Are Workers Rewarded for Inconsistent Performance?

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Following Lazear (1995) a small body of personnel economics literature has considered whether workers who demonstrate greater performance inconsistency than comparable workers of similar average productivity are rewarded more highly. Lazear conjectured that there would be an 'upside potential to risky workers' so inconsistent performers would be more highly rewarded in salary due to their capability of providing extraordinarily high productivity albeit on a few occasions. Firms would consider this unusually high performance to be an option value and would reward workers more highly to reflect this.

Empirical testing for upside potential of risky workers is very difficult in most industries as individual workers' mean and variance of productivity cannot be cleanly derived. Survey data are unhelpful in this context and results from nano-econometric firm-level data may not easily generalise. Instead, sports data offer good opportunities to study the relationship between worker salary and variations in productivity since we can extract performance data at individual worker (player) level for many different competing firms (clubs) over time (seasons) into a large data set. Bollinger and Hotchkiss (2003) tested for a relationship between player salaries and ex ante expected player productivity using a sample of young early career players in Major League Baseball. They found evidence in support of Lazear's hypothesis. Young players with high expected variations in productivity were indeed paid more highly than comparable players with lower variance in productivity.

Recently, Deutscher et al. (2017) and Deutscher and Büschemann (2016) have studied the relationship between player salaries and performance variation in, respectively, National Basketball Association and German Bundesliga soccer. Their findings are intriguing. For basketball, over the 2007/08 to 2010/11 seasons, the authors found that players were more highly rewarded for consistency in performance rather than inconsistency. Two measures of performance were used, one for points scoring and another for ball acquisition from opponents. Consistency in both dimensions was measured across games within seasons and was shown to be rewarded by higher salary. The authors attributed this to diminishing marginal productivity in a team production function. More consistent players produced more expected points for their teams and were rewarded with higher salaries.

However, the results of Deutscher and Büschemann (2016) for Bundesliga soccer point in a different direction. The authors lacked data on both direct salaries and player performances so were compelled to use proxy measures. The salary proxy was a player valuation measure created by experts at *Kicker* sports magazine. Deutscher and Büschemann (2016) argued that *Kicker* valuations were closely correlated with a subset of available salaries for Bundesliga players. The performance proxy was a set of subjective grade scores recorded by *Kicker* magazine ranging at match level from 1 (excellent) to 6 (very poor). The data set had 845 player-season observations over five seasons from 2005/06 to 2009/10. Deutscher and Büschemann found, contrary to the basketball study but in accord with Lazear's upside

potential of risky workers, that higher variation in player ratings was positively correlated with player valuation (salaries). The contrasting results could be due to differing technology of the sports or the use of proxy rather than objective measures in the Bundesliga study. The authors used a single performance proxy measure for all players regardless of field position in the team. It would appear useful to attempt to model the salary-performance consistency relationship using good data from another league and that is what motivates the present paper. Of particular interest is the question of heterogeneity in effects of performance variation on salary. Some players might be rewarded for consistency of performances (defenders and goalkeepers) while others might be rewarded for performance variation as their roles require creativity which in turn generates inconsistency. Such features of heterogeneity may well be important in a wider complex organisation setting. Our data set facilitates testing of heterogeneous effects of performance on salary.

Previous literature has largely focused on Mincer's wage equation to model salary outcomes in sports, where age, experience, position, national team selection, team effects, country of origin, and performance have been used to determine salaries. Bryson et al. (2013) find that age, height, goals per game, international appearances, and two footedness increase salaries. In general, offensive players earn more. Extraordinarily talented football players i.e. superstars in the Italian Serie A have higher salaries (Lucifora and Simmons 2003) and according to Bryson et al. (2014), migrant players in the Serie A earn more, which is partly explained by superstar effects.

Our study takes actual salary data (not a proxy measure of 'player value') and actual performance data (not journalists' assessments) from Italian Serie A soccer. A companion paper investigates the relationship between player salaries and seasonal (not match) performance measures broken down by contract type i.e. players who sign new contracts with their clubs and players who switch clubs (employers). Here, we take match-level player performance data from four seasons from 2009/10 to 2012/13. The novel performance data were purchased from Panini Digital, which supplies these and other data to Italian clubs. Available data comprise the following measures as defined by the company rather than the authors:

- Minutes played
- Balls played
- Balls played in the opposition half
- Successful passes
- Useful short passes in the opposition half
- Goalkeeper saves
- Goalkeeper catches
- Recovered balls in the defensive area
- Useful through passes
- Useful long passes
- Useful dribbles
- Assists to goals
- Goal chances
- Shots on goal
- Whether starter or substitute player

All of the above measures yielded statistically significant coefficients in a model of log salaries. Here, we derive seasonal mean and coefficients of variation for each of the performance metrics for each player subject to a minimum game time of 15 minutes in a given match and a minimum number of appearances in a season set at 5. These restrictions reduce the scope for low performance values to distort the data due to low amounts of game time. Deutscher and Büschemann have the same appearance restriction but a tougher minutes constraint set at 30 by the *Kicker* reporters. We have a rich array of performance measures and these measures cover all field positions: goalkeeper, defenders, midfielders and forwards. Previous soccer salary studies have tended to use goals and assists, which primarily relate to forwards and some attacking midfield players and do not cover functions of goalkeepers and defensive players.

