Effect of Fintech on the Productivity in the Taiwan Banking Industry

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Abstract: The development of financial technology has fostered a wave revolutionary change in financial service industry worldwide. The objective of this study is to examine whether the adoption of Fintech contributes to the productivity growth of the Taiwan banking industry in 2015. To investigate such potential effect, the study use the preferred Cost Malmquist Index to estimate the 25 listed sample banks over the period from 2010 to 2015. The empirical result suggests the observed period 2014-2015, the ΔPTE, ΔAE, ΔPE, and ΔCSE are improving by 0.01%, 0.13%, 0.42%, and 0.10% respectively. Moreover, the degree of ΔT deterioration is much improved relative to the other observe periods without adoption of Fintech. It provides the positive evidence to support an adoption of Fintech contribute a potential growth of competiveness of the Taiwan banking industry.

Key words: Cost Malmquist productivity index, bank productivity, fintech.

1. Introduction

The theory of modern financial intermediation suggests that the security, privacy, trust and information asymmetry are the niches of the existence of financial intermediaries. Nevertheless, the traditional financial intermediary requires many layers to obtain such quality. In the aftermath of the 2008 U. S. financial crisis, consumers has casted a doubt on the efficiency of the traditional financial intermediary. Driven by this force and the advances of technology, several savvy start-ups using financial technology has foster a wave of Fintech revolutionary which is actually taking out the market share and changing the landscape of financial incumbent. These destructive innovations spans in four aspects, infrastructure, money and payment, market, and marketplace, for example, Bitcoin, robot advisor, and P-to-P lending. Overall, those innovations of Fintech have provided more convenient, secure, and efficient services to the consumers. Thus, the effectiveness of disruptive innovation actually resides on the removing of the layers of intermediaries which have long embedded in the traditional financial services. The global Fintech development activity is relative slow from 2008 to 2011 but become explosive in 2015. The Fintech has spreading from the U.S.A., Europe, and the Asia since 2015.

To ensure the soundness of financial system and sustainable growth of the financial institutions in the revolutionary Fintech era, Taiwan Financial Supervisory Commission (TFSC) has declared 2015 as the first year of Fintech in Taiwan and announced a series of policies to promote the development and applications of Fintech in its financial industry. On May 12, 2016, TFSC further announced the Fintech Development Strategy White Paper which discloses its vision and policy directions regarding the revolutionary Fintech Innovation, and its proposed landscape of Taiwan Fintech society in 2020. TFSC has allowed financial institutions to own 100% share of the Fintech firms. To secure their landscape and sustainable growth, several major Taiwan domestic banks have fostered a wave of innovation to cope with the hyper competition from new Fintech start-ups. A sound cost efficiency and productivity is very important to the sustainable growth of Taiwanese financial institutions. Thus, an evaluation of the effect of adoption Fintech on the productivity of banking industry has become an important issue. The objective of this study is to examine the effect of Fintech development on the productivity in the Taiwan banking industry.

The remainder of this paper is organized as follows. Section 2 presents a review of the relevant literature. Section 3 provides a discussion of the methodology used in the study, which is followed by an evaluation of the results on Section 4. The paper concludes with a summary analysis of the findings in Section 5.

2. Review of Literature

Recently, the Cost Malmquist productivity Index (CM) approach has been evolved as a preferred approach to estimate productivity change [1]-[3]， (Maniadakis and Thanassoulis, 2004:Yang and Huang, 2009: Yang, Huang and Sheng, 2010). The origination of the CM approach can be traced to the master piece of Maniadakis *et al*. (2004). Before the work of Maniadakis *et al*. (2004), the research of productivity namely used the traditional production-based Malmquist indexes which failed to capture one of the most important aspects of managements, the allocative efficiency. Maniadakis *et al*. (2004) [1] suggested that the impact of allocative efficiency change on productivity change should be accounted for in the model. Since then the CM has become a preferred approach in the estimation of productivity.

Previous literature has well documented that the variable returns to scale (VRS) is more flexible and envelops the data in a tighter way than the constant returns to scale (CRS) under DEA approach (Yang *et al*., 2009) [2]. Departing from the work of Maniadakis *et al*. (2004), Yang *et al*. (2009) relief the assumption of CRS and proposed an alternative CM based on the VRS to estimate productivity change. Their empirical result further provide evidence to support that the CM approach outperform the traditional approach in the sense that the alternative approach convey inside cost information which carry important managerial implication.

