Chapter 3

Which Aspect of Firm Performance is Important for the Choice of Globalization Mode?

3.1 Introduction

The relationship between firm performance and the choice of globalization mode, such as exports, foreign direct investment (FDI), and foreign outsourcing (FO), has been extensively investigated. For example, Melitz (2003) theoretically predicts a premium in productivity for firms engaging in exporting goods, relative to those supplying goods only to their domestic markets. Helpman et al. (2004) predict a further productivity premium for multinational enterprises (MNEs). Empirically, the superior performance of exporting firms relative to non-globalized firms has been confirmed by a number of studies (e.g., Bernard and Jensen 1995, 1999; Clerides et al. 1998; Mayer and Ottaviano 2007). Moreover, the productivity advantage of MNEs relative to non-MNE exporters has been documented (e.g., Head and Ries 2003; Helpman et al. 2004; Kimura and Kiyota 2006; Wakasugi 2014).¹

On the other hand, Antràs and Helpman (2004) theoretically demonstrate that the productivity ordering (from the highest to the lowest) emerges from MNEs, foreign outsourcers, and non-globalized firms. Their prediction is supported by Tomiura (2007), Federico (2010), and Kohler and Smolka (2012) but partially unsupported by Defever and Toubal (2013). As for the choice between FDI and FO, Chen et al. (2012) predict that a high Tobin's q tends to motivate firms to choose FDI rather than FO. Jinji et al. (2019b) find empirical support for their prediction.

In this chapter, we attempt to compare the effects of firm performance on firms' globalization activity through various measures. We use detailed Japanese firm-level data covering the period 1994–1999 for empirical analysis. Our dataset includes information on sales, employment, capital, research and development (R&D) expenditure, direct exports, and costs of domestic and foreign outsourcing of the companies headquartered in Japan, and sales of their foreign affiliates. Data on corporate

¹ For a survey of the literature, see Greenaway and Kneller (2007), Helpman (2006), and Wagner (2007, 2012).

balance sheets and patent applications are also included. Then, we capture the degree of engagement in each mode of globalization by calculating the ratio of a mode of globalization activity (export, FDI, or FO) to the domestic sales of headquarters companies. We also capture the relative choice of globalization mode by taking the ratio of the volume of direct export by the headquarters companies to FDI (i.e., sales of foreign affiliates) and their ratio of costs of FO to FDI.

As for the measures of firm performance, we use three variables. First, as a measure of productivity, we use labor productivity (LP), defined by value-added per worker. LP is among the most frequently used measures in the literature, to measure productivity. Second, we employ two different measures to capture the importance of knowledge-capital intensity, discussed in Chen et al. (2012). One measure is Tobin's q (Tobin 1969). We estimate Tobin's q by a simple approximation version proposed by DaDalt et al. (2003). Another one is intangible asset intensity, which is the ratio of intangible to tangible assets. In general, intangible assets include patents, copyrights, trademarks, trade names, goodwill, and other items that lack physical substance but provide long-term benefits to the company. In this chapter, we use the stock of patent applications as a direct measure of intangible assets.

Then, we regress the indexes of firm choice of globalization mode on these variables. We employ a quantile regression in order to incorporate a strong negatively skewed distribution of our indexes of globalization activity. Unlike traditional estimation techniques such as the linear regression model, the quantile regression can provide estimates of parameters at different points in the conditional distribution of the dependent variable. Thus, it incorporates heterogeneity among firms and allows outliers in the sample.² In our estimation, we control for capital intensity (capital–labor ratio) and R&D intensity (the ratio of R&D stock to labor).

The main findings are as follows. Our quantile regression estimation indicates that LP plays an important role in the choice between exporting and FDI but Tobin's q does not. In contrast, Tobin's q has a significant effect on the choice between FDI and FO, but LP does not. Interestingly, the intangible asset intensity favors FDI over both exporting and FO. Finally, our estimation result indicates that firms with higher physical capital intensity tend to engage in more FDI and less FO.

