Performance, Productivity and M&A in the Shipping Industry

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In the shipping industry, Mergers and Acquisitions (M&A) had been often taken place from the beginning of the 21th century. With using unbalanced panel dataset comprises 133 shipping firms for the period 2002-2011, we consider whether M&As improve firms' performance or productivity. First, we calculate financial performance, labor productivity and total factor productivity (TFP). TFP indicates firms' technology level. We use two-step method developed by Levinsohn and Petrin (2003), to calculate TFP. This method adjusts endogeneity problem of input factors. Second, we relate performance and productivity to characteristics of them in order to identify the static, selection and dynamic effect of M&As. We examine whether the benefit of M&As like improvement in resource allocations, expanding in scale, makes firms' performance and productivity better.

Key Words: *Productivity, Merger, Acquisition, Shipping, Total Factor Productivity*

1. Introduction

(1) M&A activity in Shipping Industry

In the shipping industry, Mergers and Acquisitions (hereafter M&A) had been often taken place from the beginning of the 21th century.

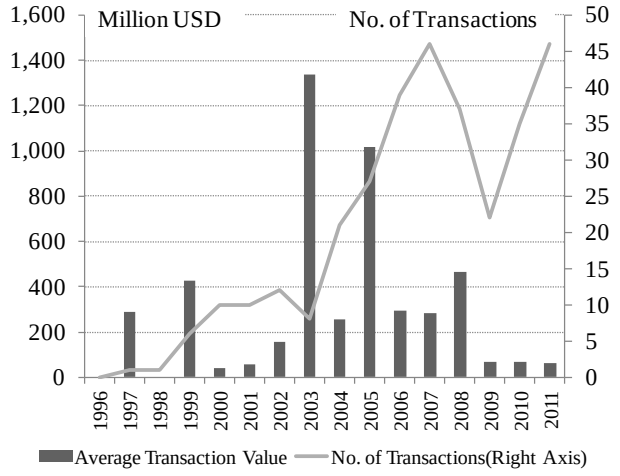

Fig.1 Average M&A Transaction Values and No. of M&A activities in Shipping Industry.

As we can see in Fig.1, M&A transaction by shipping companies were little seen in the last five years of the 20th century. After 2003, number of transaction was quickly increased and average transaction values were also increased. Probably it reflects two facts. First, M&A becomes a widely-used method. By Standard & Poor's Statistics, Other than shipping industry, the number of M&A activities was largely increased after 2003. And average transaction values have become smaller than before. Second, finance had been easier for shipping companies after shipping boom after 2003.

We examine whether the benefit of M&As like improvement in resource allocations, expanding in scale, makes firms' performance and productivity better.

(2) Literatures related to this study

We use approach developed by LP to calculate TFP. It regards residual between real value added and fitted value of estimated production function as TFP.

In this kind of estimation, an assumption for estimation by ordinary least squares is not satisfied because the productivity expressed as residual is correlated with input. Suppose the information of productivity is already known by a firm. If the productivity is high, this firm decides to use input more. While if the productivity is low, this firm does to use input less. However, for econometricians, the productivity is unknown information, and then the effect by productivity change is included in the error

term. Thus, the endogeneity problem that the independent variable is correlated with the error term occurs and the regression coefficient in an ordinary least squares regression is biased. If difference in the productivity is firm specific and if the productivity is constant over time, we can handle this problem using fixed effect model. However, it is not appropriate assumption in most case that the productivity is constant over time.

A research that tackles this endogeneity problem other than fixed effect model is Olley and Pakes (1996)（hereafter OP）. They proposed the method handles the endogeneity bias explicitly in the estimation of production function. First, they consider the case that the shock by the productivity change has an effect not only on the production function but also on the facility investment function. They suggested that if there is monotone relationship between the level of facility investment and the productivity, the endogeneity problem may be handled by using the level of investment as proxy for the productivity shock. Based on this idea, the OP method computes estimator without bias in two-step.

However, the OP method also has problems. Because there is adjustment cost in investment, smooth response cannot be achieved by investment as proxy for the productivity shock. Further, if we would like to use OP method, we can only take sample that investment for facilities is taken place. LP tackles this problem. They use intermediate input as proxy instead of investment to be able to estimate with more samples. And now, the methodology by LP to estimate the productivity is a widely used to calculate TFP.