3. Methodology

Assume that at time period t a decision making unit (DMU) or a Taiwan's bank uses N inputs (x^t) to produce M outputs (y^t). The production technology at time t defines the input requirement set as: $L^t(y^t) = \left\{x^t : x^t \text{ can produce } y^t\right\}$. The input distance function [4]-[6] (Shepherd 1970; Färe 1988; Färe *et al*. 1994) is defined at time t as: $D_I^t(y^t, x^t) = \sup_{\rho}\left\{\rho : (x^t / \rho) \in L^t(y^t), \rho > 0\right\}$. The input distance function is the reciprocal of the Farrell's (1957) [7] input-oriented measure of efficiency and so $D_I^t(y^t, x^t)$ can be used to measure production technical efficiency at time period t, i.e.,

$$TE_I^t(y^t, x^t) = \frac{1}{D_I^t(y^t, x^t)} \leq 1 \quad (1)$$

A similarly defined distance function, denoted by $D_I^{t+1}(y^{t+1}, x^{t+1})$, can be used to measure efficiency in time period t+1, i.e. $TE_I^{t+1}(y^{t+1}, x^{t+1}) = 1/D_I^{t+1}(y^{t+1}, x^{t+1})$. In order to assess change in productivity over time or the Malmquist index, two mixed-period input distance functions need to be defined as : $D_I^t(y^{t+1}, x^{t+1}) = \sup_\rho \left\{\rho : (x^{t+1}/\rho) \in L^t(y^{t+1}), \rho > 0\right\}$ and $D_I^{t+1}(y^t, x^t) = \sup_\rho \left\{\rho : (x^t/\rho) \in L^{t+1}(y^t), \rho > 0\right\}$.

When input prices, $w^t \in R_+^N$, are available, one may define the production technology in terms of cost function, which is

$$C^t(y^t, w^t) = \min_x \left\{w^t x : x \in L^t(y^t), w^t > 0\right\} \tag{2}$$

The cost function, $C^t(y^t, w^t)$, which is dual to the input requirement set $L^t(y^t)$ of production, is the minimum cost of producing a given output y^t with the input prices at w^t under the t*th* period technology. Corresponding to the input distance function or the input-oriented technical efficiency, the t*th* period cost efficiency (CE^t) is defined as

$$CE^t(y^t, x^t, w^t) = \frac{C^t(y^t, w^t)}{w^t x^t} \le 1 \tag{3}$$

Had the outputs yt were produced under the (t+1) production technology and input prices at wt+1, the cost function would be $C^{t+1}(y^t, w^{t+1}) = \min_x \left\{w^{t+1}x : x \in L^{t+1}(y^t), w^{t+1} > 0\right\}$. Similarly, $C^t(y^{t+1}, w^t) = \min_x \left\{w^t x : x \in L^t(y^{t+1}), w^t > 0\right\}$. Thus, $C^{t+1}(y^t, w^{t+1})$ and $C^t(y^{t+1}, w^t)$ are the mixed-period minimum cost functions. The corresponding mixed-period cost efficiencies are $CE^{t+1}(y^t, x^t, w^{t+1}) = \frac{C^{t+1}(y^t, w^{t+1})}{w^{t+1}x^t}$ and $CE^t(y^{t+1}, x^{t+1}, w^t) = \frac{C^t(y^{t+1}, w^t)}{w^t x^{t+1}}$. Dual to the measure of the production Malmquist productivity index, the Cost Malmquist productivity index is defined as the geometric mean of the two ratios of cost efficiency,

$$\begin{aligned} CM &= \left[\frac{CE^t(y^t, x^t, w^t)}{CE^t(y^{t+1}, x^{t+1}, w^t)} \times \frac{CE^{t+1}(y^t, x^t, w^{t+1})}{CE^{t+1}(y^{t+1}, x^{t+1}, w^{t+1})}\right]^{\frac{1}{2}} \\ &= \left[\frac{w^t x^{t+1}/C^t(y^{t+1}, w^t)}{w^t x^t/C^t(y^t, w^t)} \times \frac{w^{t+1}x^{t+1}/C^{t+1}(y^{t+1}, w^{t+1})}{w^{t+1}x^t/C^{t+1}(y^t, w^{t+1})}\right]^{\frac{1}{2}} \end{aligned} \tag{4}$$

