Wage disparity and team performance in the process of industry development: Evidence from Japan's professional football league

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Eiji Yamamura*

Department of Economics, Seinan Gakuin University, 6-2-92 Sawara-ku, Nishijin, Fukuoka 814-8511, Japan

Abstract

The changing effects of wage disparity on team performance during the process of industry development are examined using data sourced from the Japanese professional football league. The results show that wage disparity leads to a reduction in team performance during the developing stage but does not influence performance during the developed stage. Unobserved fixed team effects and endogeneity bias were controlled in the study.

Keywords: Wage disparity, team performance, industry development

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* Tel: 81-92-823-4543, Fax: 81-92-823-2506
E-mail: cyl02111@nifty.com

1. Introduction

Two conflicting views exist regarding wage disparity within sports teams and its effect on team performance in professional leagues. One theory purports that wage equality improves team performance and will, therefore, will enhance worker cooperation (Levine 1991). There are a number of studies that support this view (e.g., Depken 2000; Richards and Guell 1998; Sommer 1998; Wiseman and Chatterjee 2003). In contrast, tournament theory suggests that wage inequality leads to higher worker productivity (Lazear and Rosen 1981; Rosen 1986)[1]. If this is true, wage inequality improves team performance, which is also supported by empirical evidence (Avrutin and Sommers 2007)[2].

Previous studies have not considered endogeneity in wage inequality, and so their results appear to exhibit estimation bias. This paper attempts to control for this bias by using the dynamic panel model. Furthermore, the effect of wage inequality on team performance possibly depends on the conditions within professional sports leagues, an aspect that has not been sufficiently investigated. For instance, the skill level of professional sports leagues can appear low during inception stages, and then improve over time, through experience and technology transfers from more advanced foreign leagues (Yamamura 2009). During this development process, the effect of income inequality on team performance may change. Using data sourced from the Japanese professional football league (J-League), established in 1993, this paper examines the relationship between wage inequality and team performance in the context of industry development.

2. Data and Model

Approximately 200 countries belong to the Fédération Internationale de Football Association

[1] Ramaswamy and Rowthorn (1991) suggest that 'damage potential' leads to a positive relationship between wage inequality and team performance.
[2] Berri and Jewell (2004) suggest there is no relation between wage disparity and team performance.

(FIFA), while only 32 teams, those that win preliminary rounds, are able to participate in the final tournament. Since Japan's J-League began in 1993, the skills and performance of the Japanese national team have improved significantly. This improvement is due in part to the transfer of star players, from professional football leagues in South America and Europe, into the J-league. For example, Zico (Brazil) and Schillaci (Italy) played in the J-league during its early stages. Prior to 1993, the Japanese national team consisted of amateur players and its performance had been far from the level required to advance to the World Cup. In 1994, the Japanese team was comprised of J-League players but failed to qualify for the Football World Cup. However, four years later, the Japanese team won its preliminary competition and qualified to play in the 1998 World Cup. Subsequently, the Japanese team has qualified for the last three World Cups (2002, 2006, and 2010)[3].

Team level data regarding the J-league was used to examine how the effects of wage disparity on team performance vary at different team-development stages. This paper uses a data panel to describe the J-league teams from 1993 to 2006: the developing stage is 1993–1998, before any World Cup qualifications, and 1999–2006 is the developed stage. The data was sourced from the Nikkan Sports newspaper from 1994 to 2007. To conduct the estimation (using data from 1993–2006), the sample was divided into developing and developed stages, and the effects of wage disparity on team performance during the different stages were compared.

Table 1 includes the variable definitions and a summary of statistics. As in Depken's (2000) study on baseball, a fixed effects model was also used in this study, with WIN as a dependent variable, and AVSAL and SALHHI as independent variables and year dummies. However, AVSAL and SALHHI are also considered as endogenous variables, which create endogeneity bias due to the reverse causality that team performance influences players' salaries and the accompanying wage disparity within a team. In addition to the fixed effects model, a Arellano-Bond type dynamic panel

[3] The 2002 World Cup was held in Japan and Korea. As host countries, Japan and Korea were not required to win preliminary rounds to advance to the World Cup.

model (Arellano 2003) is used in this paper for the purpose of controlling for endogeneity bias and unobservable fixed team effects. This paper provides a control for endogeneity bias, a measure not taken in earlier studies (e.g., Avrutin and Sommer 2007; Berri and Jewell 2004; Depken 2000; Sommer 1998; Richards and Guell 1998). The estimated function takes the following form:

$$WIN_{it} = \alpha_1 WIN_{it-1} + \alpha_2 AVSAL_{it} + \alpha_3 SALHHI_{it} + \varepsilon_t + \nu_{i,} + u_{it},$$

where ε_t, $\nu_{i,}$ and u_{it} represent the following unobservable effects: $_t$ is the year-specific effects, $_i$ is the unobserved team-specific effects, and $_{it}$ is the error term, respectively. $_{t-1}$ is the lagged year of the $_t$ year. The structure of the data set used in this study in panel form. Lagged dependent variable WIN_{it-1} was used as a control in the initial level. AVSAL and SALHHI were used as endogenous variables in the dynamic panel model and the levels of endogenous variables that lagged for two or more periods could also be used as instrumental variables (Arellano 2003).