Our analysis proceeds in two stages. In the first stage, we model team-season points as a function of team productivity measures aggregated from the player seasonal performance measures, weighted by game times. This demonstrates which productivity measures are more or less important in generating team wins and points and reveals which performance metrics ought to be more highly rewarded in the player labour market. We focus on intermediate inputs, such as successfully completed passes, rather than goals and assists to goals as those must generate team points as a tautology.

In the second stage, we model player salaries as a function of player productivity measures (mean and coefficient of variation). The set of players in this second stage need not correspond to the players representing teams in the first stage. That is partly because three teams are relegated from Serie A in each season and we do not observe Serie B salaries. Also, some players may move to other leagues or may retire. Our salary data come from *Gazzetta dello Sport* and are published in September of each year, from 2010 through to 2013. They represent gross basic pay and exclude performance-related and other bonuses. Salary levels at time *t* are regressed on performance levels and associated coefficient of variation from season *t*-1, where these performances may come from a different club if the player has switched teams. We can assess player salaries by different contract types:

- Within an existing multi-year contract, where salary was determined prior to revealed performance in the previous season
- New contract for a player who switches teams
- New contract for a player staying with current team

Our salary model for estimation is:

$logSALARY_t = \alpha_0 + \alpha_1 MEANPROD_{t-1} + \alpha_2 CVPROD_{t-1} + \alpha_3 AGE_t + \alpha_4 AGE_t^2 + \alpha_5 CAREER\ GAMES_t + \alpha_5 NATIONAL\ TEAM_t$ + Country of origin dummies + Position dummies + Team dummies + error

Variable	Obs	Mean	Std. Dev.	Min	Max
LN(Salary)	985	7.343	0.765	5.298	9.473
MEANPROD	985	17.724	1.552	11.733	21.95
CVPROD	985	3.02	1.042	0.212	8.212
AGE	985	26.889	3.876	18	38
AGE^2	985	738.043	209.138	324	1444
CAREER GAMES	985	102.658	96.49	0	536
NATIONAL TEAM	985	0.737	0.44	0	1
CLUB ATTENDANCE	817	28.112	13.431	9.649	59.731
GOALKEEPER	985	0.07	0.255	0	1
DEFENDER	985	0.343	0.475	0	1
MIDFIELD	985	0.4	0.49	0	1
FORWARD	985	0.187	0.39	0	1

Table 1: Summary statistics

This model is estimated by OLS with and without fixed effects and also by quantile regressions. *MEANPROD* is average level of performance of a player in the previous season while *CVPROD* is the corresponding coefficient of variation. *AGE* is the player's age as at September 1 in a given year. *CAREER GAMES* is number of games played in Serie A over the player's career. *NATIONAL TEAM* is a dummy variable denoting whether the player had appeared for his national team in the previous season. In our preliminary estimation, we use *IVG* as a composite performance metric compiled by experts at Panini Digital comprising weights on the key performance measures noted above. Both Montanari et al. (2008) and Fumarco and Rossi (2018) use IVG in their studies.

Our focus is on the sign and size of α_2. The positive sign on this coefficient in the estimates indicates that performance volatility increases player salary in Italian soccer, thereby supporting Lazear's hypothesis of upside potential of risky workers. A one-unit increase in the coefficient of variation of aggregated performance increases player base salary by 14.2%. The coefficients for our control variables all have expected signs and are significant. The volatility effects are persistent in quantile regressions.

Of central interest to our paper is the volatility of specific, observable, performance metrics that may have effects on player salaries. Our initial results indicate that the salary effects of performance inconsistency are not unidimensional, for some dimensions of performance, i.e., successful passes, inconsistency leads to salary reductions. Moreover, it the average number of tackles has an overall negative effect on salaries because tackles are desperate measures on the field and most likely show that the player was in the wrong position to begin with. Hence, teams value inconsistency in some dimensions but not in all.

LN(Salary)	OLS	FE
MEANPROD	0.136***	0.104***
CVPROD	0.133***	0.142***
AGE	0.371***	0.421***
AGE^2	-0.007***	-0.008***
CAREERGAMES	0.002***	0.002***
NATIONAL TEAM	0.275***	0.170***
CLUB ATTENDANCE	0.027***	-
DEFENDER	0.418***	0.451***
MIDFIELD	0.414***	0.460***
FORWARD	0.589***	0.629***
Constant	-1.460*	-1.087
Observations	817	979
R-squared	0.542	0.606
Season FE	-	YES
Nationality FE	-	YES
Team FE	-	YES
Adj. R-squared	0.536	0.589

*** p<0.01, ** p<0.05, * p<0.1

Table 2: Regression results (OLS with and without fixed effects)

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