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Pay and performance in Italian football

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Introduction

This paper poses a fundamental research question of importance for football team executives: which player performance measures affect player salaries? Put another way, what are football clubs really paying for when they agree contracts with their players? Which skills are most highly valued? Answers to these questions can help football clubs improve their performances. Similarly, football players' agents can improve bargaining outcomes if they know what clubs are really willing to pay for in terms of performance attributes. For fans, it is helpful to dissuade a popular judgement that player salaries are 'crazy', or more precisely, randomly determined.

We show that in the top division of Italian football, teams pay higher salaries for *shots on target*. We explore some possible reasons why this occurs. Our analysis is based on good panel data on pay and individual productivity in Italian football; these data are more precise and detailed than in other studies of European football (Franck & Nüesch, 2012; Frick, 2007; Lucifora & Simmons, 2003). We have 14 seasons of data and detailed performance statistics for players in Italy's Serie A at seasonal level covering 2000/01 to 2013/14. As a novel feature of this paper, we are able to isolate productivity effects on pay for *players who sign new contracts.*

Previous papers on salary determination in European football have relied on market valuation measures as salary proxies e.g. *Kicker* valuations (Frick, 2007, Franck & Nüesch, 2012) or *Transfermarkt* valuations (Bryson, Frick & Simmons, 2012). These measures have been criticised, e.g. they conflate *salary* with *potential transfer fee.* The 'wisdom of the crowd' assumption is criticised by Peeters (2016) but is also forcefully defended by Frick (2016). Even if *Transfermarkt* valuations are good proxies for player salaries, as argued by Frick (2016), we maintain that if direct salary measures are available then these should be used when estimating wage equations.

Previous European player salary models have used very basic performance measures, notably goals and assists (Lucifora & Simmons, 2003). Franck & Nüesch (2012) introduced a larger set of performance measures in their evaluation of superstar effects in the German Bundesliga. In addition to goals and assists, their measures included shots on target, shots off target, clearances, blocks & interceptions (as one category), saves to shots ratio for goalkeepers and percentage of successful crosses.

One paper that uses direct salary information from Italy's Serie A together with an aggregate, composite measure of player productivity (IVG, to be explained below) is Montanari et al. (2008). They use a five year moving average player performance, measured by IVG, and find this to be positively related to player salary. Other significant determinants of player salary were team points in previous season and number of seasons of tenure out of previous five seasons as a measure of playing experience. However, their analysis is limited to just two seasons with a modest sample size of 326.

In this paper, we apply a rich panel data set over a long period with detailed salary and performance information. Since we know details of player contracts (date signed and date of expiry), we are able to model player salaries at the point of signing a new contract. This ensures that previous performance and current salary are properly aligned. If all data are used then the investigator runs the risk that salary, pre-determined at t-n under a multiyear contract, is inappropriately regressed on performance at time t leading to biased estimates of the pay-performance relationship. This is a further limitation of the earlier Serie A salary study of Montanari et al. (2008).

Labour Market Context

Unlike North American sports labour markets, where various restrictions apply, the footballers' labour market is in principle competitive. Players are, in theory, globally mobile. Following Szymanski (2009), there no barriers to player movement within the European Union post-Bosman ruling, player unions have a minor role and performance is fully observable. In this setting, pay should equal marginal revenue product.

Nevertheless, some restrictions on movement remain. Immigration controls and work permits apply to non-EU players attempting to join clubs in the European Union. EU countries vary in their applications of immigration policy towards footballers. In Italy, quotas have been imposed on club hiring of non EU players since 2003/04- could hire just one non EU player and this is conditional on replacement of an existing non EU player. Nevertheless, several non-EU players do get hired in Italy's Serie A. There were 166 non-EU players in Serie A in 2006/07. Moreover, players have preferences e.g. there are currently few English players contracted outside England. Some Italian players prefer to remain in Italy or even in their native region (Bryson et al., 2014).

There are 20 clubs in Italy's Serie A with 25 to 30 first team players in a typical club's squad, making for a somewhat 'thin' market in which search frictions could generate labour market imperfections as teams and players attempt to find optimal matches (Leeds & Kowaleski, 2001). In practice, teams are unlikely to go beyond 30 first team players as a larger squad could simply result in disruption as unsettled 'benchwarmers' become aggrieved at lack of playing time. Surplus players tend to be made available 'on loan' to other clubs, not necessarily in Italy, or transferred out. Financial pressures in Italy have led to a greater reliance on loaned players especially for smaller clubs as long-term contracts are inherently risky.