The remainder of the chapter is organized as follows. Section 3.2 describes the data employed in this chapter and explains variables used in our analysis. Section 3.3 explains our estimation strategy. Section 3.4 provides empirical results and discusses implications arising from those results. Section 3.5 concludes.

² Koenker and Bassett (1978) introduce quantile regressions. See Koenker (2005) and Hao and Naiman (2007) for technical details. In the trade literature, studies of employing quantile regressions include Dufrenot et al. (2010), Figueiredo et al. (2016), Liu and Ma (2021), and Wagner (2006).

3.2 Data and Variables

3.2.1 Data

We first collect firm-level data on Japanese companies from two sources: the Basic Survey of Japanese Business Structure and Activities (BSJBSA) or *Kigyo Katsudo Kihon Chosa*, and the Basic Survey of Overseas Business Activities (BSOBA) or *Kaigai Jigyo Katsudo Kihon Chosa*. These are annual surveys implemented by the Ministry of Economy, Trade and Industry (METI) and include data on the business activities of companies headquartered in Japan and their affiliates, such as sales, employment, capital, R&D expenditure, and direct exports of the headquarters, and sales of their foreign affiliates. The BSJBSA also includes information on outsourcing—i.e., the number of domestic and foreign firms to which a headquarters company contracted out its manufacturing or processing tasks and the cost involved in contracting out business activities during 1994–1999.

We obtain data on corporate balance sheets from the Nikkei Economic Electronic Database Systems (NEEDS) Company Financial Reports, which covers about 4,000 publicly traded firms on the Japanese stock market. All publicly traded firms are identified by two codes—a Nikkei company code defined by Nikkei Inc. and a security code defined by the Japanese Securities Identification Code Committee. Since firm codes in the BSJBSA and BSOBA surveys differ from those in NEEDS, we use the Nikkei company code to link the three datasets. By matching the full names and addresses of companies among the three datasets we were able to identify approximately 1,100 headquarters companies for each year during the period 1994–1999.

Moreover, we collect data on patent applications by companies headquartered in Japan made to the Japanese Patent Office (JPO) during 1990–1999 from the database released by the Institute of Intellectual Property (IIP).³

3.2.2 Measures of Globalization Activity

The globalization activity of our sampled companies is indicated by providing the number of firms engaging in each globalization mode in Table 3.1. We identify FDI firms, outsourcing firms, and export firms by acquiring information on foreign affiliates' sales reported in the BSOBA survey in year t and on the costs of FO and export reported in the BSJBSA survey in year t . Among these headquarters companies, about two-thirds reported implementing at least one globalization activity from 1994 to 1999. The share of the companies involved in globalization activities in our sample is overwhelming, contrary to the findings in Tomiura (2007) that about 90% of the firms are “domestic” for Japanese companies. This may be because the publicly traded companies are usually sizable and competitive compared with firms that

³ See Goto and Motohashi (2007) for the details of the IIP dataset.

Table 3.1 Globalization choice of Japanese companies

Year	No. of firms	Export (X) only	FDI (I) only	FO (O) only	$X + I$	$I + O$	$X + O$	All ($X + I + O$)
1994	1006	325	32	13	315	101	131	89
1995	1280	277	51	6	503	141	167	135
1996	1388	234	68	9	555	167	195	160
1997	1323	193	77	5	569	157	173	149
1998	1334	222	67	9	551	153	186	146
1999	1380	248	71	13	552	157	188	151
Total	7711	1499	366	55	3045	876	1040	830

