverted personalities are overrepresented; there may be ulterior motives related to social media revelations such as brand management for stars) (see Gaenssle 2024). This concern is assuaged by the fact that disclosures are regularly made by the mother. Other concerns of selection effects into fatherhood can also be alleviated. For example, it is plausible to worry of a selection effect linked to marriage. We are not however overly concerned with this channel. Workers in this context tend to be relatively homogeneous, and all births are recorded in stable relationships/marriages. This group of individuals all tend to have financial stability at a relatively young age. The players are concentrated within a narrow age band (~18–35) and are all at peak physical fitness.

Second, it could be possible that dates of birth are not random due to family planning. Parents could act strategically to maximise the chances of their child's success in the industry (relative age effects) or may plan for a birth to coincide with the summer break. While the birth percentage during the off-season months is the highest, we still observe a relatively equal birth distribution across all quarters (22%-Q1; 25%-Q2; 27%-Q3; 26%-Q4).

While we are assuming all births are homogenous, we removed five observations that we considered sensitive cases (e.g., premature births where the player was unavailable to play for a significant period). We also modelled minutes as an outcome variable to explore the validity of this assumption as the emotional stressors of each birth are unobservables. There is no evidence of players in the final sample exhibiting unusual levels of absenteeism that could proxy birth complications. This gives us greater confidence in this assumption.

### 3.2 | Player–Performance Data

We matched the birth dataset to a panel of player performances prior to and after the onset of paternity. These data are typically unbalanced across observations due to the seasonal stage, injury or owing to differential participation levels (i.e., playing in European competitions). Where possible, we use natural cut-offs in the performance data such as the player ending a league season or incurring injury. OPTA performance data (accessed via Fbref.com) provide match-level data, date-season, venue, competition, the player's age, squad (domestic club or international team), match-level position and minutes played. OPTA are recognised as providing one of the highest levels of quality data for the industry.

We selected the most advanced performance measures available from this source to attain a detailed assessment of productivity. For example, we favour analytics such as expected goals and expected assists (xG and xA) as they represent superior metrics to the traditional/basic measures. Traditional measures such as goals or assists can be over or undervalued, lack contextualisation and are subject to random variation (see Brechot and Flepp 2020; Flepp and Franck 2021). In short, the evidence implies that performance measured with, for example, xG is more informative as these advanced measures eliminate the influence of luck on performance, thus offering a richer assessment of offensive contributions for both goalscoring and playmaking.[6]

We also examine standard performance measures that past evidence has shown to be reasonable indicators of player productivity or work rates. For example, Lichter, Pestel, and Sommer (2017) find that a basic measure of passes is strongly correlated with running distances. We measure these general match activities through event data (number of passes, carries, etc.). While advanced analytics are only entering the literature, our work-rate measures such as passes are staples of past research (Bryson, Rossi, and Simmons 2014) and can still be informative.

We believe that utilising these precise productivity traits is preferable to adopting a composite online rating (e.g., WhoScored.com) or journalist scores. In the case of performance composites produced by commercial companies, these evaluations are derived from private algorithms and lack variation. Journalistic ratings are subjective and can be biased (Principe and van Ours 2022). Table 1 offers an overview of the data and defines the productivity measures. Note there are differences across the number of match-level observations in Table 1 due to performance data limitations.[7]

## 4 | Methods

We proceed with fixed-effect panel regressions where we focus on changes within the sample group following the onset of fatherhood.

**TABLE 1** | Summary statistics.

| Variable | Definition | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|---|
| Minutes | Minutes played per match | 3167 | 72.54 | 27.39 | 1 | 120 |
| Age | Age in years on match date | 3167 | 27.60 | 3.32 | 18.2 | 36.5 |
| Home | 1 if match was played at home and 0 otherwise | 3167 | 0.47 | 0.49 | 0 | 1 |
| Off-season birth | 1 if the birth took place outside of the domestic league season and 0 otherwise | 3167 | 0.31 | 0.46 | 0 | 1 |
| First-time father | 1 for first-time fathers and 0 for subsequent births | 3167 | 0.45 | 0.49 | 0 | 1 |
| Non-penalty expected goals (NPxG) | Goals a player should have scored given the context of the goalscoring opportunity excluding penalty kicks (i.e., probability of a given shot resulting in a goal being scored) | 2705 | 0.13 | 0.26 | 0 | 2.3 |
| Expected assists (xA) | How many assists a player should have made based on their build-up and attacking play. The likelihood that a completed pass will become a goal assist | 2705 | 0.10 | 0.20 | 0 | 2.2 |
| Shots on target (SoT) | Count of shots on target excluding penalty kicks | 3167 | 0.47 | 0.82 | 0 | 6 |
| Completed passes (CMP) | Count of total passes completed | 2705 | 36.36 | 24.51 | 0 | 171 |
| Progressive passes (PrgP) | Count of completed passes that move the ball towards the opponent's goal at least 10 yards from its furthest point in the last six passes or any completed pass into the penalty area. Excludes passes from the defending 40% of the pitch | 2705 | 3.99 | 3.61 | 0 | 24 |
| Carries | Count of the number of times a player controls the ball with their feet | 2705 | 31.85 | 19.85 | 0 | 139 |
| Tackles | Count of the number tackles per match | 2705 | 1.18 | 1.34 | 0 | 8 |

