



**Discussion Paper Series**

No.207

**The Adjustment Speed of Employment at  
Foreign-Owned Firms**

Yukako Murakami  
Kyoji Fukao

March 2007

**Hitotsubashi University Research Unit  
for Statistical Analysis in Social Sciences**

**A 21st-Century COE Program**

Institute of Economic Research  
Hitotsubashi University  
Kunitachi, Tokyo, 186-8603 Japan  
<http://hi-stat.ier.hit-u.ac.jp/>

# The Adjustment Speed of Employment at Foreign-Owned Firms

Yukako Murakami\*

Kyoji Fukao †

## Abstract

Is employment practice at foreign-owned firms different from that of Japan, the life-time employment system? Using firm level data of the Japanese manufacturing sector, this paper showed that the adjustment speed of employment at foreign-owned firms was slightly higher than at domestically-owned firms. This finding suggests that firm-specific skills are less important in foreign-owned firms than in Japanese firms.

JEL Code: F11, J5

Key Words: Multinational firms, FDI, adjustment speed, employment, life-time employment system

---

\* Department of Economics, Hitotsubashi University, Kunitachi-shi Tokyo 186 Japan.

e-mail: murakami@econ.hit-u.ac.jp

† Professor, Institute of Economics Research, Hitotsubashi University, Kunitachi-shi Tokyo 186 Japan.

## The Adjustment Speed of Employment at Foreign-Owned Firms

### *1. Introduction*

This paper investigates whether the adjustment speed of employment of foreign-owned firm is faster than that of domestically-owned firms. One characteristic of the labor market in Japan is that it is more stable and the adjustment speed is slower than, for example, in the United States. One reason that Japanese firms do not dismiss workers easily is the highly firm-specific nature of human capital. Since the costs of training workers are sunk costs, firms do not dismiss their employees easily.<sup>1</sup> Gordon (1982), for example, found that real wages in the U.S. are less flexible and employment levels fluctuate more heavily than in Japan. Similarly, Abraham and Houseman (1989) observed that the employment adjustment in U.S. is faster than that in Japan. At the same time, they also found that the adjustment of working hours in the two countries does not differ.

A survey of theoretical and empirical studies on the adjustment speed of labor is provided in Hamermesh (1993). He highlights the following findings of these studies: First, firms tend to adjust working hours rather than the size of the workforce. Second, firms in the U.S. tend to adjust employment levels faster than firms in other developed countries. Third, labor force adjustments tend to fall more heavily on unskilled labor than on skilled labor. And fourth, labor force adjustments tend to be greater when the unemployment rate is high than during other periods.

There is also a large body of empirical literature on the speed of adjustment of employment in Japan. There are two possible determinants that explain the differences of adjustment speed among firms. The

first is the role played by labor unions. Noda (1998) shows that the adjustment speed of employment in unionized firms is slower than in non-unionized small and medium enterprises. The second possible determinant is the capital ownership structure, that is, who are the main owners of the firm. Abe (1997) shows that firms whose main shareholders are banks show a slower adjustment speed of employment. This is confirmed by Tomiyama (2001), who finds that firms with a strong main-bank relationship display a slower adjustment speed of employment.

Since it is generally assumed that foreign-owned firms value workers' general abilities more highly than firm specific skills, and since foreign-owned firms do not rely on life-time employment practice, it can be expected that the adjustment speed of employment at foreign-owned firms is faster than at other firms in Japan. This paper investigates this hypothesis. However, it should be noted that the analysis here concentrates on the foreign-ownership variable only. Unionization rates or, in the case of domestically-owned firms, the ownership structure cannot be considered because our data set does not contain such information.

## 2. Specification and Empirical Tests

To investigate whether the adjustment speed of employment is related to the foreign-ownership ratio, the following partial adjustment function is assumed:

---

<sup>1</sup> For a detailed description, see Fukao and Otaki (1993).

$$\ln L_{f,t} - \ln L_{f,t-1} = \lambda_f (\ln L_{f,t}^* - \ln L_{f,t-1}) \quad (1)$$

When firms face an unexpected change in circumstances from time  $t-1$  to time  $t$  – such as a rise in energy prices, the emergence of new business opportunities, etc, the firm's activity to achieve the new steady state ( $L^*$ ), which is based on its own cost structure, is different from each other. Their difference of each firm's labor demand to respond the change of circumstances is shown at the speed ( $\lambda$ ).