The Cost Malmquist productivity index (4) measures the change over time in cost efficiency. Parallel to the decomposition of production Malmquist productivity index, the CM may be decomposed into the effects due to the improvement in production technology, in production efficiency, due to variation in input prices and production scale. Recently, Maniadakis *et al.* (2004) have proposed a decomposition of CM under the assumption of constant returns to scale technology. However, since the evidence shown that the sample banks operation in Taiwan is more likely subject to variable returns to scale, we further extend the decomposition of the Cost Malmquist productivity index under the variable returns to scale.

It can be shown that the Cost Malmquist productivity index CM can be decomposed as follows:

$$CM = \Delta PTE \times \Delta T \times \Delta AE \times \Delta PE \times \Delta CSE \tag{5}$$

where the first component ΔPTE is the pure technical efficiency change and the second component ΔT is the technical change can be defined as follow:

$$\Delta PTE = \frac{D_{IV}^{t+1}(y^{t+1}, x^{t+1})}{D_{IV}^{t}(y^{t}, x^{t})} = \frac{TE_{IV}^{t}(y^{t}, x^{t})}{TE_{IV}^{t+1}(y^{t+1}, x^{t+1})}$$

$$\Delta T = \left[\frac{D_{IV}^{t}(y^{t+1}, x^{t+1})}{D_{IV}^{t+1}(y^{t+1}, x^{t+1})} \times \frac{D_{IV}^{t}(y^{t}, x^{t})}{D_{IV}^{t+1}(y^{t}, x^{t})}\right]^{\frac{1}{2}} \tag{6}$$

The third component ΔAE is the allocative efficiency change defined as

$$AE = \frac{C_{IV}^{t}(y^{t}, w^{t}) \times D_{IV}^{t}(y^{t}, w^{t}) / w^{t}x^{t}}{C_{IV}^{t+1}(y^{t+1}, w^{t+1}) \times D_{IV}^{t+1}(y^{t+1}, w^{t+1}) / w^{t+1}x^{t+1}} \tag{7}$$

The subscript "V" under the cost function indicates the measure of production cost under variable returns to scale technology. The numerator, as shown by Maniadakis *et al*. (2004) and denoted as $AE(y^{t}, x^{t}, w^{t}) = C_{IV}^{t}(y^{t}, w^{t}) \times D_{IV}^{t}(y^{t}, w^{t}) / w^{t}x^{t}$, is the input-oriented measure of allocative efficiency at time period t. The ΔAE represents the change over time the allocative efficiency, $\Delta AE = AE_{IV}^{t}(y^{t}, x^{t}, w^{t}) / AE_{IV}^{t+1}(y^{t+1}, x^{t+1}, w^{t+1})$. If the allocative efficiency $AE_{IV}^{t}(y^{t}, x^{t}, w^{t}) = 1$, it implies that the cost efficiency is identical the technical efficiency.

The fourth component of the Cost Malmquist decomposition ΔPE is the price effect change, i.e.,

$$\Delta PE == \left[\frac{\dfrac{C_{V}^{t+1}(y^{t}, w^{t+1}) \times D_{IV}^{t+1}(y^{t}, x^{t})}{w^{t+1}x^{t+1}}}{\dfrac{C_{V}^{t}(y^{t}, w^{t}) \times D_{IV}^{t}(y^{t}, x^{t})}{w^{t}x^{t}}} \times \frac{\dfrac{C_{V}^{t+1}(y^{t+1}, w^{t+1}) \times D_{IV}^{t+1}(y^{t+1}, x^{t+1})}{w^{t+1}x^{t+1}}}{\dfrac{C_{V}^{t}(y^{t+1}, w^{t}) \times D_{IV}^{t}(y^{t+1}, x^{t+1})}{w^{t}x^{t+1}}}\right]^{1/2} \tag{8}$$

The first term insider the brace measures the impact of relative input price changes from w^{t} to w^{t+1} on the shift of minimum cost frontiers in producing (y^{t}, x^{t}), while the second term measures the shift in producing (y^{t+1}, x^{t+1}). The input effect change ΔPE is then defined as the geometric mean of the terms.