Source: Authors' calculation from BSJBSA and BSOBA for 1994–1999

Table 3.2 Descriptive statistics

	No. Obs.	Mean	Std. Dev.	Percentiles				
				10%	25%	50%	75%	90%
RXI	3707	32.44	719.43	0.00	0.27	0.84	2.16	7.13
ROI	3707	997.16	28608.99	0.00	0.00	0.00	0.02	19.52
$TobinQ$	7105	1.29	0.61	0.80	0.98	1.18	1.44	1.78
$LnPatK$	5691	− 5.17	1.86	−7.76	−6.31	−4.86	−3.81	−3.02
$LnLP$	7084	2.25	0.72	1.36	1.81	2.26	2.71	3.13
$LnKL$	7104	2.48	0.82	1.54	2.02	2.48	2.95	3.45
$LnRL$	5691	−12.17	1.99	−14.68	−13.34	−11.92	−10.79	−9.94

Source: Authors' calculation from BSJBSA, BSOBA, NEEDS, and IIP for 1994–1999

are not publicly traded. Therefore, the publicly traded companies may have greater ability to enter international markets. Among our sampled companies, over 66% undertake FDI (including companies that also engage in export and/or FO). About 83% of our sampled firms export and 36% outsource. Compared with the number of firms engaged in FDI and exporting, the number of FO firms is quite limited.

To capture the degree of engagement in globalization modes, we construct indexes to measure the relative choice of globalization modes. RXI is the ratio of export sales (denoted X) to FDI, which is measured by sales by foreign affiliates (denoted I). ROI is the ratio of outsourcing costs (denoted O) to foreign affiliate sales (I). The former measures the relative choice of exporting over FDI, and the latter measures the relative choice of FO over FDI.

Descriptive statistics are summarized in Table 3.2. The statistics of the percentiles and mean show that the distributions of the indexes have a strong negative skew. There are some outliers among firms that engage in globalization activities, reflecting that some leading MNEs mainly produce abroad rather than domestically.

3.2.3 Measures of Firm Performance

In this subsection, we explain our measures of firm performance. We begin with LP. Following Tomiura (2007), LP ($LnLP$) is measured in logarithms as

$$LnLP = \log [(Sales - COGS)/L],$$

where L and $Sales$ denote the number of regular employees and total sales, respectively, and $COGS$ refers to the cost of goods sold. Tomiura (2007) argues that this measure is preferable to gross output per worker because deducting costs from sales is important, especially when the manufacturing process involves outsourcing.

Tobin's q (Tobin 1969) is measured as the ratio of the firm's market value to its tangible assets. Corporate finance scholars have developed complex estimations of Tobin's q that rely on the estimated market value of the firm (Abel and Blanchard 1986; Perfect and Wiles 1994). As indicated by DaDalt et al. (2003), these approaches to Tobin's q produce more precise estimations but are computationally costly. Moreover, these approaches may be subject to a larger selection bias. They suggest that a simple approach is preferable unless extreme precision of the q estimates is paramount and the sample selection bias is unlikely to be significant. We attempt to use a simpler approximation version as discussed in DaDalt et al. (2003), who propose the following simple approximation of Tobin's q :

$$\text{Tobin's } q = \frac{MVE + PS + LTDEBT + CL + BVINV - CA}{TA},$$

where MVE is the year-end value of common stock and PS is the liquidation value of preferred stock. $LTDEBT$, CL , $BVINNV$, CA , and TA denote the book values of long-term debt, current liabilities, inventory, current assets, and total assets, respectively. We exclude PS in our measure for Tobin's q because the data are unavailable.

As a measure of intangible assets, we use patent stock, Pat . We construct a patent stock at period t from the data on patent applications by using the perpetual inventory method as follows:

$$Pat_t = I_t + (1 - \delta)Pat_{t-1}, \quad (3.1)$$

where Pat_t is the stock of patent applications at the end of period t , I_t is the number of patent applications during period t , and δ is the depreciation rate. Following the convention in the literature, we resort to the traditional 15% depreciation rate (see Hall et al. 2005). We use the number of patent applications in 1990 as the benchmark value for Pat . Since our data on patent applications begin from 1990 and our sample period begins in 1994, there are four years between the benchmark year and the first year of the sample period. Thus, the value of Pat in 1994 estimated by the perpetual inventory method is influenced little by the initial value of Pat in the benchmark year. We then compute the logarithm of the ratio of patent stock to tangible fixed capital, denoted as $LnPatK$, as a measure of the ratio of intangible to tangible assets.