For our primary analysis, we specify a model that takes the form

$$Perf_i = \alpha + \beta_1 PostPartum_i + \beta X_i' + P_i' + S_i' + \eta_i' + T_i' + C_i' + u_{it} \quad (1)$$

The unit of observation is an explicit performance measure documented in Table 1 (*Perf*) and denotes the outcome variable for player *i*. $\beta_1$ is of primary interest in our specification, and *PostPartum* is captured by an indicator variable that holds a value of 1 for matches played after the birth and 0 before becoming a father. The vector $X_i'$ represents a set of controls for individual- and match-level characteristics in match *i*. This includes minutes played, player age and its quadratic value to isolate experience, a home match indicator variable to account for home advantage (Fischer and Haucap 2022) and an indicator to capture if the birth took place during the domestic off-season to control for any major timing lags between birth and performance. Finally, as medical and sociological research demonstrates that first-time fathers are more sensitive to paternal events compared to experienced fathers (Baldwin and Bick 2018; Dolan and Coe 2011; Poh et al. 2014), we use an indicator to control for the possibility of these individual experiencing more salient emotions. These fathers could be more sensitive to lifestyle or identity changes when navigating a new social role. We are conscious of identification problems arising from the minutes–performance relationship. While minutes are included as a control in our preferred specification, we take steps to test the robustness of these results.

($P_i'$) are player-specific fixed effects to account for variations in human capital and playing style. We also include fixed effects for seasons ($S_i'$), a player's position (defence, midfield and forward [$\eta_i'$]), a player's team ($T_i'$) and the competition of the performance ($C_i'$). These account for relevant time-invariant factors and other unobservable determinants of performance. They are justified for a variety of reasons. First, our data cover seven seasons, several of which are impacted by COVID-19 regulations (a specific matter we address later with a check). Second, productivity statistics differ across a player's role and are a function of unobserved team quality features. These should complement the player fixed effects in capturing nuances across individual human capital. Lastly, it is important to capture motivation or effort and opposition quality levels that are a function of the differing leagues/opposition strength and the prize at stake (e.g., cup matches vs. knock-out Champions League matches). $u_{it}$ is an error term.

We also test the sensitivity of performance changes to birth timing. The birth itself is one event in the pregnancy. Although this intrapartum period represents the most intense emotional shock, the period prior to the birth can be an emotive time also. Feelings of excitement, anxiety or fear may not only manifest after birth. Thus, we consider the perinatal period—a time that encompasses both the weeks leading up to birth and the postnatal period shortly afterwards. We operationalise this through estimating Equation (1) with a lagged version of the *PostPartum* indicator that shifts the performance window backward to include differential periods prior to, and up to 3 months after, the birth (i.e., the prenatal and postpartum period).

We estimate OLS fixed effects and Poisson (MLE) regressions as our performance measures include both continuous and count data. Expected goals (xG) and expected assists (xA) can take on any value, whereas event data such as passes, carries or tackles represent tally counts, indicating the number of times a player has performed a strict action. We cluster all standard errors at the player level as we suspect performance metrics to be correlated across different matches.

## 5 | Results

### 5.1 | Postpartum Performance

Table 2 presents the estimates of the relationship between alternative performance measures and the onset of fatherhood. A full set of fixed effects is included to account for characteristics related to players, positions, squads, competitions and seasons. Our coefficient of interest is *Postpartum*. The most interesting result is a strong statistical effect on expected assists (xA). This suggests that players engage in less creative goalscoring opportunities that are conducive to team production. While no negative xG effect is recorded, the observed negative effect persists when we combine xG and xA; this merged measure can be used to consider complete expected goal involvement. For general match activities such as passes, which can correlate with running, we do not observe any statistical effects, suggesting no changes in general work-rates.

**TABLE 2** | Postpartum performance.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | **NPxG** | **xA** | **SoT** | **CMP** | **Prog Passes** | **Carries** |
| **Estimator** | **OLS FE** | **OLS FE** | **Poisson** | **Poisson** | **Poisson** | **Poisson** |
| Postpartum | −0.0119 | −0.0301*** | 0.1005 | 0.0026 | −0.0308 | −0.0021 |
| | (0.0132) | (0.0101) | (0.0178) | (0.0196) | (0.0347) | (0.0180) |
| Minutes | 0.0022*** | 0.0014*** | 0.0178*** | 0.0195*** | 0.0197*** | 0.0194*** |
| | (0.0003) | (0.0001) | (0.0011) | (0.0006) | (0.0011) | (0.0006) |
| Age | 0.1553* | 0.0895 | 0.7854* | −0.0610 | −0.2814 | −0.0556 |
| | (0.0846) | (0.0856) | (0.4517) | (0.1426) | (0.3997) | (0.1540) |
| $Age^2$ | −0.0024* | −0.0012 | −0.0143* | 0.0000 | 0.0042 | 0.0001 |
| | (0.0013) | (0.0013) | (0.0073) | (0.0027) | (0.0065) | (0.0028) |
| Home | 0.0148 | 0.0204*** | 0.1756*** | 0.0563*** | 0.1700*** | 0.0642*** |
| | (0.0094) | (0.0071) | (0.0492) | (0.0149) | (0.0269) | (0.0163) |
| Off-season | 0.0074 | −0.0463 | 0.0749 | −0.0650 | −0.1203 | −0.1006* |
| | (0.0270) | (0.0368) | (0.2132) | (0.0440) | (0.1244) | (0.0607) |
| First-time father | 0.0871** | 0.0223 | 0.5973*** | 0.1709** | 0.3043** | 0.0955 |
| | (0.0351) | (0.0311) | (0.2068) | (0.0716) | (0.1178) | (0.0793) |
| Constant | −2.5626 | −1.4636 | −16.9842 | 3.2814 | 3.3624 | 2.7369 |
| | (1.3859) | (1.3851) | (7.1104) | (2.1236) | (5.9718) | (2.2524) |
| $R^2$/Pseudo $R^2$ | 0.08 | 0.07 | 0.21 | 0.59 | 0.27 | 0.51 |
| Observations | 2705 | 2705 | 3167 | 2705 | 2705 | 2705 |