Secondly we relate productivity to characteristics of them in order to identify the static, selection and dynamic effect of M&As. This method is often used in consider the effect of deregulation or privatization in banking sector. For example, Berger et al. (2005) suggested this method, and found that in Argentina, state-owned banks have poor long-term performance and privatization improves performance of banks, but improvement is likely due to placing nonperforming loans into residual entities. Nakane and Weintraub (2005) estimates the productivity of Brazilian banks by LP method and evaluates the effect of privatization using method suggested by Berger et al. (2005). Lin and Zhang (2009) used this method and showed that although foreign investment did not have large performance improvement.

With using unbalanced panel dataset comprises 133 shipping for the period 2002-2011, we consider whether M&As improve firms' performance or productivity. We examine whether the benefit of M&As like improvement in resource allocations, expanding in scale, makes firms' performance and productivity better.

The rest of the paper is organized as follows. Section 2 explains data used in this study. Section 3 introduces measuring method of productivity proposed by Levinsohn and Petrin (2003), and gives value added productivity of shipping industry. Section 4 examines the relationship between the productivity measured in Section 4 and static, selection and dynamic characteristics of M&As in shipping industry. Section 5 concludes the paper.

2. Data

In this study, data is in principle taken from Standard & Poor's CapitalIQ Database. It gives balance sheets and income statements data. We complemented some data by companies' annual reports. And we convert them real value with consumer price index from Federal Reserve Board website. Finally, our dataset comprises 133 shipping firms for the period 2002-2011 but it is unbalanced panel. Total observations are 1,090.

(1) Variables for measuring TFP

Table 1 shows summary statistics of data for measuring TFP. Property indicates the net monetary value of ships and other facilities. And it is the largest part of total asset. Cost of revenue indicates basic costs such as bunker oil. It does not contain labor cost. This is used as intermediate input to calculate TFP. Value added indicates created monetary value by the industry. Usually, Value added is calculated by operating profit plus staff cost. Because of data restriction, we calculated it by operating profit plus Selling, General and Administrative Expense. This cost contains staff cost.

Summary statistics show that all averages exceed medians considerably. And all standard deviations are larger than averages. This is caused by the scale difference between sample firms. So we consider the tendency of these variables with Fig.1 which illustrates annual changes of weighted average value of the data, all data has expanding trend. Total asset is used as weight.

Table 1 Summary Statistics of variables for measuring TFP

	Employees (person)	Property (Millon USD)	Cost of Revenue (Million USD)	Value Added (Million USD)
Average	4,122	1,332	1,658	365
Median	636	154	552	97
Standard Deviation	13,370	4,086	4,209	1,223
Minimum	1.0	-5.4	0.1	-841.9
Maximum	120,000	42,231	45,758	16,768
Observations	870	1,090	1,088	1,090

First, Fig.2 shows that these four data had expanding tendency. This reflects cargo expansion from

2003. But after 2006, increase in employees was ceased. Then increase in cost of revenue and value added were also stopped in 2008.This is caused by the considerable cargo decrease after the financial crisis. And it reflects the cost reduction by slow steaming by shipping companies after 2009.Property basically keeps expansion because the delivery of ships which ordered before the crisis are not still completely stopped in 2011.

And we can find the difference between cost of sales and value added becomes larger. This indicates that the increase of the intermediate input cost contributes more than the increase of the value added.

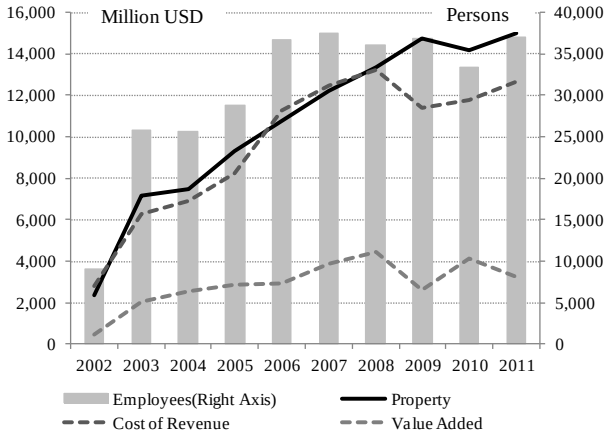

Fig.2 Annual Changes of the Average value of variables for measuring TFP

(2) Performance variables

Other than TFP, we focus on four performance measures. First, we use a measure of firms' profitability, return on assets (hereafter ROA), defined as operating profit relative to total assets. Second, we use a measure of firms' financial stability, equity ratio defined as total equity relative to total assets. Third, we also use the labor productivity defined as *per capita* value added.