The fifth component of the Cost Malmquist decomposition ΔCSE represents the cost scale efficiency change, i.e.,

$$\Delta CSE = \left[\frac{\dfrac{C_{V}^{t+1}(y^{t+1}, w^{t+1})}{C_{C}^{t+1}(y^{t+1}, w^{t+1})}}{\dfrac{C_{V}^{t+1}(y^{t}, w^{t+1})}{C_{C}^{t+1}(y^{t}, w^{t+1})}} \times \frac{\dfrac{C_{V}^{t+1}(y^{t+1}, w^{t})}{C_{C}^{t+1}(y^{t+1}, w^{t})}}{\dfrac{C_{V}^{t}(y^{t}, w^{t})}{C_{C}^{t}(y^{t}, w^{t})}}\right]^{1/2} \tag{9}$$

Each term of the ratio, for example, $\Delta CSE^{t}(y^{t}, w^{t}) = \dfrac{C_{V}^{t}(y^{t}, w^{t})}{C_{C}^{t}(y^{t}, w^{t})}$ measures the efficiency of getting closer to optimum scale size in minimizing the cost of producing y^{t} at input price w^{t}. Thus, the cost scale efficiency change, $\Delta CSE = \left[\frac{CSE^{t+1}(y^{t+1}, w^{t+1})}{CSE^{t+1}(y^{t}, w^{t+1})} \times \frac{CSE^{t}(y^{t+1}, w^{t})}{CSE^{t}(y^{t}, w^{t})} \right]^{1/2}$ is defined as the geometric mean of the cost efficiency at scale sizes y^t and y^{t+1} in t and (t+1) periods.

Thus, overall the decomposition of the Cost Malmquist productivity index is as follows:

CM = pure technical efficiency change (ΔPTE) × technical efficiency change (ΔT)

× allocative efficiency change (ΔAE) × price effect change (ΔPE)

× cost scale efficiency change (ΔCSE) (10)

Values of the above five components, ΔPTE, ΔT, ΔAE, ΔPE and ΔCSE, of greater than unity suggest deterioration, while values of less than unity suggest the improvement.

To compute and decompose the Cost Malmquist productivity index CM requires the computation of the minimum cost function under both VRS and CRS technologies, $C_V^t(y^t, w^t)$ and $C_C^t(y^t, w^t)$. For the k*th* DMU (i.e. sample bank) $C_V^t(y^t, w^t)$ is computed from the following linear programming problems:

$$\min_{x,\lambda} \quad w_{kn}^t x_n = C_V^t(y^t, w^t) \tag{11}$$

$$\sum_{j=1}^{J} \lambda_j y_{jm}^t \ge y_{km}^t, \quad m = 1, 2, \ldots, M$$

subject to

$$\sum_{j=1}^{J} \lambda_j x_{jn}^t \le x_{kn}, \quad n = 1, 2, \ldots, N$$

$$\sum_{j=1}^{J} \lambda_j = 1, \quad \lambda j \ge 0, xn \ge 0.$$

For the minimum cost function $C_C^t(y^t, w^t)$ under the constant returns to scale technology, it can be calculated by relaxing the constraint $\sum_{j=1}^{J} \lambda_j = 1$ from (11). As for the mixed-period cost function $C_V^t(y^{t+1}, w^{t+1})$, it can be similarly computed as follows:

$$\min_{x,\lambda} \quad w_{kn}^t x_n = C_V^t(y^{t+1}, w^t)$$

$$\sum_{j=1}^{J} \lambda_j y_{jm}^t \ge y_{km}^{t+1} \quad m = 1, 2, \ldots, M$$

subject to

$$\sum_{j=1}^{J} \lambda_j x_{jn}^t \le x_{kn}, \quad n = 1, 2, \ldots, N$$

$$\sum_{j=1}^{J} \lambda_j = 1 \quad , \lambda j \geq 0, xn \geq 0.$$

Other cost functions, $C_V^{t+1}(y^{t+1}, w^{t+1})$, $C_V^{t+1}(y^{t}, w^{t+1})$, $C_C^{t+1}(y^{t+1}, w^{t+1})$, and $C_C^{t+1}(y^{t}, w^{t+1})$ are similarly obtained with and without the constraint $\sum_{j=1}^{J} \lambda_j = 1$.

