

The Impact of Banking Competition on the Innovation: An Empirical Investigation on the Banking Institutions of ASEAN Countries

Rachada Fongtanakit

Graduate School, Suan Sunandha Rajabhat University, Bangkok, Thailand
rachada.fo@ssru.ac.th

Sudawan Somjai

Graduate School, Suan Sunandha Rajabhat University, Bangkok, Thailand
sudawan.so@ssru.ac.th

Sriparinya Toopgrajank

Graduate School, Suan Sunandha Rajabhat University, Bangkok, Thailand
sriparinya.to@ssru.ac.th

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Abstract:

The current study aims to examine the banking competition on the innovation of the banking industry in ASEAN countries. The data were extracted from the database of the World Bank and individual banks from 2005 to 2016. The findings exposed that banking competition has played an essential role in the innovation of the banking industry in ASEAN countries. Competition forces the institutions to become more innovative and advance in their processes to enhance the performance of the institutions and interest of the consumers. These results give the guidelines to the policy implementers and policymakers that they increase the competition among the banks around the globe because this competition motivates the stakeholders of the banks towards innovation and advancement.

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1. Introduction

It is very important to understand the innovation determinant's as it forms the competitive edge of the organizations and also considered one of the critical drivers for the growth of any country's economy (Solow, 1957; Fongtanakit, Somjai, Prasitdumrong, & Jermstiparsert, 2019; Ditkaew, Pitchayatheeranart, & Jermstiparsert, 2020; Kerdpitak & Jermstiparsert, 2020). This task is taken up by the growing literature by giving not only positive but also negative links among innovation and characteristics of different companies and markets. Thought, these

investigations having some realistic works investigating the association among the development of market capital and innovation output. This work contributes to the literature by examining the effect on innovation by competition in banking at the state-level. One of the main challenges facing the literature of innovation as it is endogenous with the qualities of the company and market, inclusive of the banking competition at the province level (Hitt, Hoskisson, & Kim, 1997). Therefore an association between innovation and competition in banking might give us an idea regarding the impact of competition in

banking on innovation. This study lightens endogeneity worries by using the stunning deregulations of inter-state bank laws in the United States of America. An act titled as “Inter-state Banking and Branching Efficiency Act (IBBEA)” approved by United States congress in the year of 1994 (Vincent, Bharadwaj, & Challagalla, 2004). In this manner, the IBBEA legalizes the inter-state branching across the United States in the year 1997. In agreement with the explanation of (Rice & Strahan, 2010) that, it was a watershed incident of IBBEA by allowing the inter-state branching in the country. Most of the past literature argued that whenever states try to ease the restrictions over the bank branching, it ultimately results in the opening of more number of branches to compete for each other within the industry (Ar, 2012).

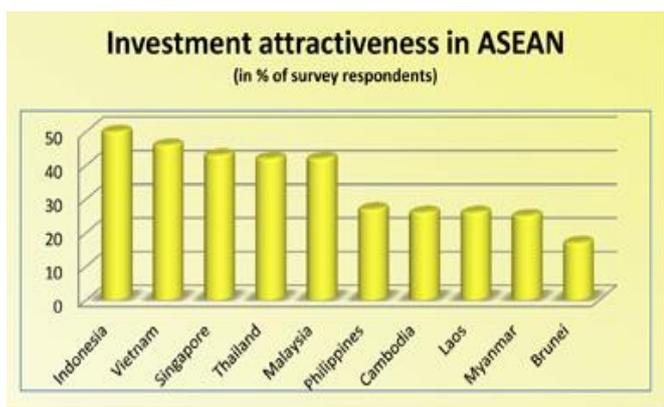
Table 1: Percentage of Investment due to Innovation in ASEAN Countries

Country	Percentage Investment
Indonesia	48%
Vietnam	42%
Singapore	40%
Thailand	39%
Malaysia	39%
Philippines	23%
Cambodia	22%
Laos	22%
Myanmar	21%
Brunei	13%