Table 3.3 Correlations of variables

	<i>LnLP</i>	<i>TobinQ</i>	<i>LnPatK</i>	<i>LnKL</i>	<i>LnRL</i>	<i>RXI</i>	<i>ROI</i>
<i>LnLP</i>	1						
<i>TobinQ</i>	0.18	1					
<i>LnPatK</i>	−0.17	0.15	1				
<i>LnKL</i>	0.35	−0.03	−0.26	1			
<i>LnRL</i>	−0.21	0.06	0.80	−0.32	1		
<i>RXI</i>	−0.02	0.01	0.01	−0.02	0.01	1	
<i>ROI</i>	0.00	−0.01	0.00	−0.02	0.02	0.09	1

Moreover, as shown in Helpman et al. (2004), we control for capital intensity and R&D intensity. The former is measured by the logarithm of the ratio of tangible fixed capital to regular employees in the headquarters company, denoted as *LnKL*. The latter is measured by the logarithm of the ratio of R&D stock to employees, denoted as *LnRL*. R&D stock, denoted as *RD*, is computed in the same manner as patent stock. That is, in Eq. (3.1), Pat_t and Pat_{t-1} are replaced by RD_t and RD_{t-1} , respectively, and I_t is interpreted as the R&D expenditure in the period of t . In calculating R&D stock we use $\delta = 0.15$. Similar to the case of patent stock, R&D expenditure in 1990 is used as the benchmark value, and R&D stock in 1994 is estimated by the perpetual inventory method.

Descriptive statistics for these measures of firm performance are presented in Table 3.2 and correlations of the variables are shown in Table 3.3. As shown, the mean and median values of Tobin's q are 1.29 and 1.18, respectively, both of which are very close to those reported in Hall et al. (2005) for the US firms and slightly below those in Fukuda et al. (1999) for Japanese firms in the period 1985–1996.

3.3 Estimation Strategy

As discussed in the previous section, the globalization indexes in our sample have a strong negatively skewed distribution, which indicates that the heterogeneity across firms may be substantial. Thus, the relationships between the globalization indexes and firm characteristics may also differ across firms. It may be important to provide information about the relationship at different points in the conditional distribution of the indexes.

Quantile regressions are a useful tool to address this issue.⁴ The major advantage of a quantile regression estimator is that it can provide information about the relationship at different points in the conditional distribution of the globalization indexes. In contrast, traditional regression techniques, such as ordinary least squares (OLS), can only summarize the average relationship between the globalization indexes and the

⁴ See Koenker 2005 and Hao and Naiman 2007 for details on quantile regression estimation.

set of regressors. A key underlying assumption of these traditional techniques is that the effects of the regressors on the dependent variable are best represented at the conditional mean of the dependent variable. This is not the case in the presence of a skewed distribution.

Here, we use an algorithm known as least absolute deviations (LAD) to provide quantile estimates, where estimation is implemented by solving linear-programming problems.⁵

3.4 Empirical Results

In this section, we report our empirical results. We examine the effects of LP, Tobin's q , and the intensity of intangible assets on the relative choice between two globalization modes, RXI and ROI . Following Helpman et al. (2004), we use a linearized version of regression equations and consider a specification that controls for the firm's capital intensity ($LnKL$) and R&D intensity ($LnRL$).