4. Empirical Results

This study uses a balanced panel data of 25 listed Taiwanese banks from 2010 to 2015. The data are collected from the TEJ database, Financial Statistics Monthly which is published by the Central Bank of Taiwan. All the nominal variables have been deflated by the annual consumer price index of Taiwan with the base year being 2010. The study adopts intermediation approach to select input and output variables. In addition to total loans (Y_1) and investments (Y_2), non-interest revenues (Y_3) was taken as an output variable, to account for the increasing proportion of fee income in bank revenue. Input variables include labor input (X_1), borrowed funds (X_2), and physical capital(X_3). The input price variables include labor price (W_1, Personnel expenses / labor input), funds price [W_2, (Deposit and loan interest expenditure) / borrowed funds] and Capital price [W_3, (Business and management expenses labor cost) / physical capital)].

All of the sample banks are commercial banks, therefore the banking activities are very much in line with each other. However, there are considerable variations in bank size. Moreover, the use of output growth to assert the increase of productivity faced the potential criticism that the increase of some DMU outputs were mainly from the accumulation and increase of factors and less from the technology advancement and efficiency improvement [8]. Therefore, the introduction and decomposition of CM are essential. Table 1 summarizes the descriptive statistics of all 25 sample banks over the observed periods.

Table 1. Descriptive Statistics by Taiwan Bank Industries for a Time Period 2010-2015

		Y1	Y2	Y3	X1	X2	X3	P1	P2	P3
Full period	Mean	769000000	270000000	3896193	4671	1020000000	16138410	6502	8569942	11032377
	Median	636000000	224000000	2593204	4801	892000000	9295694	6024	6881394	10713935
	Maximum	2410000000	1450000000	27361743	10708	3850000000	97864904	19855	36453834	38540275
	Minimum	70217208	2583171	348633	865	108000000	861880	800	914619	1427578
	Std. Dev.	601000000	259000000	4051283	2603	813000000	19319379	4508	7175679	7570297
2010	Mean	673000000	232000000	3435750	4486	896000000	14792504	5758	6103653	9706874
	Median	538000000	161000000	2656325	4583	733000000	8718774	5985	4926725	9636106
	Maximum	2090000000	1090000000	16442126	9538	3200000000	76596999	15578	26086235	28823676
	Minimum	70217208	2583171	386382	914	108000000	2160859	873	914619	1492594
	Std. Dev.	556000000	250000000	3333126	2523	750000000	16219995	4106	5653503	6650750
2011	Mean	724000000	233000000	3287511	4598	940000000	15831208	6018	7761437	10206808
	Median	608000000	204000000	2439679	4986	800000000	9377488	5651	6886685	10521913
	Maximum	2170000000	1030000000	15794691	9881	3230000000	97864904	15732	30577630	29498252
	Minimum	82517301	15814755	348633	939	120000000	1412342	835	1160701	1438823
	Std. Dev.	591000000	233000000	3241900	2548	762000000	20017181	4176	6662267	6883917
2012	Mean	750000000	247000000	3405285	4614	974000000	16121313	6300	8744876	10530358
	Median	667000000	203000000	2497411	4892	880000000	9213899	5719	8438783	10544151
	Maximum	2200000000	1050000000	17566381	9824	3310000000	97253348	16732	32987442	30847877
	Minimum	86464057	27350212	348964	926	135000000	954086	867	1217974	1457642
	Std. Dev.	594000000	234000000	3545365	2571	784000000	20196780	4319	7227135	7112945
2013	Mean	784000000	267000000	3875641	4686	1030000000	16236657	6690	8732611	11056539
	Median	713000000	235000000	2572165	4784	914000000	10742005	6359	8551868	10737842
	Maximum	2260000000	1120000000	19498565	10126	3430000000	97497978	18558	33364505	32542792