Table 2 shows summary statistics of performance variables. The Average of ROA and equity ratio is not so different from their medians. It indicates that these figures are not so biased. Standard deviations are not large for these variables. But the average of labor productivity is considerably larger than median. This reflects existence of outliers.

Table 1 Summary Statistics of performance variables

	ROA	Equity Ratio	Labor Productivity
Average	0.07	0.42	0.85
Median	0.05	0.40	0.12
Standard Deviation	0.08	0.21	3.53
Minimum	-0.40	-1.10	-9.42
Maximum	0.55	1.00	52.37
Observations	1,090	1,090	864

And Fig.3 shows that equity ratio was increased about 10% from 2002 to 2005. And it was not so decreased after the financial crisis. Then financial stability of shipping firms becomes well.

However, labor productivity has decreasing tendency from 2004 and recent figures are lower than 2002.And ROA also has similar tendency. This means the increase in sales is not related to the increase in profit or salaries.

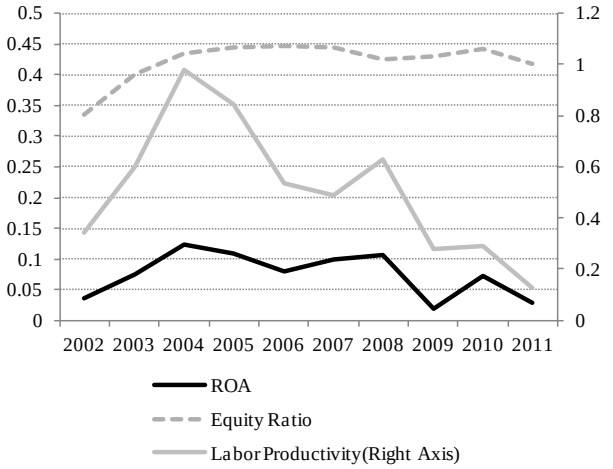

Fig.3 Annual Changes of the Average value of performance variables

3. Measuring Productivity

(1) Estimation of Production Function

Before starting estimation, we explain two-step estimation method proposed by LP and Petrin et al.(2005). We assume that the production function takes Cobb-Douglas form. Then, the natural logarithm of production function is described as (3a).

$$v_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \varpi_t + \eta_t \qquad (3a)$$

v_t is natural logarithm of value added in t, l_t and m_t are natural logarithm of labor input and intermediate input in t. k_t is natural logarithm of capital input in t.

Error term is made up of ϖ_t and η_t. The former is state variable that corresponds to productivity and has effects on firms' decisions. And the latter is "pure" error term that is not correlated with input choice.

Now, we assume that demand for intermediate input is dependent on k_t and ϖ_t. Then we can write demand function of intermediate input as

$$m_t = m_t\left(k_t, \varpi_t\right) \tag{3b}$$

.

If this demand function is monotonically increasing in ϖ_t, we can make the inverse demand function. ϖ_t is expressed as function of k_t and m_t,

$$\varpi_t = \varpi_t\left(k_t, m_t\right) \tag{3c}$$

Thus, we can write the production function as

$$v_t = \beta_l l_t + \phi_t\left(k_t, m_t\right) + \eta_t \tag{3d}$$

where $\phi_t\left(k_t, m_t\right) = \beta_0 + \beta_k k_t + \varpi_t\left(k_t, m_t\right)$.

If we substitute third-order polynomial in and for k_t and m_t, we are able to consistently estimate parameters of (3e) using ordinary least squares.

$$v_t = \delta_0 + \beta_l l_t + \sum_{i=0}^{3}\sum_{j=0}^{3-i}\delta_{ij} k_t^i m_t^j + \eta_t \tag{3e}$$

Although we cannot separately identify β_0 from the intercept of $\phi_t\left(k_t, m_t\right)$, we may have estimate of β_l and ϕ_t . This completes the first step.