*Note:* All regressions include player, position, team, season and competition fixed effects. Clustered robust standard errors at a player level are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

We carry out two permutation-based placebos on the xA effect to ask if this is due to random fluctuations in the data or other aspects of the study design (see Appendix 1). The observed relationship between postpartum and xA from these tests strengthen the argument that the negative result seen in Table 2 is not due to chance. In both cases, we modelled Xa in scenarios where the estimated effect is expected to be zero. First, we conducted a within-sample placebo, re-estimating the model (1000 times) with the postpartum variable randomly reshuffled. Across this placebo experiment, the true (observed) effect of fatherhood on Xa falls at the left tail of the distribution. Ninety-nine per cent of the tests return a higher $p$-value ($>0.004$), while 97% of the randomised tests return a $p$-value above the 5% significance threshold. Second, we collect (out-of-sample) data from a historical period and modelled Xa. Owing to data limitations on the accessibility of earlier data, this was a smaller sample and necessitated the specification of a reduced model ($N=494$). For the historical sample, 99% of the tests return a higher $p$-value than estimated with the reduced model in our actual sample ($>0.003$). Ninety-five per cent of the tests return a $p$-value above the 5% significance threshold.

Overfitting is a concern due to the high dimensionality associated with including the fixed effects. This could potentially lead to biased inferences. While our preferred specification includes a full set of fixed effects, the results remain robust when omitting competition and squad fixed effects (see Appendix 2 for a reduced model). Other identification challenges also arise, particularly the inclusion of minutes as a control. In the absence of any valid instrument (due to the recurring interdependence of performance measures), we estimate the model without this control, and the results remain consistent (see Appendix 3).

Other issues related to minutes or the opportunity to perform are owed consideration. Minute/play allocations also raise issues over the reliability of performance statistics, and checks on minutes played per match are a customary practice in this context (Butler et al. 2024); observations with low match minutes could drive the results. To address this, we applied various incremental minutes filters to assess the stability of the results with respect to minutes played (see Appendix 4 for an example of robust results for a 15-min minimum play threshold).

### 5.2 | Perinatal Effects

To consider if the correlations are attributable to the birth only, it is worthwhile to consider the perinatal period, a timeframe that captures anticipatory emotions and stressors leading up to birth and the postpartum period up to approximately 3 months. To address this, we adjusted the birth indicator to include various prenatal cut-offs. Table 3 present the results ranging from the inclusion of one up to four matches prior to the birth as a postpartum observation. These pre-birth inclusions correspond to approximately a typical month of football or 4-week period prior to the birth and the post-birth period, up to 3 months. The negative Xa effect holds when the first match prior to birth is included and weakens in significance when earlier matches are also included. We also identify negative work-rate correlations in pass totals and carries when incorporating the period leading up to birth. The concentration of these stronger statistical effects may cautiously suggest a relationship between paternity and performance that is attributable to the perinatal period.

### 5.3 | Expectancy News

It is possible to broadly examine information effects and ask if performance patterns alter when fathers become knowledgeable of pregnancy. This analysis of expectancy news rests on

**TABLE 3** | Perinatal performance.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Period** | ***t*−1** | ***t*−2** | ***t*−3** | ***t*−4** |
| NPxG | −0.0145 | −0.0093 | −0.0068 | −0.0121 |
| | (0.0096) | (0.0084) | (0.0086) | (0.0088) |
| Xa | −0.0212** | −0.0176* | −0.0156* | −0.0159* |
| | (0.0093) | (0.0097) | (0.0085) | (0.0089) |
| SoT | 0.0537 | 0.0331 | 0.0156 | −0.1020 |
| | (0.0793) | (0.0765) | (0.0743) | (0.0737) |
| CMP | −0.0469*** | −0.0416** | −0.0261 | −0.0320* |
| | (0.0174) | (0.0166) | (0.0164) | (0.0161) |
| Prog Passes | −0.0620** | −0.0547* | −0.0287 | −0.0446 |
| | (0.0311) | (0.0303) | (0.0302) | (0.0271) |
| Carries | −0.0464** | −0.0410** | −0.02632 | −0.0318* |
| | (0.0182) | (0.0188) | (0.0175) | (0.0172) |