Tables 3.4, 3.5 and 3.6 summarize quantile regressions of $LnLP$, $TobinQ$, and $LnPatK$ on globalization choices RXI and ROI . For RXI , the estimated coefficients of $LnLP$ in Table 3.4 are negatively significant at two higher quantiles of the 50th and 75th percentiles. This result implies that an increase in LP tends to motivate a firm to choose more FDI and less exporting. However, all coefficients of $LnLP$ fail the null hypothesis for ROI . In Table 3.5, the coefficients of $TobinQ$ are significantly negative for ROI at the 25th and 75th percentiles, whereas we find no significant effects of $TobinQ$ on RXI . Thus, an increase in Tobin's q tends to

Table 3.4 Quantile estimates of productivity on globalization choices

Variables	RXI			ROI		
	QR_{25}	QR_{50}	QR_{75}	QR_{25}	QR_{50}	QR_{75}
$LnLP$	-0.02 (0.027)	-0.15*** (0.040)	-0.31*** (0.12)	0.25 (0.19)	0.15 (0.97)	-1.13 (2.51)
$LnKL$	0.07*** (0.019)	0.13*** (0.039)	0.46*** (0.12)	-1.55*** (0.26)	-5.24*** (1.33)	-15.96*** (3.52)
$LnRL$	0.04*** (0.0087)	0.10*** (0.016)	0.32*** (0.047)	0.56*** (0.12)	3.32*** (0.58)	4.05*** (1.53)
No. of Obs.	3034	3034	3034	868	868	868

Notes: (a) ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. (b) The values in the parentheses are standard errors. (c) QR_X refers to quantile regression at X th percentile. (d) A constant term and industrial and year dummies are included in the estimations. (e) Quantile regression is based on the least-absolute value (LAV) model

⁵ See Cameron and Trivedi (2009) for the detailed Stata command for the quantile estimation.

Table 3.5 Quantile estimates of Tobin's q on globalization choices

Variables	RXI			ROI		
	QR_{25}	QR_{50}	QR_{75}	QR_{25}	QR_{50}	QR_{75}
<i>Tobin Q</i>	0.01 (0.014)	-0.01 (0.045)	0.00 (0.002)	-0.40** (0.18)	-1.47 (0.94)	-5.99** (3.00)
<i>LnK L</i>	0.06*** (0.018)	0.05 (0.038)	0.30*** (0.11)	-1.40*** (0.26)	-5.57*** (1.17)	-16.07*** (3.42)
<i>LnRL</i>	0.04*** (0.0088)	0.09*** (0.018)	0.29*** (0.048)	0.44*** (0.13)	3.08*** (0.53)	3.71** (1.58)
No. of Obs.	3042	3042	3042	871	871	871

Notes: (a) ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. (b) The values in the parentheses are standard errors. (c) QR_X refers to quantile regression at X th percentile. (d) A constant term and industrial and year dummies are included in the estimations. (e) Quantile regression is based on the LAV model

Table 3.6 Quantile estimates of intangible asset intensity on globalization choices

Variables	RXI			ROI		
	QR_{25}	QR_{50}	QR_{75}	QR_{25}	QR_{50}	QR_{75}
<i>LnPat K</i>	-0.04*** (0.011)	-0.20*** (0.017)	-0.40*** (0.064)	-1.81*** (0.17)	-4.43*** (0.41)	-16.87*** (1.28)
<i>LnK L</i>	0.06*** (0.016)	0.06** (0.025)	0.36*** (0.10)	-1.80*** (0.33)	-5.79*** (0.73)	-26.90*** (2.10)
<i>LnRL</i>	0.06*** (0.009)	0.19*** (0.016)	0.50*** (0.058)	0.92*** (0.17)	4.51*** (0.37)	6.34*** (1.19)
No. of Obs.	3042	3042	3042	871	871	871

Notes: (a) ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. (b) The values in the parentheses are standard errors. (c) QR_X refers to quantile regression at X th percentile. (d) A constant term and industrial and year dummies are included in the estimations. (e) Quantile regression is based on the LAV model

motivate a firm to choose more FDI and less FO, but it does not affect the choice between exporting and FDI.

In Table 3.6, on the other hand, all quantile estimates of *LnPat K* are significantly negative for both RXI and ROI . This result implies that headquarters companies with relatively higher intangible assets tend to favor FDI over exporting and outsourcing. In short, the effects of intangible asset intensity on firms' choices of globalization mode are not the same as those of Tobin's q .