In the second step, we estimate β_k . We begin by estimating ϕ_t using $\hat{\phi}_t = \hat{v}_t - \hat{\beta}_t l_t$, that is,

$$\hat{\phi}_t = \hat{\delta}_0 + \sum_{i=0}^{3}\sum_{j=0}^{3-i}\hat{\delta}_{ij} k_t^i m_t^j \tag{3f}$$

For any candidate of β_k, we can calculate a prediction of ϖ_t for all t , using

$$\hat{\varpi}_t = \hat{\phi}_t - \beta_k k_t \tag{3g}$$

In addition, LP assumes that productivity follows first-order Markov process,

$$\varpi_t = E\left[\varpi_t \mid \varpi_{t-1}\right] + \xi_t \tag{3h}$$

where ξ_t is innovation term of productivity, and is not correlated with k_t .Using $\hat{\varpi}_t$, we may have consistent nonparametric approximation of $E\left[\varpi_t \mid \varpi_{t-1}\right]$. Precisely, the approximation of $E\left[\varpi_t \mid \varpi_{t-1}\right]$ is given by the predicted value of this regression,

$$\hat{\varpi}_t = \gamma_0 + \gamma_1\hat{\varpi}_{t-1} + \gamma_2\hat{\varpi}_{t-1}^2 + \gamma_3\hat{\varpi}_{t-1}^3 + \varepsilon_t \tag{3i}$$

In accordance with LP, we will call this $E\left[\hat{\varpi}_t \mid \hat{\varpi}_{t-1}\right]$. Given $\hat{\beta}_l$, β_k and $E\left[\hat{\varpi}_t \mid \hat{\varpi}_{t-1}\right]$, LP write the sample residual of the production function as

$$\hat{\eta}_t + \hat{\xi}_t = v_t - \hat{\beta}_l l_t - \beta_k^* - E\left[\hat{\varpi}_t \mid \hat{\varpi}_{t-1}\right] \tag{3j}$$

Then, we can have $\hat{\beta}_k$ which is the estimate of β_k as the solution to

$$\min_{\beta_k}\sum_t\left(v_t - \hat{\beta}_l l_t - \beta_k - E\left[\hat{\varpi}_t \mid \hat{\varpi}_{t-1}\right]\right)^2 \tag{3k}$$

(2) Estimation Result of Productivity

Table 3 shows the results of the estimation of production function by methodology by LP. We did this by using property. And for comparison, we show the estimation results by ordinary least squares (hereafter OLS).

Table 3 Estimation Result of TFP

	Dependent Variable: Value Added	
	OLS	Levinsohn-Petrin
ln(Employees)	0.1577 (8.35)***	0.0874 (2.19)**
ln(Property)	0.7539 (29.55)***	0.7489 (4.60)***
Constant	-1.1113 (7.93)***	
Observations	773	773
R-squared	0.7	

Absolute value of t statistics in parentheses

** significant at 10%; ** significant at 5%; *** significant at 1%

For all estimation, coefficients of employee which is labor input variable are positive and significantly different from zero. But if capital input (property) variable is same, the coefficient of employees by OLS (0.1577) is greater than by LP (0.0874). For the coefficient of capital input, there is not significant difference between OLS (0.7539) and LP (0.7489). They are also positive and significantly different from zero.

As we have already noted, in order to express productivity as a function of intermediate input and capital input, estimation by LP takes advantage of the nature that intermediate input is monotonically in-

creasing in productivity. Then we must check whether this assumption for using LP method. For this purpose, we arrange estimation of (3b) in subsection 3(1) and that intermediate input on productivity by LP and capital input. Because of space restriction, result is not shown. But for all independent variables, coefficients are positive and significantly different from zero. Thus, our data is satisfied assumption for using LP method.

Table 4 shows summary statistics of TFP. Because of outliers, average and standard deviation are considerably larger than median.

Table 4 Summary Statistics of TFP

	TFP
Average	0.84
Median	0.54
Standard Deviation	1.67
Minimum	0.00
Maximum	29.95
Observations	773

Fig.4 shows that TFP had been largely increased from 2003 to 2008. However after the crisis, TFP went down to former level.