*Note:* All regressions include player, position, team, season and competition fixed effects. Clustered robust standard errors at a player level are reported in parentheses.
***$p<0.01$.
**$p<0.05$.
*$p<0.1$.

two assumptions: that the birth is full term (~37–42 weeks) and that the information is communicated to expectant fathers in a timely manner. To investigate expectancy news, we infer a conception window, considering performances in the weeks prior, and 3 weeks after an estimated conception date. This strategy is followed to allow a general timing lag between conception and knowledge of the pregnancy. As there are unobservables, and we do not know the specifics of the birth relative to due dates (i.e., early or late birth), this is a less precise analysis. Following the primary model, our variable of interest is now *Expecting* and is similarly captured by an indicator variable. Table 4 shows no evidence that impending fatherhood impacts performance across all measures. We carried out sensitivity analysis around the 3-week window for the information to become known and found similar results to those presented in Table 4.

### 5.4 | Additional Checks

To strengthen our confidence in the study design and primary findings, we conducted a range of additional checks. These checks involved minor econometric adjustments such as altering the functional form of variables and modifying our clustering choices (e.g., using clusters in squad fixed effects). We also explored multidimensional fixed effects by incorporating team-by-season and player-by-season fixed effects. This was investigated to study seasonal variations across team style as players are often deployed in different positions over time (often due to managerial changes). These minor adjustments did not alter the primary results significantly, and the coefficients remained relatively stable.

We also manipulated the model given the other data available but did not uncover any significant results. For example, we examined the potential mediation of emotions by birth sex, given the existence of parental preferences in this domain (Mishra and Parasnis 2022). However, including birth sex in our regressions did not affect performance. Additionally, birth type (single vs. twin births) did not impact the results. We also carried out further analysis by constructing age categories (18–23, 23–30 and over 30) to form the basis of interactions as we suspected the maturity of the father may be a confounding issue. However, these checks do not yield any noteworthy results.

We also investigated the COVID-19 period in more detail and included a control for births between March 2020 and March 2021

**TABLE 4** | Performance post expectancy news.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | NPxG | xA | SoT | CMP | Prog Passes | Carries |
| Estimator | OLS FE | OLS FE | Poisson | Poisson | Poisson | Poisson |
| Expecting | −0.0006 | 0.0053 | −0.0805 | −0.0272 | −0.0611 | −0.0518 |
| | (0.0214) | (0.0186) | (0.0848) | (0.0301) | (0.0496) | (0.0319) |
| Minutes | 0.0015*** | 0.0018*** | 0.0110*** | 0.0192*** | 0.0173*** | 0.0193*** |
| | (0.0003) | (0.0003) | (0.0024) | (0.0008) | (0.0011) | (0.0008) |
| Age | −0.1531 | 0.3345 | −1.9221 | −0.3335 | −0.5867 | −0.5398 |
| | (0.3579) | (0.3301) | (1.6844) | (0.9968) | (1.2366) | (0.9840) |
| Age$^2$ | 0009 | −0.0060 | 0.0350 | 0.0058 | 0.0101 | 0.0093 |
| | (0.0061) | (0.0061) | (0.0274) | (0.0184) | (0.0232) | (0.0180) |
| Home | 0.0562*** | 0.0378*** | 0.3015*** | 0.0758*** | 0.1359*** | 0.0549** |
| | (0.0171) | (0.0128) | (0.0983) | (0.0221) | (0.0383) | (0.0229) |
| Off-season | −0.0497 | −0.3453*** | −19.889*** | 0.0228 | .-0.2152 | 0.6481** |
| | (0.1009) | (0.0542) | (0.708) | (0.2792) | (0.5176) | (0.1446) |
| First-time father | −0.1515 | 0.4268*** | −18.4533*** | 0.1137 | 0.7039 | −0.2420 |
| | (0.1688) | (0.1274) | (1.4509) | (0.3563) | (0.4467) | (0.3505) |
| Constant | 3.0455 | −4.8002 | −4.997 | 6.3302 | −5.1140 | 8.5699 |
| | (5.2152) | (4.4442) | (27.0447) | (13.7924) | (16.8791) | (13.7581) |
| $R^2$/Pseudo $R^2$ | 0.06 | 0.07 | 0.23 | 0.62 | 0.30 | 0.53 |
| Observations | 1154 | 1154 | 1317 | 1154 | 1154 | 1154 |

*Note:* All regressions include player, position, team, season and competition fixed effects. Clustered robust standard errors at a player level are reported in parentheses.
***$p < 0.01$.
**$p < 0.05$.
*$p < 0.1$.

in our models. This period witnessed exceptional restrictions imposed on access of hospitals, contacts with family, friends and relatives. The postpartum statistical effects hold for this check, and we note one minor change to the perinatal effects (progressive passes in $t-1$ falls from a 5% level of significance to a 10% level).