Given a willingness to move, a player's wage is determined by a bilateral bargain between players' agent and clubs. Following Solow & Krautmann (2011) and assuming for convenience that the team and player have equal bargaining power parameters, then solving the Nash bargaining problem involves finding the value of salary offer that maximizes the symmetric product of each party's gain over its outside option.

In recent years, the financial fortunes of Italian clubs have worsened and there is currently a high dependence on sales of broadcast rights (Boeri & Severgnini, 2014). Gate attendances and receipts fell during our sample period, reflecting shifting tastes against football. Boeri & Severgnini (2014) highlight the role of hooliganism, episodes of which led to some teams being forced to play behind closed doors, Scandals, including the *Calciopoli* corruption case may also have induced disillusionment of fans with Italian football (Boeri & Severgnini, 2011; Buraimo et al. 2016). So there were negative shocks to club revenues in Italy, in contrast to England, France, Germany and Spain, and these shocks created downward pressure on player salaries as marginal revenue products declined.

Salary and Performance Data

Gazzetta dello Sport has published detailed basic salary figures for every Serie A club on a consistent basis each September since 2008. Before 2008, salary data were available on a similar basis compiled from Italian newspaper and magazine sources by Rossi (20011). Close inspection shows that these sources generate a consistent series across time. Bryson, Rossi & Simmons (2014) used Italian salary and performance data to consider migration and superstar effects on pay but that paper did not consider pay at point of signing a new contract. Here, we can apply contract data to ascertain time of signing a new contract. Until recently Italy was the only European country to offer publicly available salary data for footballers. From 2014, http://fussball-geld.de is a new source of player salaries for the Bundesliga.

Length of contract runs from one to three years; there are some five year contracts but these are rare. A typical salary profile is uniform over the life of a contract. Our salary data are base salaries, net of tax. Signing and loyalty bonuses and payments for appearances and team performance targets are not revealed. A newly signed contracts means renewal, first contract with current club or a transfer from another club. The majority of cases are renewals. As noted above, using all player-season observations has the problem that salary (t-n) is a function of performance (t). Pay-performance relationships cannot then be identified. In this respect, we follow the approach taken in salary models of Major League Baseball and National Basketball Association. From descriptive data we observe a salary ranking by team position: Forwards, Midfield, Defender, Goalkeepers, as shown by Frick (2007, 2011).

Contracts may include a *buyout fee* clause where a club that wishes to hire a player who is under contract at another club has to at least match the buyout fee to trigger permission to open contract negotiations with this player. Most contracts specify several contingency clauses e.g. appearance bonus after N appearances, team performance bonuses, international appearance bonus and a win bonus for each game won. Bonuses tend to be more at team level than individual level to avoid excessively selfish behaviour by players in meeting performance targets.

Player performance data were purchased from the official data provide of Serie A, Panini Digital (www.paninidigital.com), which provides statistical support to Italian teams and media. Aggregate and detailed performance data were available from 2000/01 to 2013/14 at seasonal level by player.

The aggregate measure of player performance given to us is IVG. This is an index of general evaluation and is a concise and objective measurement of a player's performance based on statistics IVG figures are available for club managers and journalists to use in their player evaluations for the purposes of player assessment and journalistic match reporting respectively. These figures circulate through the Italian football industry and are used in player contract negotiations. IVG is a continuous variable (mean 18.2; s.d. 1.47) with variation across players and teams. The measure is only available to us for players who complete 1000 minutes in a season. This restriction is reasonable since it takes out fringe players who create extra noise in the data. It is common in North American studies to specify minimum appearances (plate appearances in baseball, e.g. Bodvarsson et al. 2014) or game time (minutes played in basketball: Simmons & Berri, 2011). We only use the aggregate IVG measure to evaluate team productivity since we require a metric for team-mate productivity so as to introduce productivity spillovers into our salary model (Arcidiacono et al, 2016; Idson & Kahane, 2000; Simmons & Berri, 2011).