Assume that the relationship between the adjustment speed of employment and firm ownership is given by the following linear relationship.

$$\lambda_f = \gamma_0 + \gamma_1 \sum_f FF33DUM_f \quad (2)$$

The optimum employment level  $L_{f,t}^*$  can be represented by the following function which is derived from a Cobb-Douglas production function.

$$\ln L_{f,t}^* = \alpha_0 + \alpha_1 \ln Y_{f,t} + \alpha_2 \ln WAGE_{f,t} \quad (3)$$

Given these assumptions, the adjustment speed of employment function can be represented as follows:

$$\begin{aligned}
\ln L_{f,t} = & \beta_0 + \beta_1 \ln L_{f,t-1} + \beta_2 FF33DUM_{f,t} \ln L_{f,t-1} \\
& + \beta_3 \ln Y_{f,t} + \beta_4 \ln WAGE_{f,t} + \beta_5 FF33DUM_{f,t} \ln Y_{f,t} \\
& + \beta_6 FF33DUM_{f,t} \ln WAGE_{f,t} + \beta_7 FF33DUM_{f,t} \ln WAGE_{f,t} \\
& + \sum_j \gamma_j INDYDUM_{f,j,t} + \sum_t \delta_t YEARDUM_{f,t}
\end{aligned} \tag{4}$$

where  $L_{ft}$  is the total number of workers of firm  $f$  in year  $t$  and  $Y_{ft}$  is real output.  $FF33DUM_{ft}$  is a dummy variable which takes a value of 1 if the foreign-ownership ratio is 33.4% or greater and 0 otherwise.  $WAGE_{ft}$  stands for the average wage calculated as total wage payments divided by the total number of workers and the wage index of the SNA statistics.  $\lambda_f$  in equation (1), which is the adjustment speed of employment at domestically-owned firms, is represented by  $1-\beta_1$ . Therefore, the adjustment speed of employment at foreign-owned firms is given by  $\beta_2$ . If the coefficient  $\beta_2$  is positive, then the adjustment speed at foreign-owned firms is slower than that at domestically-owned firms; conversely, it is faster if  $\beta_2$  is negative.

A problem that arises when estimations are based on panel data and the lagged dependent variable is included among the independent variables is that the estimators are not sufficiently consistent to satisfy the condition of strong exogeneity (see, e.g., Wooldridge). One of the best solutions for this problem was provided by Arellano and Bond (1991) who suggested that a GMM estimator has a high performance. Saito and Tachibanaki (2005) have applied the Arellano-Bond estimator to estimate the employment adjustment function. Following their example, we try our estimation using a dynamic panel estimator.

Table 1a The Adjustment Speed of Employment (Basic Estimation)