We could cautiously explore additional effects of fatherhood with a clear hypothesis regarding expected performance. Research across species indicates that aggression levels decrease with the onset of fatherhood (see Horrell, Acosta, and Saltzman 2021). Fathers exhibit lower testosterone levels than non-fathers (Grebe et al. 2019). If there are (psycho)biological spillovers associated with fatherhood, we hypothesise a decrease in aggression during a match postpartum. To investigate aggression responses, we sourced additional event data on tackling to proxy aggressive behaviour and modelled this with Equation (1). We find no evidence to support an aggression reduction hypothesis postpartum (see Appendix 5).

As many of our findings are based on modelling count data, we considered negative binomial regression as a natural alternative to Poisson (see Appendix 6). This allowed us to relax the mean–variance equality assumption and consider the impact of overdispersion. It offers a check on the stability of the results as one may hold econometric concerns if Poisson is negatively biased. The results are qualitatively similar to the Poisson estimations (without the inclusion of squad fixed effects). While the negative binomial model provides extra flexibility to handle overdispersion in the count data, we did not favour this approach over Poisson due to challenges in achieving full model convergence and the frequent need to omit squad fixed effects.

## 6 | Conclusion

Paternity profoundly effects the lives of men, often more than anticipated. We make progress by asking if the wide-ranging physical, psychological and cognitive changes accompanying fatherhood affect workplace performance. We do this in a competitive workplace setting where productivity is precisely monitored and measured with advanced statistics. The results show negative correlations between specific aspects of performance and paternity. We observe a correlation between fatherhood and reduced creative or collaborative behaviour (expected assists). Statistical associations are also present in the perinatal period, where we observe negative effects across creativity measures and work-rate proxies. We find no evidence that news of a pregnancy impacts player performance. We also follow various lines of enquiry as additional checks related to birth sex, birth type (single/twin), COVID restrictions and player aggression. These findings contribute academically by providing evidence on productivity effects in the absence of paternity leave uptake. More broadly, the findings add to an interdisciplinary literature on the consequences of fatherhood.

What can be learned from the results? Within the setting, the findings have implications for the strategic deployment of talent; management ought to carefully consider selection during the paternity phase. It is crucial to cautiously consider the generalisability of the findings as professional football has a unique and highly competitive labour market. However, in broad terms, observing adverse performance effects in a setting with ‘superstar wages’ raises concerns for workers in other high-pressure labour market contexts where there is low or no uptake of paternity leave. While competitions for career progression are ubiquitous, very few labour markets receive the equivalent remuneration of elite professional footballers to buffer from the negative effects of lifestyle changes. Furthermore, the findings could raise concerns for pressurised contexts where there can be a greater emphasis on individualised rather than team roles (e.g., healthcare settings). The findings, especially concerning perinatal effects, can inform paternity policies. If negative performance effects are observed prior to birth, it may be worthwhile to design policies to facilitate employees to take leave across paternity phases rather than solely after the birth.

We recognise the limitations of this work. First, conception, pregnancy and childbirth are processes fraught with challenges and medical issues. We have no knowledge of pregnancy or birth struggles in our context, treating the pregnancy and the birth as a homogeneous event. Emotional shocks could be mediated by the pregnancy or birth experience. Second, if data become available on a random set of non-fathers' (or a clear distinction between fathers and non-father can be made), ideally with larger sample sizes, quasi-experimental techniques could offer greater insights to causality. If one is to meet these data requirements in a sporting setting, it may be desirable to study this question in an individual sporting context to limit concerns regarding any potential spill-over effects. Finally, the negative effects clearly raise concerns for the career trajectories of female athletes, who carry the most profound costs of childbirth and could incur far greater performance penalties—this is a question for future research as data limitations prevent a comparison in football presently, but it may be possible to conduct a study for other sports.


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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.

### Endnotes

[1] The adjustment observed in our setting is that, at times, players can train/travel independently and connect with their club just prior to performing their match day duties.

[2] Past research has shown that individual-specific events in this context do not extend to team output (Butler et al. 2024).

[3] Wicker, Hallmann, and Breuer (2012) is an exception.

[4] Several observations were collected retrospectively, meaning that fatherhood is observed at a later stage. We visited historical social media posts to verify these disclosures.

[5]This is not an exact match as several fathers had multiple children born over the period. Our initial sample covered 130 births, but in 10 cases we could not identify the exact date of birth.

[6]xG and xA measures are derived from historical data. To illustrate, for xA, OPTA models evaluate how often passes of similar types and from similar positions have resulted in goals controlling for the angle and distance of the pass, pass type (e.g., cross, through ball and short pass), pass location on the pitch, defensive positioning and match context (e.g., open play or set piece).

[7]Shots on target are recorded for all competitions, while the advanced performance statistics such as xG are unavailable for specific domestic cups.