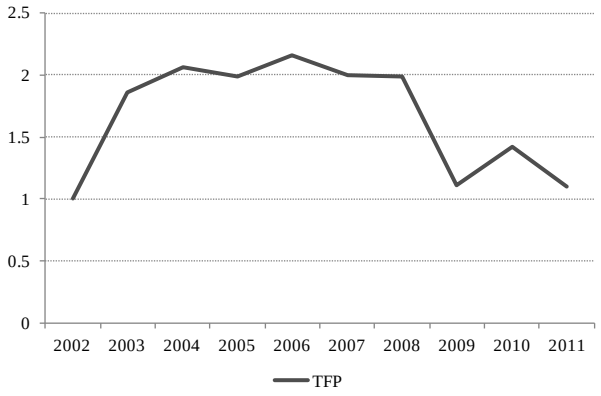

Fig.4 Annual Changes of the Average value of TFP

4. Productivity, Performance and M&A

(1) Model

In this section, we argue that relationship between change in ownership and productivity estimated in the previous section. Following Berger et al. (2005), we evaluate them effect through the three effects. The static effect indicates different types of business, such as container shipping, bulker, tanker and so on. The selection effect checks the inherent tendency. And the dynamic effects indicate the two types of effect by M&A. First one is the before and after effect on productivity and performance. This indicates that whether productivity and performance are increased after M&A. Second one is the over time effect. This indicates that whether productivity and performance are increased after M&A over time. The regression model we employ is (4a).

$$TFP_{it} = \rho + \theta_1 ST_i + \theta_2 SE_t + \theta_3 DY1_{it} + \theta_4 DY2_{it} + \theta_5 CO_{it} + \theta_6 YF_t + \zeta_{it} \quad (4a)$$

where ρ is constant, ST are the indicators associated with static effect, SE are dummy variables that indicate the selection effect, DY1 indicates whether before or after M&A, DY2 indicates years after M&A. COs are other control variables and YFs are year fixed effects. The control variables include the logarithm of lagged total assets to help account for firms' size. The year fixed effect is used to capture the many changes in market and other conditions over the year.

The variables specified in (4a) are defined in Table 5.

Table 5 Variables in regression models

Symbol	Definition
Dependent Variables	
TFP	Total Factor Productivity estimated by LP method.
ROA	Return on assets, defined as operating profit relative to total assets.
EQR	Equity ratio defined as total equity relative to total assets.
LBP	labor productivity defined as value added relative to employees.
Independent Variables	
Static Dummy	
Container	Dummy variable indicating a shipping company engages in container shipping business. Takes 1 or 0 for all periods for a company.
Bulker	Dummy variable indicating a shipping company engages in bulk carrier shipping business. Takes 1 or 0 for all periods for a company.
Tanker	Dummy variable indicating a shipping company engages in tanker shipping business. Takes 1 or 0 for all periods for a company.
GAS	Dummy variable indicating a shipping company engages in GAS carrier shipping business. Takes 1 or 0 for all periods for a company.
CAR	Dummy variable indicating a shipping company engages in CAR carrier and Ferry shipping business. Takes 1 or 0 for all periods for a company.

Table 5(Continued) Variables in regression models

Selection Dummy	
M&A_Buyer	Dummy variable indicates that experienced a M&A as a buyer. Takes 1 or 0 for all periods for a company.
M&A2nd_Buyer	Dummy variable indicates that experienced a M&A as a buyer twice or more. Takes 1 or 0 for all periods for a company.
M&A_Seller	Dummy variable indicates that experienced a M&A as a seller(target). Takes 1 or 0 for all periods for a company.
M&A2nd_Seller	Dummy variable indicates that experienced a M&A as a seller(target) twice or more. Takes 1 or 0 for all periods for a company.
Dynamic Dummy	
dynamic_M&A_Buyer	Dummy variable indicating the following years a M&A as a buyer. Takes 1 from the next year following the M&A transaction.
dynamic_M&A2nd_Buyer	Dummy variable indicating the following years second (or more) M&A as a buyer. Takes 1 from the next year following the M&A transaction.
dynamic_M&A_Seller	Dummy variable indicating the following years a M&A as a seller(target). Takes 1 from the next year following the M&A transaction.
dynamic_M&A2nd_Seller	Dummy variable indicating the following years second (or more) M&A as a seller(target). Takes 1 from the next year following the M&A transaction.
Dynamic time indicator	
dynamic_time_M&A_Buyer	Number of years since a M&A as a buyer. Takes 0 for all periods prior to a foreign acquisition. Starts with 1 for the first year following the change.
dynamic_time_M&A2nd_Buyer	Number of years since second (or more) M&A as a buyer. Takes 0 for all periods prior to a foreign acquisition. Starts with 1 for the first year following the change.
dynamic_time_M&A_Seller	Number of years since a M&A as a seller(target). Takes 0 for all periods prior to a foreign acquisition. Starts with 1 for the first year following the change.
dynamic_time_M&A2nd_Seller	Number of years since second (or more) M&A as a seller(target). Takes 0 for all periods prior to a foreign acquisition. Starts with 1 for the first year following the change.
Other Control Variables	
ln(asset)	Natural logarithm of total assets in period t-1 for each company.
Year fixed effects	Year dummys. Base year is 2002.