|   | (1) Actual Output                   |                                    | (2) Predicted Output               |                                    |
|---|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| log(Workers $t-1$ )                             | 0.41672 ***<br>[9.31]               | 0.42323 ***<br>[9.43]              | 0.15931 **<br>[2.13]               | 0.15894 **<br>[2.13]               |
| log(Workers $t-1$ )*Foreign Ownership dummy     | -0.04348 *<br>[-1.89]               | -0.04799 **<br>[-2.08]             | 0.00834<br>[0.34]                  | 0.00782<br>[0.32]                  |
| Foreign ownership dummy                         | -0.13794 *<br>[-1.71]               | -0.14998 *<br>[-1.85]              | -0.06713<br>[-0.77]                | -0.06576<br>[-0.76]                |
| log(Output $t$ )                                | 0.14034 ***<br>[26.79]              | 0.12165 ***<br>[25.13]             | 0.03574 ***<br>[3.45]              | 0.03555 ***<br>[3.46]              |
| log(Output $t$ )*Foreign Ownership dummy        | 0.02538<br>[1.40]                   | 0.02948<br>[1.63]                  | -0.01018<br>[-0.53]                | -0.00966<br>[-0.51]                |
| log(Payments /workers)                          | -0.22440 ***<br>[-43.50]            | -0.22307 ***<br>[-42.97]           | -0.20079 ***<br>[-27.88]           | -0.20028 ***<br>[-27.87]           |
| log(Payments /workers)* Foreign Ownership dummy | 0.06213 **<br>[2.02]                | 0.06091 **<br>[1.97]               | 0.04183<br>[1.21]                  | 0.04012<br>[1.16]                  |
| constant  | -0.01051 ***<br>[-19.92]            | -0.01060 ***<br>[-19.98]           | -0.01968 ***<br>[-24.11]           | -0.01971 ***<br>[-24.17]           |
| Industry dummy                                  | yes                                 | no                                 | yes                                | no                                 |
| Year dummy                                      | yes                                 | yes                                | yes                                | yes                                |
| No. of observations                             | 32658                               | 32658                              | 20116                              | 20116                              |
| Wald Test                                       | chi2(65)=3709.09<br>Prob>chi2=0.000 | chi2(9)=3412.00<br>Prob>chi2=0.000 | chi2(63)=1749.31<br>Prob>chi2=0.00 | chi2(8)=1694.39<br>Prob>chi2=0.000 |
| Sargan test                                     | chi2(5)=45.60<br>Prob>chi2=0.0000   | chi2(5)=49.44<br>Prob>chi2=0.0000  | chi2(2)=8.54<br>Prob>chi2=0.0141   | chi2(2)=9.17<br>Prob>chi2=0.0102   |

This paper uses a firm-level panel data set that is constructed based on the *Kigyō Katsudo Kihon Chōsa* (Basic Survey of Business Activity) – a survey covering firms with more than fifty employees.<sup>2</sup>

The results of the estimation are presented in Table 1a. In the left 2 columns of Table 1a, in which actual output is used for the estimations, the coefficients indicate that the adjustment speed of employment at foreign-owned firms is significantly higher than at domestically-owned firms. This suggests that, compared with domestically-owned firms, foreign-owned firms, as expected, tend to value general skills more highly than firm-specific skills and do not follow the practice of life-time employment.

Following Abe (1997) and Tomiyama (2001) who consider a model in which firms forecast their production and determine their employment levels in advance, we predicted the output of each firm and

<sup>2</sup> The compilation of the micro data of *the Basic Survey of Business Activity* was conducted as a part of the RIETI project “Study on Industry- and Firm-level Productivity in Japan.”

tried to estimate the same specification using the predicted value of real output.<sup>3</sup> The right columns in Table 1 show that the coefficient of this estimation are not statistically significant. The previous results using actual output showed that foreign-owned firms adjust their workforces faster than domestically-owned firms. However, this result using predicted real output is not sufficiently robust evidence to conclude that the adjustment speed of employment in foreign-owned firms is faster.

While the results for the overall sample were inconclusive, it could still be the case that foreign-owned firms react more swiftly in times of adversity. In our next set of estimations, we therefore include a dummy variable for firms that reduced total employment, decreased their white-collar workforce, or experienced a decline in output. The dummy, *decreaseDUM<sub>it</sub>* takes the value 1 if the firm reduced total employment (or the white collar work force or saw a decline in real output) compared with the previous year and 0 otherwise. Each variable in (4) is multiplied by this dummy variable.

---

<sup>3</sup> The estimation result is:  $\log(Y_t) = 0.10079 + 0.985904 * \log(Y_{t-1}) + \text{industry dummies}$ . The t-statistics show that the coefficients are statistically significant at 1 % level. The number of observation is 50173. The predicted values do not include firm dummies.