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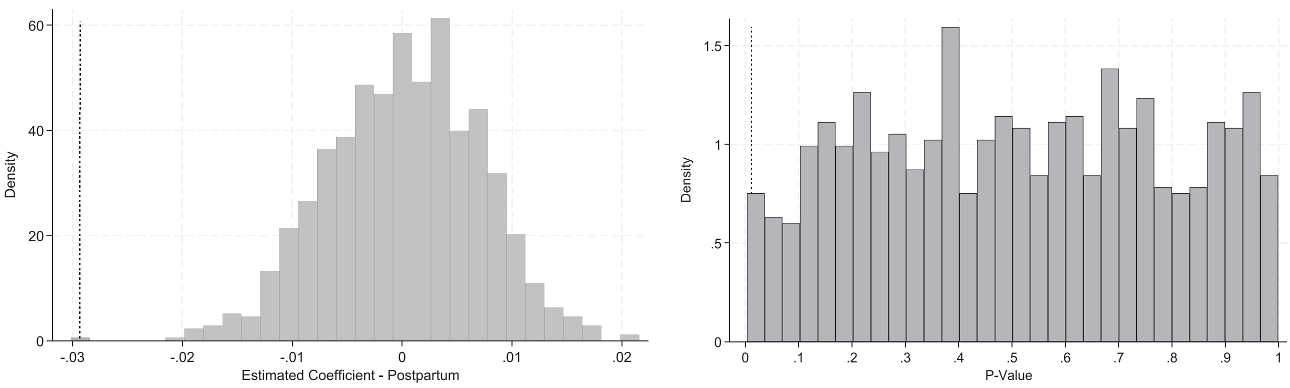
**Appendix 1**

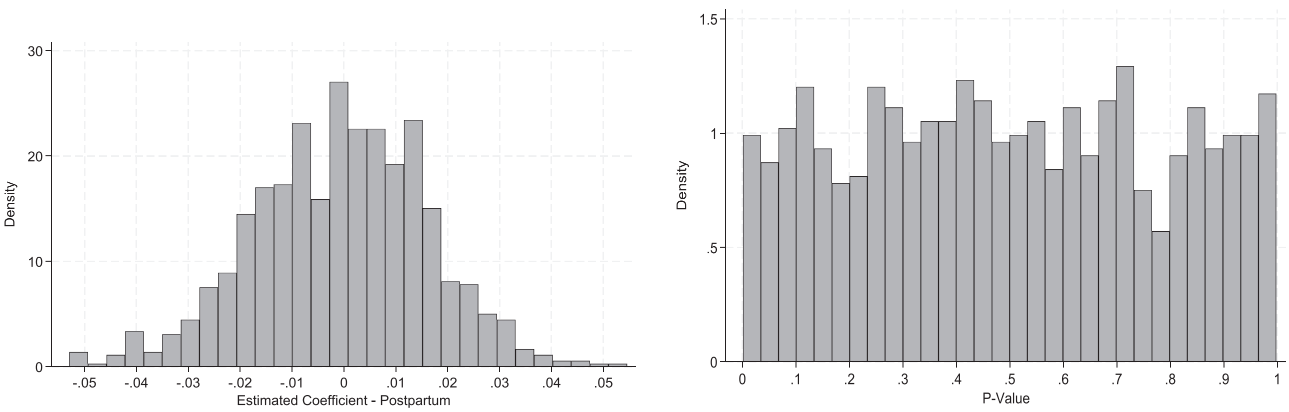
**Placebo Tests**

(a) Within-Sample Permutation – Coefficient (b) Within-Sample Permutation – P-Value




Panel (a) represents the estimated coefficients from the regression following a random reshuffling of the postpartum variable. Panel (b) plots the corresponding p-values from the reassignment. The dashed black line represents the postpartum estimates and p-value displayed in table 2.

(c) Out-of-Sample Permutation – Coefficient (d) Out-of-Sample Permutation – P-Value




Panel (c) represents the estimated coefficients for a reduced regression model for an out-of-sample dataset (N = 494) following 1,000 random shuffles of the postpartum variables. The reduced model includes player, position, and competition fixed effects. Panel (d) plots the corresponding p-values from the reassignment.

### Appendix 2

**Postpartum Performance: Reduced Model**

| Estimator | (1) NPxG OLS FE | (2) xA OLS FE | (3) SoT Poisson | (4) CMP Poisson | (5) Prog Passes Poisson | (6) Carries Poisson |
|---|---|---|---|---|---|---|
| Postpartum | −0.0152 | −0.0252** | 0.0710 | 0.0103 | −0.0186 | 0.0101 |
| | (0.0129) | (0.0086) | (0.0652) | (0.0213) | (0.0379) | (0.0202) |
| Minutes | 0.0021*** | 0.0015*** | 0.0176*** | 0.0192*** | 0.0197*** | 0.0191*** |
| | (0.0002) | (0.0001) | (0.0012) | (0.0005) | (0.0011) | (0.0006) |
| Age | 0.0213* | 0.0997 | 1.0104* | 0.0400 | −0.0769 | 0.0524 |
| | (0.1162) | (0.0761) | (0.4948) | (0.1450) | (0.3833) | (0.1586) |
| Age$^2$ | −0.0037** | −0.0014 | −0.0187*** | −0.0020 | 0.0004 | −0.0020 |
| | (0.0017) | (0.0011) | (0.0064) | (0.0027) | (0.0063) | (0.0028) |
| Home | 0.0154 | 0.0175** | 0.1931*** | 0.0566*** | 0.1614*** | 0.0620*** |
| | (0.0095) | (0.0073) | (0.0482) | (0.0146) | (0.0266) | (0.0160) |
| Off-season | 0.0190 | −0.0386 | 0.0637 | −0.0793** | −0.0892 | −0.0766** |
| | (0.0234) | (0.0320) | (0.1801) | (0.0337) | (0.0926) | (0.0447) |
| First-time father | 0.092*** | 0.0274 | 0.4833*** | 0.1511** | 0.2901*** | 0.0943 |
| | (0.0323) | (0.0243) | (0.1606) | (0.0720) | (0.1016) | (0.0734) |
| Constant | −3.1489 | −1.6660 | −18.3143 | 2.3293 | 0.8515 | 1.8404 |
| | (1.8533) | (1.2385) | (6.1489) | (2.1412) | (5.8324) | (2.3445) |
| $R^2$/Pseudo $R^2$ | 0.05 | 0.05 | 0.20 | 0.59 | 0.26 | 0.50 |
| Observations | 2705 | 2705 | 3167 | 2705 | 2705 | 2705 |