(2) Estimation Results

Table 6 shows the estimation results by the employed regression models.

Table 6 Estimation Results: performance, productivity and M&A activities

	Dependent Variable			
	TFP	ROA	EQR	LBP
Static Dummy				
Container	0.062	-0.0009	-0.0104	0.298
	(0.37)	(0.15)	(0.63)	(0.91)
Bulker	-0.0564	0.0314	0.0404	-0.4896
	(0.42)	(6.60)***	(2.96)***	(1.86)*
Tanker	-0.0337	-0.0046	-0.0511	1.3621
	(0.24)	(0.90)	(3.47)***	(4.82)***
GAS	-0.0772	-0.0148	-0.0323	-1.1595
	(0.48)	(2.43)**	(1.85)*	(3.61)***
CAR	-0.1254	-0.0174	-0.0331	-0.1593
	(0.72)	(2.64)***	(1.75)*	(0.46)
Selection Dummy				
M&A_Buyer	0.2376	0.0266	0.0156	-0.2623
	(1.01)	(3.22)***	(0.66)	(0.57)
M&A2nd_Buyer	-0.7796	-0.0332	-0.0576	-1.4291
	(1.72)*	(2.13)**	(1.29)	(1.62)
M&A_Seller	-0.0934	-0.0606	-0.0784	0.2882
	(0.33)	(5.67)***	(2.55)**	(0.53)
M&A2nd_Seller	-0.2308	0.0403	0.0638	-1.1223
	(0.50)	(2.07)**	(1.14)	(1.18)
Dynamic Dummy				
dynamic_M&A_Buyer	1.3900	0.0012	0.0737	0.2970
	(3.48)***	(0.08)	(1.72)*	(0.37)
dynamic_M&A2nd_Buyer	-0.4973	-0.0107	-0.1132	-0.4229
	(-0.73)	(0.38)	(-1.41)	(-0.31)
dynamic_M&A_Seller	0.1898	0.0529	-0.0410	-0.6409
	(-0.25)	(1.86)*	(-0.50)	(-0.42)
Dynamic time indicator				
dynamic_time_M&A_Buyer	-0.137	-0.0002	-0.0167	0.2321
	(2.17)**	(0.07)	(2.22)**	(1.77)*
dynamic_time_M&A2nd_Buyer	0.2067	0.0134	0.0364	-0.0676
	(1.31)	(1.97)**	(1.86)*	(0.20)
dynamic_time_M&A_Seller	-0.034	-0.0081	0.0136	-0.0615
	(0.15)	(0.98)	(0.57)	(0.14)
Other Control Variables				
ln(asset)	0.053	0.0041	0.0114	-0.1271
	(-1.02)	(2.31)**	(2.22)**	(-1.25)
Year Dummy	Yes	Yes	Yes	Yes
Constant	0.455	0.0323	0.335	1.917
	(1.27)	(2.67)***	(9.67)***	(2.76)***
Observations	773	1,090	1,090	864
R-squared	0.06	0.26	0.06	0.06