At player level, our research question requires that we have data on individual performance metrics and our source does supply these. There are numerous measures available and Table 1 reports descriptive statistics for performance metrics per minute played broken down by position. Outfield productivity measures comprise goals scored, shots on target, total shots, assists, fast breaks, fouls against a player, successful passes, useful[1] through passes, useful crosses, useful dribbles, recovered balls and lost balls. These measures are all as presented to us by Paninidigital. Specific measures for defenders are available to us including anticipations, fouls committed, interceptions and tackles. Productivity measures are expressed as value per minute played although estimates with totals, just controlling for minutes played, gave similar qualitative results.

TABLE 1 HERE

[1] The adjective useful refers to all those plays that are favourable to the team that keep the possession of ball and generate an offensive play that could lead to a fastbreak, to an offensive cross and a shot on goal.

Model and Results

We estimate a standard salary model as:

Log salary = *f*(*age, age squared, career experience, game time, team characteristics***,** *player productivity, playing for national team, teammate productivity, team size, team fixed effects, nationality dummies, year dummies*). (1)

We define two types of nationality: non-Italian European Union and non-European Union, with Italian as base category. A team size effect is included, measured as previous season average attendance. Salary is determined at the beginning of a given season while performance measures are taken from the previous season. Teammate productivity is team IVG from previous season excluding player in observation, to avoid a reflection problem. We include career games played in Serie A as an experience variable. Our estimating equation includes year and team fixed effects. The model is estimated separately by player position in the team, where positions are given to us by www.paninidigital.com. We have 594, 737 and 377 observations for salary of a new contract for defenders, midfielders and forwards respectively over seasons 2000/01 to 2013/14. Goalkeepers are omitted from the analysis as a qualitatively different position meriting separate analysis.

Goals scored can be broken into an identity as goals divided by shots on target multiplied by shots on target. Goals per shot on target is then a measure of shooting efficiency, which we term goal efficiency. We could present the same decomposition for shots attempted but shots on target and shots attempted are highly correlated ($\rho = 0.8$). Econometric results with shots attempted are very similar to shots on target.

Since we have a large number of productivity measures, we estimated our salary model in two ways. The first was specific-to-general where productivity variables were added sequentially and coefficients were tested for significance. The second approach was general-to-specific where all possible productivity measures were included and variables were sequentially deleted according to lack of significance of coefficients. The two approaches delivered identical results. Several productivity measures had insignificant coefficients regardless of the approach taken to model selection. These included dribbles, crosses, fouls by and against a player, punts, interceptions, tackles and fast breaks

TABLE 2 HERE

As expected attendance, teammate productivity, career games in Serie A and minutes played in previous season all have significant, positive effects on salary of a new contract. The conventional quadratic form of age gets statistical support. Salary is maximised at 28 years of age for forwards & midfielders and 27 for defenders. This is in line with industry expectations and previous work and so adds confidence to our results.

Turning to the productivity variables, giving the ball away (lost balls) delivers a salary penalty for defenders but not for midfield players or forwards. This is perhaps because giving the ball away in a defensive position is more harmful than elsewhere on the pitch. One may wonder why a defender who gives the ball away earns a new contract in the first place. The simple answer is that such a player can compensate in ways that are less tangible than losing possession such as physical presence, marking, closing down opponents and general defensive organisation e.g. at set plays.

For midfield players, successful passes are helpful for salary; retention of possession vital in top level football. This is the flip side of losing the ball for defenders. Midfield players are expected to take possession and distribute the ball teammates, preferably to set up attacks but also to keep possession away from the opposition. More successful passes completed is rewarded by higher salary. Similarly, midfield players (but not defenders or forwards) are rewarded for providing assists, the final pass leading to a goal. Some midfield players are notable for their creative ability in instigating attacks and assists carry a salary premium.

The only productivity variable that delivers a positive and significant coefficient across all playing positions is shots on target. In contrast, we see that shooting efficiency does not deliver significant coefficients for any position. Essentially, Italian clubs are paying players to take shots.

It is worth exploring whether shots on target actually affect game outcomes. We collected data from www.whoscored.com over six Serie A seasons, 2008/09 to 2013/14 and estimated a simple production function with team points regressed on team and opponent inputs. The results are shown in Table 3 below.

TABLE 3 HERE

The model specification breaks goals down into shooting efficiency and shots on target or total shots. When total shots and shots on target are entered jointly we find that the coefficient on total shots is insignificant (column 1). Specifications in columns 2 and 3 with goals per shot on target and goals per shot fit the data equally well, a reflection of the high correlation between total shots and shots on target. It appears that shots on target comes through as a relevant and important input to team points.