*Note:* Regressions include player, position and season fixed effects only. Clustered robust standard errors at a player level are reported in parentheses.
*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.

### Appendix 3

**Postpartum Performance: Minutes Control Exclusion**

| Estimator | (1) NPxG OLS FE | (2) xA OLS FE | (3) SoT Poisson | (4) CMP Poisson | (5) Prog Passes Poisson | (6) Carries Poisson |
|---|---|---|---|---|---|---|
| Postpartum | −0.0189 | −0.0294*** | 0.1056 | 0.0018 | −0.0347 | −0.0024 |
| | (0.0143) | (0.0107) | (0.0787) | (0.0274) | (0.0389) | (0.0243) |
| Age | 0.2281** | 0.1379 | 1.2852** | 0.2726 | −0.1236 | 0.3545 |
| | (0.0988) | (0.0935) | (0.5337) | (0.1951) | (0.4199) | (0.2217) |
| Age$^2$ | −0.0037** | −0.0020 | −0.0229*** | −0.0054 | 0.0023 | −0.0066* |
| | (0.0015) | (0.0014) | (0.0081) | (0.0034) | (0.0067) | (0.0038) |
| Home | 0.0150 | 0.0205*** | 0.1538*** | 0.0490*** | 0.1622*** | 0.0568*** |
| | (0.0092) | (0.0073) | (0.0526) | (0.0168) | (0.0285) | (0.0185) |
| Off-season | 0.0233 | −0.0357 | 0.2153 | 0.0579 | −0.0248 | 0.0264 |
| | (0.0309) | (0.0383) | (0.2259) | (0.0623) | (0.0936) | (0.0795) |

(Continues)

(Continued)

| Estimator | (1) NPxG OLS FE | (2) xA OLS FE | (3) SoT Poisson | (4) CMP Poisson | (5) Prog Passes Poisson | (6) Carries Poisson |
|---|---|---|---|---|---|---|
| First-time father | 0.0845* | 0.0206 | 0.6112*** | 0.1884*** | 0.3477*** | 0.1067 |
| | (0.0428) | (0.0343) | (0.2232) | (0.0671) | (0.0979) | (0.0785) |
| Constant | −3.3855** | −2.1464 | −22.6195*** | 0.5814 | 0.1053 | −0.9764 |
| | (1.6133) | (1.5284) | (8.4841) | (2.8589) | (6.2584) | (3.200) |
| $R^2$/Pseudo $R^2$ | 0.03 | 0.04 | 0.18 | 0.41 | 0.19 | 0.31 |
| Observations | 2705 | 2705 | 3167 | 2705 | 2705 | 2705 |

*Note:* All regressions include player, position, team, season and competition fixed effects. Clustered robust standard errors at a player level are reported in parentheses.
*** $p<0.01$.
** $p<0.05$.
* $p<0.1$.

**Appendix 4**

**Postpartum Performance: Minutes Filter**

| Estimator | (1) NPxG OLS FE | (2) xA OLS FE | (3) SoT Poisson | (4) CMP Poisson | (5) Prog Passes Poisson | (6) Carries Poisson |
|---|---|---|---|---|---|---|
| Postpartum | −0.0211 | −0.0324*** | 0.0986 | −0.0018 | −0.0337 | −0.0066 |
| | (0.0140) | (0.0104) | (0.0747) | (0.0193) | (0.0347) | (0.0178) |
| Minutes | 0.0023*** | 0.0015*** | 0.0158*** | 0.0171*** | 0.0178*** | 0.0169*** |
| | (0.0003) | (0.0002) | (0.0013) | (0.0006) | (0.0012) | (0.0006) |
| Age | 0.1568* | 0.0970 | 0.7924* | −0.0570 | −0.2737 | −0.0557 |
| | (0.0846) | (0.0945) | (0.4699) | (0.1391) | (0.4167) | (0.1499) |
| Age$^2$ | −0.0023* | −0.0013 | −0.0143* | 0.0001 | 0.0041 | 0.0000 |
| | (0.0013) | (0.0014) | (0.0077) | (0.0026) | (0.0067) | (0.0027) |
| Home | 0.0164* | 0.0213*** | 0.1705*** | 0.0531** | 0.1687*** | 0.0609*** |
| | (0.0098) | (0.0078) | (0.0504) | (0.0151) | (0.0276) | (0.0165) |
| Off-season | 0.0105 | −0.0451 | 0.0759 | −0.0721 | −0.1324 | −0.1095* |
| | (0.0273) | (0.0387) | (0.2185) | (0.0448) | (0.1354) | (0.0618) |
| First-time father | 0.0962*** | 0.0222 | 0.5911*** | 0.1629** | 0.2800** | 0.0868 |
| | (0.0350) | (0.0329) | (0.2069) | (0.0695) | (0.1243) | (0.0785) |
| Constant | −2.6434* | −1.6986 | −16.8649** | 3.7543* | 4.1370 | 3.3210 |
| | (1.4118) | (1.5438) | (7.2129) | (2.0002) | (6.0792) | (2.1313) |
| $R^2$/Pseudo $R^2$ | 0.07 | 0.06 | 0.21 | 0.43 | 0.24 | 0.45 |
| Observations | 2531 | 2531 | 2975 | 2531 | 2531 | 2531 |