3. Results

Table 2 shows the results from the fixed effect estimation, a model also used by Depken (2000) with regard to a study on major league baseball. Table 3 provides the results of the dynamic panel estimation. Column (1), in both Tables 2 and 3, shows the data results for 1993 to 2006. Column (2) shows the results regarding the developing stage, from 1993 to 1998, while column (3) shows the developed stage results, from 1999 to 2006.

In the interests of brevity, only the results for SALHHI are discussed in this paper. Table 2 shows that SALHHI takes a negative sign and is statistically significant in columns (1) and (2), which is congruent with the results from the major league baseball study (Depken 2000). However, column (3) shows that the sign for SALHHI becomes positive and is statistically significant, which is contrary to Depken's findings.

Table 3 illustrates Sargan's over-identification test and second-order serial correlation test, used to check the validity of the estimation results in the dynamic panel model. The null hypothesis is that the instrumental variables do not correlate with the residuals. If the hypothesis is not rejected, the instrumental variables are valid. Further, the test for the null hypothesis (that there is no second-order serial correlation with the disturbance of the first-differenced equation) is important because the estimator is consistent when there is no second-order serial correlation. Table 3 shows that both hypotheses are not rejected in all estimations, suggesting that estimation results are valid. Interestingly, SALHHI in column (2) continues to yield a negative sign and is statistically significant at the 5% level, whereas signs for SALHHI in columns (1) and (3) are not statistically significant. The results from Tables 2 and 3 support the argument that wage disparity within a team reduces team performance during the developing stage but does not affect it during the developed stage (when endogeneity bias and the unobservable team fixed effects are controlled). Thus, the gap between the skills of a star player coming from Europe (or South America) and domestic players is great during the developing stage. Foreign-born high salaried players with advanced skills cannot sufficiently integrate within J-league teams, resulting in a reduction in team performance. Later, during the developed stage, the skill gap among the players is thought to diminish, even where wage inequality continues to exist, because some domestic players advanced faster technically during the earlier developing stage. Domestic Japanese players can now match the skill levels of foreign players, resulting in the harmonization of the team. Thus, the negative relationship between wage inequality and team performance disappears.

4. Conclusions

A dynamic panel estimation to control for fixed team effects and endogeneity bias was conducted using Japanese professional football league data from 1993 to 2006. The effect of wage disparity on team performance was examined with regard to different industry developmental stages. Empirical results suggest that wage disparity leads to a reduction in team performance during the developing stage but does not influence performance during the developed stage.

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Table 1
Descriptive statistics of study data (1993–2006)

	Definition	Mean	Standard deviation	Minimum	Maximum
WIN	Rate of wins.	0.45	0.15	0.86	0.11
AVSAL	Average annual salary of players. (Millions yen)	2.30	0.98	6.24	0.56
SALHHI	Inter-team annual salary; Herfindahl index.	0.07	0.05	0.56	0.03

Table 2
Determinants of winning ratio (fixed effect model)

	(1) 1993–2006	(2) 1993–1998	(3) 1999–2006
$AVSAL_t$	0.04**	0.02	0.03
	(2.62)	(0.91)	(1.08)
$SALHHI_t$	–0.50*	–0.64*	1.34*
	(–1.82)	(–1.96)	(1.85)
Dummy year	Yes	Yes	Yes
Observations	219	87	132

Notes: Numbers in parentheses are t-statistics calculated using robust standard error. * and ** indicate significance at 10 and 5 per cent levels, respectively. 'Yes' means that dummy years are included as independent variables.

Table 3
Determinants of winning ratio (dynamic panel model)

	(1) 1993–2006	(2) 1993–1998	(3) 1999–2006
WIN_{it-1}	0.15	0.05	0.12
	(1.63)	(0.31)	(0.92)
$AVSAL_t$	0.02	0.03	0.03
	(1.28)	(0.80)	(1.42)
$SALHHI_t$	–0.47	–2.30**	0.50
	(–0.95)	(–2.37)	(0.88)
Year dummy	Yes	Yes	Yes
Sargan test	140.7	27.6	113.5
<P-value>	<0.15>	<0.42>	<0.11>
Serial correlation	–0.60	–0.48	–0.03
Second order <P-value>	<0.50>	<0.62>	<0.96>
Observations	158	52	106

Notes: Numbers in parentheses are z-statistics calculated using robust standard error. * and ** indicate significance at 10 and 5 per cent levels, respectively. 'Yes' means that dummy years are included as independent variables.