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

First, we check the static effects. Coefficients of Dummy Variables for container business are all insignificantly different from zero. Coefficients of Except TFP regression, dummy variables for bulker business are significantly different from zero. However in LBP regression, coefficient is negative. Thus in bulker business, inherently profitability and stability are higher, and labor productivity is inherently lower. For tanker business, coefficients of EOR and LBP regression are significantly different from zero. Coefficient of EQR is negative that of LBP is positive. This indicates that in tanker business, inherently labor productivity is higher, and profitability is inherently lower. For GAS carrier business, coefficients of ROA, EQR and LBP regressions are sig-

nificantly different from zero and negative. This indicates that in GAS carrier business, inherently profitability, stability and labor productivity are lower. For CAR carrier business, coefficients of ROA regressions are significantly different from zero and negative. This indicates that in CAR carrier business, inherently profitability is lower.

Second, we check the selection effects. Coefficients of M&A_Buyer are insignificantly different from zero except ROA regression. In the ROA regression, the coefficient of M&A_Buyer is significantly positive. This indicates that M&A buyer firms are inherently profitable. Similarly, coefficients of M&A2nd_Buyer are insignificantly different from zero except ROA regression. But coefficient in ROA regression is significantly negative. So this means M&A buyer firms have higher profitability, but repeated M&A buyer firms have lower profitability. Coefficients of M&A_Seller are significantly negative in ROA and EQR regressions. Thus, M&A seller firms have lower profitability and stability. Coefficients of M&A2nd_Buyer are insignificant except ROA regression. Coefficient in ROA regression is significantly positive. This indicates repeated M&A seller firms have lower profitability in total. But they have better profitability than M&A sellers who sold only once.

Third, we check the dynamic dummies. Coefficients of dynamic_M&A_Buyer are significantly positive in TFP and EQR regressions. This indicates that after M&A, buyer firms increase TFP and stability. Coefficients of dynamic_M&A_Seller are significantly positive in ROA regression. This indicates that after M&A, seller firms increase productivity. And Coefficients of dynamic_M&A2nd_Seller are dropped.

Fourth, we check the dynamic time indicators. Coefficients of dynamic_time_M&A_Buyer are significantly negative in TFP and EQR regressions, and significantly positive in LBP regression. This indicates that after M&A, buyer firms decrease TFP and stability over time. On the other hand, buyer firms increase labor productivity and stability over time.
Coefficients of dynamic_time_M&A2nd_Buyer are significantly positive in ROA and EQR regressions. This indicates that after M&A, buy firms increase profitability and stability. And Coefficients of dynamic_time_M&A2nd_Seller are dropped.

From the estimation results, buying other organization through M&A activities have large effect on TFP and EQR for the first time. And selling their organization or child firms through M&A activities have large effect on ROA. Thus M&A activities have positive effect. But M&A effect on TFP and EQR are short term. Overtime negative effects (the coefficients of dynamic_time_M&A_Buyer) gradually cancel out the past positive effects. On the other hand, repeated purchase has negative effect at the beginning on ROA and EQR, but gradually turns to be positive.

5. Concluding Remarks

In this study, we consider the effect of M&A activities in the shipping industry. With using unbalanced panel dataset comprises 133 shipping for the period 2002-2011, we consider whether M&As improve firms' performance or productivity.

First, from summary statistics, we found the difference between cost of sales and value added becomes larger. This indicates that the increase of the intermediate input cost contributes more than the increase of the value added. And this means the increase in sales is not related to the increase in profit or salaries. In fact, ROA and labor productivity has decreasing tendency.

Second, from the estimation results, buying other organization through first time M&A activities have large effects on TFP and financial stability. But these effects are valid in short term. As time goes, negative effects balance out the positive effects. Thus, the M&A effect on TFP are short and there is not any leaning effect. This indicates that purchased firms' assets are easy to degrade and purchased firms' technologies are probably obsolete.

We found learning effect on labor productivity for the first purchase. But any learning effects on labor productivity by repeated purchase.

Repeated purchases have longer effects on profitability and financial stability. These might be some kinds of learning effects. So repeated purchases might be useful.

Selling their organization or child firms through M&A activities have large effect on ROA.

We conclude that M&A activities have positive effects on shipping companies. Our study provides a little support for the recent M&A activities in shipping industry. On the profitability and financial stability, longer term effects are found. Then resource reallocation effect of M&A works well. And positive effect on TFP and labor productivity although they continues only short term.

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