Why do teams emphasize shots on target over shooting efficiency? The key appears to be the consistency of each action.[2] The correlation in shot attempts on target from season-to-season is 0.703. In contrast, shooting efficiency only has a correlation across seasons of 0.171. In essence, teams focus on shots on target because that statistic is predictable. Whether those

[2] The sample employed considered 1026 midfielder and forwards who just signed new contracts. Data was from Italy Serie A for the 2001/02 to 2013/14 seasons. Players have had at least 1 shot to be included.

shots actually turn into goals is mostly random and therefore not something teams should be paying for. [3]

Returning to the salary model of Table 2, this importance of shots on target as a production function input is then reflected in salary premia. To assess economic significance of shots on target as predictor of salary, we obtain the salary elasticity at mean shots on target (0.013) as 0.45. A one standard deviation increase in shots on target per minute from 0.013 to 0.019 results in a salary increase of 19%, expressed as a shift from €2.34m to €2.78m at the mean. These are non-trivial effects.

We can compare the forwards' salary premium for shots on target with those for completed passes and assists by midfield players. At mean passes per minute of 0.38, the salary elasticity with respect to passes is 0.14. A one standard deviation increase in passes per minute, from 0.38 to 0.56, yields a 6.5% rise in salary, €1.67m to €1.78m at the mean. Similarly, at mean assists per minute of 0.0012, the salary elasticity with respect to assists is 0.04. For midfield players, the salary elasticity with respect to shots on target is 0.09. Clearly, these elasticities are not as big as for striker shots on target. For defenders, a one standard deviation increase in lost balls per minute from 0.182 to 0.257 generates an 8.0% reduction in salary, other things equal, which highlights the importance of ball retention in Italian football.

The salary distribution for players in Italian football is non-normal with skewness and excess kurtosis (Lucifora & Simmons, 2003; Bryson et al, 2014), in common with most sports leagues. To deal with salary skewness, we estimated quantile regression models with same specification as in Table 2. The coefficients of three main productivity measures of interest are reported in Table 4.

[3] This result also tells us about how teams can construct a successful team. To be successful teams need to make every effort to take more shots than their opponent. That means focusing on hiring players who are successful at getting shots. Because every team knows this, the price of players who take shots will likely be bid to a point where teams with less money cannot afford their services. And this helps explain why in soccer – unlike many North American sports – payroll and wins are highly correlated (see Szymanski (2003)).

TABLE 4 HERE

The quantile regression estimates show some evidence that performance measures have higher marginal effects further up the salary distribution, especially when comparing 0.75 quantile with 0.1 and 0.25. We would expect pay-performance sensitivities to be greater for players of higher ability.

Conclusion

Although teams clearly win by scoring the most goals, it does not appear teams are strictly focusing on goal scorers in the labor market. Goals are about shots on target and shooting efficiency. Of these two, shots on target are much more predictable and more about the skill of the player. Therefore we find teams ignoring shooting efficiency (which appears to be mostly random) and seeking out forwards are are adept at getting shots on target.

This is not all that we find. While shooting on target is a particular skill for forwards we find completed passes is a relevant skill for midfielders and defenders. These skills are reward in contract negotiations by salary premia.

Of the various performance statistics available to us only a few are significant in a salary model: shots on target for all positions, successful passes for defenders and midfielders, assists for midfielders. There is a salary penalty to defenders for losing the ball. We find that a parsimonious model does well in explaining variations of salaries at point of signing a new contract. Adding further detailed productivity measures adds no significant explanatory power to our model. Converting coefficients of statistically significant productivity into economic impacts the greatest effects come from shots on target. When hiring or resigning players, teams give the greatest rewards to players with the most shots on target as these players are most likely to be ‘game winners’ on the field of play.