*Note:* All regressions include player, position, team, season and competition fixed effects. Clustered robust standard errors at a player level are reported in parentheses.
*** $p<0.01$.
** $p<0.05$.
* $p<0.1$.

## Appendix 5

### Postpartum Tackling

| | (1) | (2) | (3) |
|---|---|---|---|
| | Full sample | Minutes filter | Ex minutes |
| Estimator | Poisson | Poisson | Poisson |
| Postpartum | −0.0207 | −0.0280 | −0.0370 |
| | (0.0453) | (0.0450) | (0.0468) |
| Minutes | 0.0198*** | 0.0181*** | — |
| | (0.0011) | (0.0013) | — |
| Age | 0.8307** | 0.9017** | 1.2988*** |
| | (0.3854) | (0.3849) | (0.4244) |
| $Age^2$ | −0.0148** | −0.0158** | −0.0220*** |
| | (0.0063) | (0.0062) | (0.0069) |
| Home | 0.0097 | 0.0075 | 0.0026 |
| | (0.0424) | (0.0432) | (0.0412) |
| Off-season | 0.0367 | 0.0779 | 0.1685** |
| | (0.0586) | (0.0614) | (0.0797) |
| First-time father | 0.0897 | 0.0841 | 0.1189 |
| | (0.0999) | (0.0927) | (0.1384) |
| Constant | −13.5378** | −14.5767** | −19.1871*** |
| | (5.9087) | (5.9276) | (6.5835) |
| $R^2$/Pseudo $R^2$ | 0.16 | 0.14 | 0.11 |
| Observations | 2705 | 2531 | 2705 |

*Note*: All regressions include player, position, team, season and competition fixed effects. Clustered robust standard errors at a player level are reported in parentheses.
*** p < 0.01,
** p < 0.05.
* $p < 0.1$.

## Appendix 6

### Postpartum Performance: Negative Binomial Regression

| Performance measure | (1) SoT | (2) CMP | (3) Prog Passes | (4) Carries | (5) Tackles |
|---|---|---|---|---|---|
| Postpartum | 0.1005 | 0.0171 | −0.0182 | 0.0077 | −0.0201 |
| | (0.0757) | (0.200) | (0.0398) | (0.0182) | (0.0436) |
| Minutes | 0.0178*** | 0.0208*** | 0.0201*** | 0205*** | 0.0198*** |
| | (0.0011) | (0.0006) | (0.0010) | (0.0006) | (0.0011) |
| Age | 0.7855* | −0.1480 | −0.0210 | −0.0818 | 0.8340** |
| | (0.4517) | (0.1568) | (0.3727) | (0.1607) | (0.3849) |
| $Age^2$ | −0.0143* | 0.0012 | −0.0005 | 0.0003 | −0.0148** |
| | (0.0073) | (0030) | (0.0062) | (0.0028) | (0.0063) |
| Home | 0.1756*** | 0.0637*** | 0.1587*** | 0.0720*** | 0.0110 |
| | (0.0492) | (0.0142) | (0.0271) | (0.0150) | (0.0422) |
| Off-season | 0.0749 | −0.0847* | −0.0930 | −0.0905 | 0.0355 |
| | (0.2132) | (0.0479) | (0.0900) | (0.0622) | (0.0587) |

| Performance measure | (1) SoT | (2) CMP | (3) Prog Passes | (4) Carries | (5) Tackles |
|---|---|---|---|---|---|
| First-time father | 0.5973 | 0.1589** | 0.3153*** | 0.0812 | 0.0909 |
| | (0.2068) | (0.0780) | (0.1055) | (0.0815) | (0.0994) |
| Constant | −16.9853** | 4.4515 | −0.0350 | 3.4559 | −13.3989** |
| | (7.1104) | (2.2406) | (5.5843) | (2.3785) | (5.9485) |
| Pseudo $R^2$ | 0.19 | 0.18 | 0.14 | 0.16 | 0.13 |
| Observations | 3167 | 2705 | 2705 | 2705 | 2705 |
| Full set fixed effects | Yes | Yes | No | Yes | Yes |

*Note:* Clustered robust standard errors at a player level are reported in parentheses.

*** $p < 0.01$.
** $p < 0.05$.
* $p < 0.1$.