

An Econometric Analysis of Corporate Financial Condition and Wage Structure Based on Japanese Firm-Level Microdata

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Abstract

Research on human capital investment and labor productivity has so far mainly used techniques whereby microdata such as individual wages are regressed on educational attainment and years of employment. However, Japanese official microdata that contain data on individual wages usually do not include data on corporate performance and corporate financial condition. As a result, there are few empirical studies that use Japanese official microdata to assess the influence of these factors on firms' employment and wages. This paper uses firm-level microdata to quantitatively analyze the impact of corporate performance and corporate financial condition on employee numbers and wages.

Keywords: Basic Survey of Japanese Business Structure and Activities, Firm-Level Microdata, Corporate Financial Condition, Applied Econometrics

1. Introduction

Corporate performance and corporate financial condition affect firms' employment and wages. However, Japanese official microdata that contain data on individual wages usually do not include data on corporate performance and corporate financial condition. As a result, there are few econometric studies that use Japanese official microdata to assess the influence of corporate performance and corporate financial condition on firms' employment and wages.

This paper uses Japanese firm-level microdata to generate panel data, and on this basis quantitatively analyzes the impact of corporate performance and corporate financial condition on firms' employee numbers and wages.

2. Data Source

This research uses original microdata from the 'Basic Survey on Japanese Business Structure and Activities' from the years 2002 to 2010. The 'Basic Survey of Japanese Business Structure and Activities' is conducted by the Ministry of Economy, Trade and Industry and covers 'companies engaged in business with both a minimum capital of 30 million yen and 50 or more employees'¹. The survey was first conducted in 1992 and has been conducted yearly since 1996.

The survey includes a variety of survey items on corporate performance and corporate financial condition, as well as a variety of attributes on employment including employee numbers and wages. The survey covers the same companies, and as a result allows the creation of firm-level panel data. This research creates such firm-level panel data, and based on this data quantitatively analyzes the impact of corporate performance and corporate financial condition on employee numbers and wages. The focus of this research is on manufacturing companies.

¹ Numerous researches exist that are based on firm-level or establishment-level microdata such as 'Basic Survey of Japanese Business Structure and Activities' in Japan. For example see Okudaira *et al.* for an analysis of total factor productivity based on original microdata from the 'Basic Survey of Japanese Business Structure and Activities'.

3. Microdata Analysis of Corporate Financial Condition, Employment and Wages

This research conducts microdata analysis into (1) the relationship between corporate financial condition and employee numbers and (2) the relationship between corporate performance and wages. Analysis is conducted based on panel data created through exact matching of individual data from the ‘Basic Survey of Japanese Business Structure and Activities’. This research uses panel data from two different periods – the years 2002 to 2006 and 2006 to 2010 – in order to compare the relationship between corporate financial condition, employee numbers and wages before and after the economic downturn precipitated by the Lehman Brothers bankruptcy in 2008.

Two multiple regression models were created for this analysis. Model 1 is a model on the change in the number of employees. Model 2 is a model on the change in wages.

The variable used as dependent variable for Model 1 is the logarithm of the rate of increase in the number of employees, while the variable used as dependent variable for Model 2 is the logarithm of the rate of increase in wages. The variables used as independent variables for Model 1 and Model 2 are return on assets (ROA), capital adequacy ratio, net income to sales ratio, ratio of the number of full-time workers² to the number of regular workers³, export-sales ratio, import-inventory ratio, whether companies contracted manufacturing domestically, whether companies contracted manufacturing internationally, industry (subdivision level), region (8 regions), lagged variables of return on assets, lagged variables of capital adequacy ratio and lagged variables of net income to sales ratio. Four variables such as ‘whether companies contracted manufacturing domestically’, ‘whether companies contracted manufacturing internationally’⁴, ‘industry’ and ‘region’ are used as dummy variables. For Model 2, the number of regular workers and the rate of increase in full-time workers as well as the above variables are additively introduced as explanatory variables.

The lagged variables of return on assets, capital adequacy ratio and net income to sales ratio are introduced into the models as explanatory variables based on Ogawa (2003) in order to identify the influence of the past profit rate on current employee numbers and wages. For Model 1 and Model 2 not only 1-year lagged variables (ex. ‘return on assets_1’) but also 2-year lagged variables (ex. ‘return on assets_2’), 3-year lagged variables (ex. ‘return on assets_3’) and 4-year lagged variables (ex. ‘return on assets_4’) are used on t year (t=2006,2010).