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Table 1 Descriptive Statistics

Variable	Mean	Standard deviation	Minimum	Maximum
Gross salary (€m)	1.77	2.05	0.02	18.00
Age	26.20	4.33	16	39
Games	81.55	94.13	0	600
Minutes	1727	919	2	3666
Attendance (‘000)	26.34	15.38	4.19	67.27
Teammate productivity	18.20	0.66	16.48	21.38
Defender performance				
Fast breaks	0.032	0.018	0	0.34
Passes completed	0.355	0.145	0	2.88
Useful punts	0.005	0.006	0	0.08
Lost balls	0.181	0.076	0	1.52
Recovered balls	0.183	0.110	0	2.52
Anticipations	0.034	0.025	0	0.52
Fouls committed	0.017	0.011	0	0.23
Interceptions	0.137	0.064	0	1.43
Tackles	0.025	0.013	0	0.22
Useful dribbles	0.004	0.005	0	0.06
Useful crosses	0.004	0.007	0	0.13
Useful through passes	0.008	0.009	0	0.16
Assists	0.0004	0.001	0	0.005
Balls played	0.564	0.214	0.26	4.60
Useful plays	0.093	0.044	0	0.69
Goal efficiency	0.021	0.113	0	1
Shots on target	0.0002	0.01	0	0.02
Midfield performance				
Fast breaks	0.033	0.023	0	0.54
Passes completed	0.383	0.179	0	3.92
Useful punts	0.0001	0.0009	0	0.02
Lost balls	0.201	0.084	0	1.99
Recovered balls	0.128	0.088	0	2.01
Useful dribbles	0.011	0.009	0	0.06
Useful crosses	0.005	0.005	0	0.07
Useful through passes	0.016	0.019	0	0.38
Assists	0.001	0.001	0	0.01
Balls played	0.613	0.244	0.22	1.08
Useful plays	0.111	0.059	0	1.19
Goal efficiency	0.181	0.204	0	1
Shots on target	0.005	0.005	0	0.06
Forward performance				
Fast breaks	0.011	0.007	0	0.067
Passes completed	0.208	0.074	0.057	0.75
Useful punts	0.00002	0.0001	0	0.001

Lost balls	0.202	0.052	0	0.33
Recovered balls	0.050	0.021	0	0.12
Useful dribbles	0.014	0.010	0	0.053
Useful crosses	0.004	0.004	0	0.035
Useful through passes	0.005	0.005	0	0.040
Assists	0.002	0.001	0	0.012
Balls played	0.422	0.107	0.004	0.86
Useful plays	0.056	0.030	0	0.16
Goal efficiency	0.284	0.162	0	1
Shots on target	0.013	0.006	0	0.034
Fouls against	0.025	0.012	0	0.066

Table 2 Salary estimates by player position

Variable	Defender	Midfield	Forward
Age	0.529 (10.44)***	0.509 (9.27)***	0.507 (6.86)***
Age squared	-0.0097 (10.20)***	-0.009 (8.59)***	-0.009 (6.24)***
Games	0.002 (6.09)***	0.002 (4.81)***	0.002 (3.65)***
Minutes	0.0002 (6.40)***	0.0002 (7.33)***	0.0002 (5.42)***
Shooting efficiency	-465.8 (1.35)	-38.35 (1.34)	4.65 (0.12)
Shots on target	64.9 (2.90)***	18.09 (3.82)***	31.40 (5.07)***
Assists	16.70 (0.50)	35.70 (2.18)**	32.20 (1.46)
Passes completed	0.538 (2.05)**	0.360 (2.47)**	0.450 (0.97)
Lost balls	-1.063 (2.20)**	-0.509 (1.63)	-0.518 (0.73)
Attendance	0.025 (13.69)***	0.027 (16.19)***	0.030 (11.18)***
Teammate productivity	0.370 (8.12)***	0.389 (9.83)***	0.268 (4.06)***
R^2 (adj.)	0.73	0.72	0.71
N	594	737	377

Note: t-statistics in parentheses; *, ** and *** denote statistical significance at 10%, 5% and 1% respectively. Models include team and season fixed effects but not player fixed effects.

Table 3 Production function estimates of points per game

Team points/game	(1)	(2)	(3)
Defence			
Shots given up	-0.051 (6.32)	-0.053 (6.95)	-0.053 (6.91)
Tackles	0.001 (0.31)		
Interceptions	0.003 (0.70)		
Opponent goals/shot	-8.641 (15.52)	-8.619 (15.71)	-8.638 (16.14)
Attack			
Total shots	0.015 (1.14)		0.084 (12.27)
Shots on target	0.210 (7.49)	0.239 (15.70)	
Goals/shots			0.268 (18.00)
Goals/shots on target	3.463 (14.50)	3.362 (14.74)	
N	120	120	120
R^2	0.94	0.94	0.94