$$\begin{aligned}
\ln L_{f,t} = & \beta_0 + \beta_1 * decreaseDUM + \beta_2 \ln L_{f,t-1} * decreaseDUM \\
& + \beta_3 \ln L_{f,t-1} * FF33DUM_{f,t} * decreaseDUM \\
& + \beta_4 \ln Y_{f,t} * decreaseDUM + \beta_5 \ln WAGE_{f,t} * decreaseDUM \\
& + \beta_6 \ln Y_{f,t} * FF33DUM_{f,t} * decreaseDUM_{f,t} \quad (5) \\
& + \beta_7 \ln WAGE_{f,t} * FF33DUM_{f,t} * decreaseDUM_{f,t} \\
& + \beta_8 FF33DUM_{f,t} * decreaseDUM_{f,t} \\
& + \sum_j \gamma_j INDYDUM_{f,j,t} + \sum_t \delta_t YEARDUM_{f,t}
\end{aligned}$$

If  $\beta_3$  shows a negative sign, the adjustment speed of foreign-owned firms is faster than that of Japanese firms, when they decrease their total employment (or the white-collar workforce or they experience a decline in real output). The estimation result displayed in Table 1b show that the adjustment speed of employment at foreign-owned firms is not higher. The coefficient in the cases of firms that reduced employment is  $-0.0909$ . It is larger than that of the basic estimation in which it is  $-0.0435$ . However, the z-statistics and the results of the Sargan tests are not significant. In the estimations where the dummy stands for a decline in real output or a reduction in the white-collar workforce, the coefficients are not consistent with our expectation. In these cases, the results of the Sargan tests do not reject over-identification. Foreign-owned firms do not necessarily value general skills more highly than firm-specific skills. The reason is probably that during the observation period from 1994 to 1998, Japan was plagued by recession and Japanese firms, that faced a decline in the predicted value of value added or that reduced their white-collar workforce, were making efforts to reduce their employment; as a result, significant differences in the adjustment speed of labor are not observed.

Our database is too small to obtain clear evidence. Dynamic panel estimators need lagged variable both for the dependent variable and independent variables. When we impose some conditions on the samples, the database includes an insufficient number of observations for this estimator. The results of the Sargan tests and the coefficients on the independent variable are not significant. More investigations are needed to analyze the employment strategies of foreign-owned firms in Japan, requiring a dataset covering a longer time span that would make it possible to examine foreign-owned firms' demand for labor.

**Table 1b The Adjustment Speed of Employment by Case**

The Case of Firms that Reduce Employment

|  |                                    |                                   |
|--|------------------------------------|-----------------------------------|
| log(Workers $t-1$ )*foreign dummy*decrease dummy | -0.0909<br>[-1.25]                 | -0.08628<br>[-1.19]               |
| _cons  | 0.028846 *<br>(1.89)               | 0.029481 *<br>[1.92]              |
| Wald Test  | chi2(59)=212.04<br>Prob>chi2=0.000 | chi2(8)=185.15<br>Prob>chi2=0.000 |
| Sargan Test                                      | chi2(2)=1.83<br>Prob>chi2=0.4006   | chi2(2)=2.14<br>Prob>chi2=0.3425  |
| No. of observations                              | 3963                               | 3963                              |

The Case of Firms that Reduce Real Output

|  |                                    |                                   |
|--|------------------------------------|-----------------------------------|
| log(Workers $t-1$ )*foreign dummy*decrease dummy | 0.6724 ***<br>[4.57]               | -0.08628<br>[-1.19]               |
| _cons  | -0.04086 ***<br>(-6.90)            | 0.029481 *<br>[1.92]              |
| Wald Test  | chi2(47)=544.35<br>Prob>chi2=0.000 | chi2(8)=480.82<br>Prob>chi2=0.000 |
| Sargan Test                                      | chi2(2)=4.57<br>Prob>chi2=0.1018   | chi2(2)=4.63<br>Prob>chi2=0.0986  |
| No. of observations                              | 2162                               | 2162                              |

The Case of Firms that Reduce the Number of White-Collar Workers

|  |                                    |                                   |
|--|------------------------------------|-----------------------------------|
| log(Workers $t-1$ )*foreign dummy*decrease dummy | 0.237268 *<br>[1.86]               | 0.009496<br>[0.11]                |
| _cons  | -0.0074 **<br>(-2.54)              | -0.00961 ***<br>[-3.28]           |
| Wald Test  | chi2(49)=365.62<br>Prob>chi2=0.000 | chi2(8)=295.70<br>Prob>chi2=0.000 |
| Sargan Test                                      | chi2(2)=0.36<br>Prob>chi2=0.8345   | chi2(2)=0.15<br>Prob>chi2=0.9262  |
| No. of observations                              | 1599                               | 1599                              |

Note: The estimation results of the other variables are abbreviated.