	Minimum	100000000	25916773	379409	865	143000000	927198	843	1223033	1427578
	Std. Dev.	616000000	247000000	3904685	2693	827000000	20121041	4726	7175967	7613393
2014	Mean	825000000	293000000	4412072	4758	1100000000	16688947	7035	10027215	12008681
	Median	774000000	257000000	2537652	4818	1050000000	10625187	6964	10074023	11206606
	Maximum	2320000000	1190000000	21603872	10248	3590000000	97103753	19855	36453834	36425648
	Minimum	101000000	34038999	415437	878	143000000	962966	907	1379061	1593677
	Std. Dev.	633000000	266000000	4415854	2727	865000000	20399091	4922	8123481	8371182
2015	Mean	858000000	347000000	4960897	4886	1180000000	17159830	7209	10049864	12685001
	Median	847000000	257000000	3161546	4951	1130000000	9208471	7059	10385512	11390118
	Maximum	2410000000	1450000000	27361743	10708	3850000000	96728064	19814	36352682	38540275
	Minimum	126000000	55072226	451365	894	182000000	861880	800	1429607	1581235
	Std. Dev.	656000000	322000000	5535779	2793	925000000	20521340	4996	7876207	8882536

Note: The units of Y_1, Y_2, Y_3, X_2 and X_3 are in millions of USD. And the unit of X_1 is in person.

Table 2 summarizes results of the CM productivity indexes and component values for the entire sample banks in Taiwan from 2010 to 2015. CM is decomposed into ΔPTE, ΔT, ΔAE, ΔPE, and ΔCSE. The results were computed using the models presented in Section 3. ΔCSE is 1.0001 in table 2 that indicates the VRS exists in Taiwan Banking industry for the observation period. Departing from traditional approach, a value of index greater than one indicates deterioration, while a value of index less than one indicates an improvement. In the entire observation period, ΔPE is improving, ΔPTE remains constent, ΔT, ΔAE and ΔCSE are slightly decreasing. It indicates that 0.18% CM index loss is significantly caused by ΔT, ΔAE and ΔCSE. Our empirical results show that allocative efficiency change improve by 0.6% which indicate that *ΔT, ΔAE and ΔCSE* are important factors contributing to the productivity loss of sample banks over the full observed period. This evidence further reconfirms that the CM outperform traditional IM approach in the sense that CM captures more insight managerial information on the productivity change.

The colum 2 of Table 2 indicates CM index are slightly grater than 1, which reveals that each of the subperiods 2010 to 2014 sample banks encoutering productivity loss. However the sources that productivity decrease may come from many various resouces. In comparision to the other observed time period, the 2014-2015 period, CM has the most singnificant decrease, 0.47%. ΔT is 1.0021 indicating a 0.21% decrease in technology, is the major source of change. While the other components, ΔPTE, ΔAE, ΔPE, ΔCSE are improving.

Table 2. CM Index and Component Values of Taiwan Bank Industries for a Time Period 2010-2015

Year	*CM*	*Δ PTE*	*Δ T*	*Δ AE*	*Δ PE*	*Δ CSE*
	(B)	(C)	(D)	(F)	(G)	(H)
Base Year	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2010-2011	1.0014	0.9999	1.0025	1.0017	0.9943	1.0003
2011-2012	1.0025	1.0001	1.0018	1.0016	0.9944	0.9998
2012-2013	1.0007	1.0004	1.0030	1.0013	0.9937	1.0011
2013-2014	1.0018	0.9998	1.0039	1.0002	0.9942	1.0004
2014-2015	1.0047	0.9999	1.0021	0.9987	0.9958	0.9990
Full period	1.0018	1.0000	1.0022	1.0006	0.9954	1.0001

CM = ΔPTE × ΔT × ΔAE × ΔPE × ΔCSE

5. Conclusion

The development of financial technology has fostered a wave of revolutionary change in financial service industry worldwide. In fact, the Fintech start-ups provide divinity of banking services in a trustable and much efficient way which are taking out the market share and changing the landscape of financial incumbent. The evaluation of productivity change during the Fintech era has become a very important issue. On the other hand, the CM approach has evolved as a more preferred approach to the measurement of firm productivity. The objective of this study is to investigate the effect of Fintech on the productivity in the Taiwan banking industry. To investigate such potential effect, the study use the CM, to estimate the 25 listed sample banks over the period from 2010 to 2015. The empirical result suggests the observed period, 2014-2015, the ΔPTE, ΔAE, ΔPE, and ΔCSE are improving by 0.01%, 0.13%, 0.42%, and 0.10% respectively. Consistent with the objective of Fintech development, which attends to provide banking service in a more effcient operation and less cost. Although the level of technology improvement requires longer time horizon, but the above captioned index reveals that the adoptions of financial technology proposed by bank regulators carry the positive effect on the overall competiveness of the banking industry in Taiwan.

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