Figure 1: Percentage of Investment due to Innovation in ASEAN Countries

The ultimate end of this increase is the enhancement in credit availability within the state and reduce the capital cost therein. By using these deregulatory instances as extraordinary enhancement in the finance supply at the state level. (Rice & Strahan, 2010) acknowledged economic effects, as we expect that innovation can cause to enhance these deregulations as the central offices of the organizations inside the state deregulations could have the advantage of the high level of finance supply with the aim to increase output from innovation (Soto-Acosta, Popa, & Palacios-Marqués, 2016). Though surprisingly, it was found by us that soundproof that enhances in the competition in banking results in a decline in output from innovation (Thornhill, 2006). We came to know that states which are entirely open to inter-state branching results in the generation of about 30 percent total fewer patents after three years than states with more and more constraints on branching at the inter-state level. We were able to have a similar result by the usage of patent citations as an innovation proxy: states which are entirely open to inter-state branching results in the generation of about 23 percent of total that having no direct impact on output from private organizations. A few citations after three years than states with more and more constraints on interstate branching. Such findings are enough in order to adjust for state level and industry level at the state for the attention of labor force deregulatory instances in the banking that head IBBEA, effects fixed by the state and also year fixed (Koellinger, 2008).

To have a sound understanding of these results, we model patents at the state-level into public corporation produced patents. In comparison with the public corporations, the private corporations could be more sensitive to the conditions of the banking at the local level, so there could be the



difference between effects from the state-level in comparison with such two groups. Thus, we find a negative impact of the instance on a state level. In comparison, relative to organizations, private organizations practice enhancement in innovation base output following the de-regulatory instance.

Table 2. Gross expenditure on R&D as a share of GDP percent, 2000 to 2012.

Sr.	Country	Invest in R&D	Starting Year	Ending Year
1	Canada	2.5 %	2000	2012
2	China	0.80 %	2000	2012
3	Finland	3.27 %	2000	2012
4	France	2.1 %	2000	2012
5	Germany	2.5 %	2000	2012
6	Japan	3 %	2000	2012
7	Russia	1 %	2000	2012
8	South Korea	2.2 %	2000	2012
9	UK	1.7 %	2000	2012
10	USA	2.2 %	2000	2012

Kroszner and Strahan (1999) stated that factors that manifest in different ways crosswise states can impact the deregulations timing in multiple states. In this manner, it is conceivable that outcomes of this investigation are driven by switch causality, whereas contrasts in development powers crosswise over states activated deregulation(Lin, Tan, & Geng, 2013). Another clarification for our findings that a variable that is omitted is matching with the liberalization of branches could be a primary reason for a change in innovation. If, so at this point, the variation in innovation we point to deregulation in branching shows strong affiliation slightly in comparison with a casual impact. This investigation referred to point policy deploys surprises that having effects on multiple states at multiple periods. As it looks impossible that an omitted variable inconsequential to fanning deregulation will change inevitably (even a large

portion of the event) a deregulatory incident happens. In these manners, our procedure of utilizing various stuns to stunned financial deregulation crosswise over state mitigates the overload factors concern(Atalay, Anafarta, & Sarvan, 2013).

In the wake of exhibiting that there are a total abatement in-licenses and patent references following expanded financial challenge faced

from the IBDA, this now looks at three potential networks to R&D. We expect that these organizations, 1% predominately in finance from external sources subordinate businesses. In this way, these private firms should encounter increments in development yield. This is

unequivocally what we find. We utilize the proportion of outside account reliance created by Duchin, Ozbas, and Sensoy (2010) and discover outer fund subordinate private organizations situated in nations that are open to interstate spreading produce an aggregate of 7.6% more licenses and 6.4% a more significant number of references three years subsequent to stretching deregulation than companies in that nations with the most limitations on interstate expanding. This outcome is hearty to an assortment of elective intermediaries for outside money reliance. We parcel the information by organization size, age, bank reliance following Acharya, Imbs, and Sturgess (2010) and by the SA record following Hadlock and Pierce (2010), and current study watch subjectively comparable outcomes. Interestingly, we watch no impact or a negative impact of banking deregulation on private organizations with under middle reliance on outside accounts(Hung & Chou, 2013).