3. *Conclusion*

Using firm level data of the Japanese manufacturing sector, this paper investigated whether the adjustment speed of employment at foreign-owned is faster than that at domestically-owned firms. We would expect this to be the case because Japan's labor market is characterized by the life-time employment system and Japanese firms tend to hold on to their employees even in times of trouble.

Our estimation showed that basically the adjustment speed of employment at foreign-owned firms was slightly higher than at domestically-owned firms. This finding suggests that firm-specific skills are less important in foreign-owned firms than in Japanese firms. However, the estimations, in which we assumed firms forecast their output and determined employment levels accordingly in advance or in which observations included only those firms that reduced their output or the number of skilled workers did not show significant results, although we expected a more robust result, that is, that the adjustment of employment in the foreign-owned firms would be faster. Because in 1994-1998, Japan faced the long recession and the Japanese firms reduce the skilled labor or the foreign-owned firms may not decrease the

skilled labor more, the difference of the adjustment speed is not observed. While the findings here have failed to produce any clear evidence that this is the case, this could be because the data set spans only a fairly short period of time. Future investigations covering a longer time span may be able to shed more light on this issue.

### **Bibliography**

- Abe, M. (1999) "Koporeto Gabanansu to Koyo Chosei [Corporate Governance and the Adjustment Speed of Employment]," in J. Nakamura and M. Nakamura (eds.) *Nihon Keizai no Kozo Chosei to Rodo Shijo [Structural Adjustment of the Japanese Economy and the Labor Market]*, Tokyo: Nippon Hyoron Sha, 75-102.
- Abraham, K. G., and S. Houseman (1989) "Job Security and Work Force Adjustment: How Different are U.S. and Japanese Practices?" *Journal of the Japanese and International Economies* 3(4): 500-521.
- Arellano, M. and Bond, S. (1991) "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58: 277-297.
- Fukao, K., and M. Otaki (1993) "Accumulation of Human Capital and the Business Cycle," *Journal of Political Economy* 101(1): 73-99.
- Gordon, R. J. (1982) "Why U.S. Wage and Employment Behavior Differs from That in Britain and Japan?" *Economic Journal* 92 (365): 13-44.

- Hamermesh, D. S. (1993) *Labor Demand*, Princeton, New Jersey: Princeton University Press.
- Murakami, Y., and K. Fukao (2003) “Taigai tainai chokusetsu toshi to seizogyo kigyō no seisansai: kigyō katsudo kihon chosa kohyō deta ni motozuku jisho bunseki [Outward and Inward Foreign Direct Investment and Japanese Manufacturing Firms’ Productivity: Empirical Analysis Based on Firm-Level Data],” *Economic and Social Research Institute Discussion Paper Series 68*, Economic and Social Research Institute, Cabinet Office.
- Noda, T. (1998) “Roudou kumiai to koyō chōsei : kigyō paneru deta ni yoru bunseki [Labor Unions and the Adjustment of Employment: An Analysis Based on Firm Panel Data Analysis],” *Keizai Kenkyū* 49(4): 311-326, Hitotsubashi University.
- Saito, T. and T. Tachibanaki (2005) “Chusho Kigyō no Koporeto Gabanansu to Koyō Chōsei [Corporate Governance and Employment Adjustment in Small and Medium Firms],” *RIETI Discussion Paper Series 05-J-023*, Research Institute of Economy, Trade and Industry.  
Online: <http://www.rieti.go.jp/publications/dp/05j023.pdf>
- Tomiya, M. (2001) “Koporeto gabanansu to koyō chōsei [Corporate Governance and the Adjustment Speed of Employment],” *Nihon Rodo Kenkyū Zasshi* 488: 40-51. Japan Labor Research Organization.
- Wooldridge, J. (2001) *Econometric Analysis of Cross Section and Panel Data*, Cambridge, MA. MIT Press.