There are outliers specific to firm-level microdata, such as return on assets, capital adequacy ratio and net income to sales ratio, which can cause bias. To control this issue, 1% percentile and 99% percentile are set as thresholds for outliers and records outside these thresholds are deleted.

4. Results

Model 1 and Model 2 were used to conduct analysis on data from manufacturing companies covering the years 2006 and 2010.

² The term ‘full-time workers’ used in this research is originally translated as “full-time workers and staff” in the original English questionnaire from the ‘Basic Survey of Japanese Business Structure and Activities’.

³ In the ‘Basic Survey on Japanese Business Structure and Activities’, the ‘number of regular workers’ is defined as ‘the total number of paid directors and regularly employed persons’ including not only full-time employees, but also part-time employees, temporary employees, contract employees and similar.

⁴ The variable ‘whether companies contracted manufacturing domestically’ and ‘whether companies contracted manufacturing internationally’ are not available for the 2006 data.

Table 1 shows the results for Model 1. The coefficients of return on assets and net income to sales ratio are significantly positive for the rate of increase in the number of employees. This result suggests that companies which are more profitable tend to employ more workers, even when controlled for attributes such as industry (subdivision level) and region.

For lagged variables, the coefficient of return on assets is positive for the year 2008, whereas the coefficient for return on assets is negative for the year 2007. This result indicates a possibility of negative serial correlation, i.e. a tendency of excessive employment adjustment to return to original levels. It is also interesting to note that past ROA has an impact on companies' hiring activities for the current year, as the coefficient of capital adequacy ratio of the current year is significantly negative. This result shows that companies with a higher capital adequacy ratio tend to reduce employee numbers.

The coefficient of ratio of the number of full-time workers to regular workers is significantly negative. This result indicates a possibility that companies which employ more full-time workers – and therefore have a higher ratio of level of wages to sales – tend to reduce employee numbers.

For some industries, the coefficient of the dummy variable is significantly positive (ex. manufacturing of transportation equipment), whereas for other industries the coefficient of the dummy variable is significantly negative for the year 2010 (ex. manufacturing of textile mill products). This result reflects the diversity of the subdivisions within the manufacturing industry.

Both coefficients of the export-sales ratio and import-inventory ratio are not significant. This could indicate that several records contain missing values for exports and imports, resulting in a possibility that the values of exports and imports contain response errors.

Table 2 shows the results for Model 2. The coefficients of return on assets and net income to sales ratio are significantly positive for the rate of increase in wages. This result suggests that companies that are more profitable tend to raise wages, even when controlled for industry and region.

For lagged variables, the coefficient of return on assets for the year 2007 is significantly negative but with reversed signs. This result indicates a possibility that the relationship between corporate financial condition and wage structure has changed before and after the economic downturn precipitated by the Lehman Brothers bankruptcy in 2008.

5. Conclusions

This paper aims to analyze the influence of corporate performance and corporate financial condition on employee numbers and wages using firm-level microdata. The results show that when profit rates such as return on assets and net income to sales ratio are higher, i.e. corporate performance and corporate financial condition are better, employee numbers and wages tend to increase. This analysis also quantitatively demonstrates that companies with higher numbers of full-time and regular workers tend to avoid increasing the number of employees.

References

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Table 1: Results of multiple regression analysis of the rate of increase in the number of employees in Japan, manufacturing companies, the years 2006 and 2010