Furthermore, organizations' financial connections before deregulatory occasions give another approach to examine how the requirement for external fund interfaces with variations in the rivalry in banking (Nawaz, Afzal, & Shehzadi, 2013). As banking rivalry builds, we have the expectation that the advancement yield of organizations with presented credits from inter-state banks to respond diversely contrasted with organizations with advances from banks at out of state (Eisingerich, Rubera, & Seifert, 2009). This investigation theorizes that inter-state banking connections are proof that organizations can fulfill their interest in outer money from close by banks. Be that as it may, if organizations obtain from out-of-state banks, it demonstrates that they can't fulfill their interest in money from close by banks. On the off chance that financial challenge grows access to the back, and if organizations use it to fund imaginative activities, at that point, the advancement yield of the last gathering of organizations should expand following increments in banking rivalry. Without a doubt, we watch an expansion in the development yield of private organizations with excellent previous out of state bank credits after deregulatory occasions and no adjustment in the advancement yield of open partnerships and private organizations with earlier inter-state banking connections. Similar to outside fund reliance crux, such outcomes give proof that organizations which are right on the way to profit by extended access to bank money exploit state-level financial challenge to increase their inventive output. Finally, mergers and acquisitions (M&A) based clarification for the negative impact of spreading deregulation on corporate development. Founder managers' private advantages of control, the proprietors of little firms like to verify financing while at the same time parting with as low power as conceivable to the lenders (Bolton & Von Thadden, 1998). Then again, Erel, Jang, and Weisbach (2015) find that

M&As fundamentally ease the budgetary limitations of target firms and show that a noteworthy bit of partnerships' development yield gets from acquisitions of creative targets. Together, these papers propose that increments in the state-level financial challenge could permit little, imaginative firms to verify bank financing to support inventive activities and stay free as opposed to being procured by companies. This impact could prompt a lack of willing targets that would generate a decrease in corporate development. Predictable with our guess that enterprises' capacities to secure little, imaginative target firms are hindered after bank expanding deregulation, we locate the general negative impacts of banking rivalry on advancement are especially solid among organizations that are visit acquirers and have high M&A consumptions before deregulatory occasions. Further, for a given company, we locate the normal inventiveness of the objectives it gets decreases after banking rivalry increments in it is headquarter state. This outcome demonstrates that the pool of potential focuses inside a state contains less creative firms after deregulation. At long last, we find the proportion of target firms that produce in any event one patent in a year to add up to private firms found inside a state decreases in the wake of banking rivalry increments. These outcomes recommend that a decrease in the stockpile of inventive targets is a potential component that clarifies the by and large negative connection between state-level financial challenge and corporate development. Finally, it is confirmed that the banking degradation effects the performance of whole banking firm in the country and around the globe. The remainder of the paper continues as pursues of the study.

2. Literature Review

Globalization has made difficulties for the business entities. Numerous firms are contending each other to crush the challenge and win the

clients. Firms need to confront higher dangers of rivalry and the potential outcomes of losing clients.

One of the primary reasons which cause this issue is the firms experiencing issues in reacting to the quick changes in market patterns. Today, a large portion of the associations are involved in continuing their aggressive edge in their item showcase. Talat (2018) expressed that we are living in a period where our capacity to brilliantly utilization of information chooses to come. Information, the executives, is expected to show strategy, procedure, and innovation to increase authentic learning and execution. It can develop authoritative progression and advancement capacity. To have a sound understanding of these results, we molder patents at the state-level into public corporation produced patents. In comparison with the public corporations, the private corporations could be more sensitive to the conditions of the banking at the local level, so there could be the difference between effects from the state-level in comparison with such two groups. Thus, we find a negative impact of the instance on a state level. In comparison, relative to organizations, private organizations practice enhancement in innovation base output following the de-regulatory instance. We also find that deregulation is having no direct impact on output from private organizations.

Dahiyat and Al-Zu'bi (2012) inquired about that information the executives has as of late risen as another guideline in its very own privilege and, given its innovation, is in all likelihood as yet building up its hypothetical home. Innovation emerges because of consolidating new information with exhibited information to reconfigure authoritative abilities and skills, bringing about worth included items. Mardani, Nikoosokhan, Moradi, and Doustar (2018) stated that knowledge creation having a significantly high effect on innovation speed, quality and

quantity, quality of innovation. In this context, Zia and Shafiq (2017) added that knowledge creation different modes having a positive association with the not only product but also process innovation. In this aggressive world, there is an enormous interest in imagination and imaginativeness. There are numerous strategies for innovation and numerous investigators have contemplated the advancement procedure and methods.