In Tables 3.4, 3.5 and 3.6, all coefficients of *LnK L* are significantly negative in the regressions for ROI : an increase in capital intensity leads a firm to choose more FDI and less FO. This result seems consistent with the finding of Tomiura (2007) and confirms the prediction by Antràs (2003). In contrast, the coefficients of *LnK L* in the regressions for RXI are significantly positive in most cases. This suggests

that an increase in capital intensity prompts a firm to choose more exporting and less FDI. This contradicts the result shown by Helpman et al. (2004), who find that firms in more capital-intensive sectors tend to export less relative to FDI.⁶ However, to our knowledge, there are no definitive theoretical predictions regarding the relationship between capital intensity and the choice between exporting and FDI.

Moreover, all coefficients of $LnRL$ are significantly positive. Thus, an increase in R&D intensity causes a firm to export and outsource more relative to an engagement in FDI. One might regard this result as inconsistent with the conventional wisdom. However, Helpman et al. (2004) show that R&D intensity is not a useful predictor of exports versus FDI. Norbäck (2001) finds that firms with higher R&D intensity tend to export rather than engage in FDI if the costs of technology transfer are high, while the opposite is true if its costs are low. Theoretically, there is no definitive relationship between R&D intensity and the choice of globalization mode. Our empirical results suggest that the relationship between R&D intensity and the choice of the globalization mode should be investigated further theoretically and empirically.

3.5 Conclusion

By using firm-level data on Japanese firms, in this chapter it has been investigated empirically which measure of performance is important for a firm to choose various modes of globalization activity. Using quantile regressions, we found that a difference in LP is important in the choice between exporting and FDI but not important in the choice between FDI and FO. In contrast, a difference in Tobin's q is important in the choice between FDI and FO but not in the choice between exporting and FDI. Interestingly, a difference in the intangible asset intensity is important in the choice between exporting and FDI as well as in the choice between FDI and FO. Thus, our analysis revealed the differences among various measures of firm performance in the effects of globalization activity.

Our findings have important policy implications. Although existing empirical studies have primarily focused on the relationship between a firm's productivity and its choice of globalization mode, our findings illuminate the potential importance of Tobin's q on firms' globalization activities. In particular, we found that a difference in Tobin's q affects the choice between FDI and FO, whereas that in productivity is relatively less important for the choice between those two activities. Firms with lower Tobin's q are relatively more active in FO than in FDI. Thus, policies to facilitate FO will benefit the domestic economy, because FO contributes to improving the competitiveness of outsourcers by reducing their production costs. Since relatively lower values of Tobin's q imply that these firms do not effectively utilize their capital, deregulation and expansion of supportive services to small and medium enterprises may be helpful. Providing information on regulations in foreign countries and helping to find potential partner companies for outsourcing may also enhance gains from FO

⁶ Tomiura (2007) also finds that MNEs tend to be more capital intensive than exporters.

by reducing the fixed costs of outsourcing. On the other hand, firms with lower Tobin's q may be reluctant to enhance FDI because they have difficulties in financing the costs of investment, as indicated by the low value of Tobin's q . Thus, policies to create a financing mechanism for FDI will help those firms facilitate outward FDI.

There are a few caveats with respect to our analysis. First, we captured firms' globalization activities in the relative size measured by sales of foreign affiliates, such as the ratio of exports to sales of foreign affiliates and the ratio of costs of FO to sales of foreign affiliates, because many globalized firms engage in more than one globalization mode. In the theoretical models of Helpman et al. (2004) and Chen et al. (2012), by contrast, individual firms do not engage in multiple modes of globalization, although we observe multiple modes at the aggregated industry level. Second, we cannot fully explain our estimation results regarding the effects of capital intensity and R&D intensity on the choice of globalization mode. Further theoretical and empirical studies on this issue are required.

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