Variables	2006		2010	
	Coefficient	t-value	Coefficient	t-value
Corporate Finance				
Return on Assets	0.152	4.076***	0.202	6.560***
Net Income to Sales	0.161	3.396***	0.156	5.352***
Capital Adequacy Ratio	-0.075	-4.364***	-0.109	-6.050***
Ratio of The Number of Full-Time Workers to The Number of Regular Workers	-0.021	-2.436**	-0.062	-8.904***
Export-Sales Ratio	-0.011	-0.936	0.005	0.555
Import-Inventory Ratio	-0.011	-1.185	-0.008	-1.204
Return on Assets_1	0.012	0.787	-0.019	-0.784
Net Income to Sales_1	0.039	2.344**	0.065	2.842***
Capital Adequacy Ratio_1	-0.008	-0.348	0.080	3.727***
Return on Assets_2	0.020	0.630	0.056	2.363***
Net Income to Sales_2	0.025	1.018	-0.015	-0.509
Capital Adequacy Ratio_2	0.039	1.650*	0.041	1.680*
Return on Assets_3	0.007	0.199	-0.007	-0.812*
Net Income to Sales_3	-0.004	-0.126	0.029	1.593
Capital Adequacy Ratio_3	0.011	0.389	-0.003	-0.141
Return on Assets_4	0.001	0.051	-0.035	-1.453
Net Income to Sales_4	-0.011	-0.453	0.028	1.282
Capital Adequacy Ratio_4	0.008	0.466	-0.008	-0.490
Whether companies contracted manufacturing domestically or not <Not contracting manufacturing domestically>				
Contracting manufacturing domestically			0.003	1.342
Whether companies contracted manufacturing internationally or not <Not contracting manufacturing internationally>				
Contracting manufacturing internationally			-0.001	-0.215
Industry<Electronic Parts, Devices and Electronic Circuits>				
Manufacture of Food	-0.008	-1.127	0.013	2.115**
Manufacture of Beverages, Tobacco and Feed	-0.007	-0.572	0.014	1.371
Manufacture of Textile Mill Products	-0.001	-0.148	-0.024	-3.193***
Manufacture of Lumber and Wood Products, Except Furniture	0.001	0.087	-0.004	-0.364
Manufacture of Furniture and Fixtures	0.008	0.649	-0.020	-1.681*
Manufacture of Pipe, Paper and Paper Products	0.005	0.612	-0.003	-0.403
Printing and Allied Industries	-0.001	-0.147	-0.001	-0.108
Manufacture of Chemical and Allied Products	0.013	1.742*	0.015	2.310**
Manufacture of Petroleum and Coal Products	0.000	-0.014	0.030	1.765*
Manufacture of Plastic Products, Except Otherwise Classified	0.005	0.714	-0.002	-0.252
Manufacture of Rubber Products	0.018	1.567	0.007	0.649
Manufacture of Leather Tanning, Leather Products and Fur Skins	-0.004	-0.141	-0.023	-0.799
Manufacture of Ceramic, Stone and Clay Products	0.015	1.721	0.000	-0.057
Manufacture of Iron and Steel	0.016	1.736	0.002	0.313
Manufacture of Non-Ferrous Metals and Products	0.011	1.164	0.000	-0.027
Manufacture of Fabricated Metal Products	0.014	1.926*	-0.010	-1.660*
Manufacture of General-Purpose Machinery	0.010	1.388	-0.003	-0.466
Manufacture of Production Machinery	0.023	3.019***	-0.005	-0.812
Manufacture of Business Oriented Machinery	0.010	1.181	0.006	0.828
Manufacture of Electrical Machinery, Equipment and Supplies	0.011	1.550	0.003	0.407
Manufacture of Information and Communication Electronics Equipment	0.001	0.143	0.014	1.643
Manufacture of Transportation Equipment	0.025	3.653***	0.011	1.853*
Miscellaneous Manufacturing Industries	0.010	1.077	-0.006	-0.766
Region<Kanto Region>				
Hokkaido/Tohoku Region	0.013	2.665***	0.007	1.724*
Hokuriku Region	0.001	0.223	0.015	3.067***
Tokai/Koshin Region	0.007	2.138**	0.011	3.591***
Kansai Region	0.004	1.053	0.008	2.527**
Chugoku Region	0.010	1.792*	0.005	1.025
Shikoku Region	0.002	0.206	0.023	3.480***
Kyushu/Okinawa Region	0.015	2.611***	0.012	2.549**
Intercept				
	0.012	1.246	0.026	3.075***
Adj.R ²	0.03		0.07	
F-value	4.908		12.877	
N	5294		8069	

Note 1: *** = 1% significance level, ** = 5% significance level, * = 10% significance level (the same below).

Note 2: Reference group in <brackets>.