The development allows organizations to the parallel advancement of the progressions prospering in the specific circumstance. It is a strategic reason in answering to the novel varieties of a setting with different questions. Concerning affiliation, the curiosity would mean the making or receiving the new considerations or execution. Over the past investigations, the idea that advancement is significant organizations' long achievement and endurance building up an aggressive instrument is broadly recorded.

It has been noticed that organizations in developed economies of the globe spend more on innovation in comparison with underdeveloped nations (Follow figure 1 for the chart and graphical representation). Innovation operates in a worldwide framework with a noteworthy extent of innovation in cutting edge economies dependent on innovation move from outside nations. The Organization of Economic Co-activity and Development (OECD) gauges that in 2011 the USA kept on being the world's biggest entertainer of Research and Development (roughly 32 for each cent 30 of the world aggregate), trailed by China (16 percent) and Japan (12 percent). The UK positioned seventh, with 3 percent of the general worldwide spends, adding up to £27.4 billion out of 2011.

Over the OECD intensity of gross consumption on Research and Development (GERD) expanded from 2.2 percent in 2001 to 2.4 percent in 2011. Research and development power was most noteworthy in South Korea and the Research and

Development force of China, where consumption has quickened fundamentally lately, surpassed that of the UK without precedent for 2011. Use in the UK, while representing a lower portion of GDP, at 1.8 percent in 2011, showed remarkable security during the monetary emergency. The business segment, basic for the fruitful commercialization of research, keeps on being the biggest entertainer of Research and development in the UK.

Innovation is considered one of the basic tools for growth in the economy of any country but also improvement in the standard of living. Hall et al. 2009 proposed that over the past half of the century rate of return in research and development in the private sector in developed countries has been positive strongly from twenty percent to seventy-five percent. This isn't astounding. Advancement has been changing the world economy since the modern upset. Broadly useful Technologies (GPTs) like steam-power, charge and Information and Communication Technologies (ICT), and the ensuing advancements which, based upon them, have changed the manner in which individuals live and go with the quickest time of monetary development in written history. On the rear of these upgrades, the time it took to twofold expectations for everyday comforts dropped from five centuries in 1300 to one century in 1800 and afterward to 28 years in 19296.

This investigation contributed in two ways in the existing literature. First, this work is in relation to the literature which in true manners investigates the real-time banking deregulation effect. Addition of this literature is with Jayaratne and Strahan (1996), who express that inter-state deregulation of the branching enhances the real-time per capita progress in income and output rates. Following this investigation, a high amount of literature has investigated multiple consequences of the deregulations of both the

interstate branching and banking events that happened in the United States during the period from the 1970s to the 1980s. These investigation investigate that offshoot entrepreneurship make business circle of the state lesser and more similar (Morgan, Rime, & Strahan, 2004), permits organization entrance and approach over bank credit (Cetorelli, 2006) encourage inventive destruction (Kerr, 2009), and enhance the level of personal bankruptcy. Rice displays that in the mid of year 1990s, the occurrence of inter-state branching results in the expansion of credit supply and reduction in cost credit but having a nil effect on small level organization borrowed amount. We also investigated the deregulation effect in agreement with RICE. Additionally, we move a step ahead by showing that a reduction in credit costs allows private firms that are dependent on external finance to secure the financing from the bank to finance the innovation base projects.

Second, this investigates also added to evolving literature on the topic of finance and innovation. This work shows a relationship between characteristics of the market inclusive competition and innovation (Aghion, Bloom, Blundell, Griffith, & Howitt, 2005). Laws of the bankruptcy (Acharya & Subramanian, 2009) laws regarding labor (Acharya, Baghai, & Subramanian, 2013; Acharya et al., 2010), attitude of the investor towards failure (Tian & Wang, 2011) characteristics inclusive of the corporate governance (Meulbroek, Mitchell, Mulherin, Netter, & Poulsen, 1990) liquidity of the stock (Fang, Tian, & Tice, 2014) boundaries of the firm (Seru, 2014) coverage of the analyst (He & Tian, 2013) and ownership of the institutions (Aghion, 2013). Some of the empirical investigations also investigate the linkage between the development of the capital market and innovation by the organization. Benfratello, Schiantarelli, and Sembenelli (2008) proposed that the banking development process at the local level enhances

the “process of innovation” (not essentially innovation in the product) of the manufacturing organizations in Italy. Hsu, Tian, and Xu (2014) proposed that businesses having high dependency on financing from external sources and also higher technological intensive reveal a huge level of innovation in different countries with sound developed equity market, but development in credit market cause to innovation discourage in organization having such characteristics , with the sample of thirty two developed countries and emerging economies.