Table 2: Results of multiple regression analysis of the rate of increase in wages in Japan, manufacturing companies, the years 2006 and 2010

Variables	2006		2010	
	Coefficient	t-value	Coefficient	t-value
Corporate Finance				
Return on Assets	0.349	4.552***	0.558	8.891***
Net Income to Sales	0.002	0.020***	0.239	4.019***
Capital Adequacy Ratio	-0.104	-2.949***	-0.101	-2.774***
Ratio of The Number of Full-Time Workers to The Number of Regular Workers	-0.046	-2.615	-0.016	-1.153
The Number of Regular Workers	0.000	-1.531	0.000	2.021**
Rate of Increase in Full-Time Workers	0.161	7.968	0.000	0.043
Export-Sales Ratio	0.060	2.463**	-0.015	-0.856
Import-Inventory Ratio	-0.004	-0.204	0.010	0.696
Return on Assets_1	-0.004	-0.132	-0.013	-0.260
Net Income to Sales_1	0.070	2.063**	0.151	3.227***
Capital Adequacy Ratio_1	0.093	1.967**	0.017	0.378
Return on Assets_2	-0.081	-1.239	-0.025	-0.515
Net Income to Sales_2	0.046	0.908	-0.144	-2.459***
Capital Adequacy Ratio_2	0.055	1.142	0.123	2.451***
Return on Assets_3	-0.058	-0.762	-0.056	-3.311***
Net Income to Sales_3	-0.041	-0.688	0.027	0.723
Capital Adequacy Ratio_3	-0.031	-0.539	-0.068	-1.425
Return on Assets_4	0.016	0.300	-0.073	-1.494
Net Income to Sales_4	0.002	0.041	0.011	0.239
Capital Adequacy Ratio_4	-0.039	-1.138	0.066	2.072**
Whether companies contracted manufacturing domestically or not <Not contracting manufacturing domestically>				
Contracting manufacturing domestically			-0.003	-0.589
Whether companies contracted manufacturing internationally or not <Not contracting manufacturing internationally>				
Contracting manufacturing internationally			-0.012	-1.392
Industry<Electronic Parts, Devices and Electronic Circuits>				
Manufacture of Food	0.010	0.729	0.074	3.927***
Manufacture of Beverages, Tobacco and Feed	-0.016	-0.648	0.080	1.004***
Manufacture of Textile Mill Products	0.005	0.303	0.015	-0.128
Manufacture of Lumber and Wood Products, Except Furniture	-0.023	-0.783	-0.003	0.044
Manufacture of Furniture and Fixtures	0.028	1.073	0.001	2.275
Manufacture of Pipe, Paper and Paper Products	0.001	0.039	0.036	3.712**
Printing and Allied Industries	0.029	1.836*	0.054	3.133***
Manufacture of Chemical and Allied Products	0.032	2.141**	0.040	2.827***
Manufacture of Petroleum and Coal Products	0.017	0.314	0.098	2.622***
Manufacture of Plastic Products, Except Otherwise Classified	0.022	1.396	0.035	-0.645***
Manufacture of Rubber Products	0.041	1.760*	-0.014	4.480
Manufacture of Leather Tanning, Leather Products and Fur Skins	0.098	1.530	0.258	2.076***
Manufacture of Ceramic, Stone and Clay Products	0.023	1.273	0.031	-0.501**
Manufacture of Iron and Steel	0.049	2.605***	-0.008	-1.281
Manufacture of Non-Ferrous Metals and Products	0.034	1.686*	-0.021	-0.503
Manufacture of Fabricated Metal Products	0.030	2.078**	-0.006	-0.545*
Manufacture of General-Purpose Machinery	0.034	2.252**	-0.008	-2.847
Manufacture of Production Machinery	0.052	3.237***	-0.037	1.896***
Manufacture of Business Oriented Machinery	0.012	0.711	0.029	1.489*
Manufacture of Electrical Machinery, Equipment and Supplies	0.023	1.578	0.020	0.226
Manufacture of Information and Communication Electronics Equipment	0.036	1.825*	0.004	-1.259
Manufacture of Transportation Equipment	0.046	3.202***	-0.015	1.643
Miscellaneous Manufacturing Industries	0.005	0.234	0.028	-0.766
Region<Kanto Region>				
Hokkaido/Tohoku Region	-0.004	-0.428	0.003	0.396
Hokuriku Region	-0.005	-0.430	-0.008	-0.793
Tokai/Koshin Region	0.001	0.159	-0.007	-1.120
Kansai Region	0.002	0.320	0.003	0.527
Chugoku Region	0.009	0.829	-0.005	-0.458
Shikoku Region	-0.020	-1.306	0.030	2.209**
Kyushu/Okinawa Region	0.002	0.162	0.021	2.085**
Intercept	-0.135	-4.772***	-0.102	-5.886***
Adj.R ²	0.03		0.09	
F-value	4.282		16.560	
N	5294		8069	

Note 1: *** = 1% significance level, ** = 5% significance level, * = 10% significance level (the same below).

Note 2: Reference group in <brackets>.