This investigation is identified with three contemporaneous papers. Amore, Schneider, and Žaldokas (2013) locate that inter-state financial deregulation during the years the 1980s positively affects the creative execution of open companies. Chava. (2013) says differentiating impacts of intrastate spreading and interstate financial deregulation on advancement by private firms. These creators locate that interstate financial deregulation expands innovation by the youthful, private organization; however, intrastate stretching deregulation diminishes innovation by these organizations. Hombert J. and Matray A. (2013) look at the similar deregulatory occasions as the over two papers and locate the quantity of trend-setters diminishes after these two deregulatory occasions. Dissimilar to these three examinations that analyze the impacts of deregulatory occasions that happened during the 1970s and 1980s, we center on the effects of interstate fanning deregulation which happened in the mid-1990s. We locate that interstate fanning deregulation caused a reduction in the advancement yield of partnerships, yet an expansion in the development yield of outer money subordinate private firms. We additionally show that declined procurement of little, imaginative firms by open enterprises is an essential instrument that drives the decrease in corporate advancement post-deregulation.

3. Research Methods

The current study aims to examine the banking competition on the innovation of the banking industry in ASEAN countries. The data were extracted from the database of the World Bank and individual banks in ASEAN countries from 2005 to 2016. Firstly, we measure the innovation variable used in the study and the average of two major measurements to measures it. First, this study takes the number of patent applications used by the banking industry, and the second measure is the number of citations received by the patents of the banking company. Secondly, the banking competition is measure by four deposit capital (DC), No of Branches (NOB), profitability (ROA), growth opportunities (GO) (Tobin’s Q) and corporation size (CS) (the natural logarithm of book value assets) and also develop the following equation:

$$Innovation_{it} = \beta_0 + \beta_1 DC_{it} + \beta_2 NOB_{it} + \beta_3 ROA_{it} + \beta_4 GO_{it} + \beta_5 CS_{it} \quad 1$$

4. Findings

The output of the research includes the assumptions of regression, fixed and random effect models, Hausman test and logistic approach. The first assumption about the multicollinearity that assumes variables are not highly correlated and checked by the variance inflation factor. The outcome showed that no multicollinearity issue with the variables, because VIF values are less than 5 and tolerance values, is more than 0.10. Table 3, given below, shown the VIF of the study.

Table 3
Variance Inflation Factor

	VIF	1/VIF
CS	1.579	.633
ROA	1.241	.806
NOB	1.217	.822
DC	1.169	.855
GO	1.096	.912

Mean VIF 1.26

The second assumption of regression is about the normality of the data that is verified through Skewness, and Kurtosis test and outcome showed that data has abnormality problems because probabilities values of almost all the variables are less than 0.05 and reject the alternative hypothesis of data is normal. This abnormality problem does not affect the results because the study has more than 100 observations that considered large data and abnormality does not affect in case of large data. Table 4, given below, shown the Skewness and Kurtosis test of the study.

Table 4

Skewness and Kurtosis Test

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj_chi2(2)	Prob>chi2
Innovation	120	0.311	0.036	5.420	0.066
ROA	120	0.208	0.000	27.660	0.000
NOB	120	0.000	0.002	26.130	0.000
GO	120	0.000	0.000	64.410	0.000
CS	120	0.000	0.003	20.610	0.000
DC	120	0.000	0.000	.	0.000

The third assumption is about homoscedasticity that is checked by the Breusch-Pagan test and finding exposed that data has not the heteroscedasticity problems because the probabilities values are higher than 0.05 that accept the null hypothesis about the homoscedasticity. In addition, the fourth assumption is about auto-correlation that is checked by Wooldridge test and finding exposed that data has auto-correlation problems because the probabilities values are less than 0.05 that reject the null hypothesis about data has no auto-correlation issue.

This study runs the fixed as well as random effect models to verify which one is appropriate through the Hausman test. Table 5 and Table 6 given below show the results of fixed as well random effect regressions.

Table 5

Fixed Effect Model

Innovation	Coef.	S.E.	t-value	p-value	L.L.	U.L.	Sig
ROA	1.037	.201	5.16	.000	.641	1.433	**
NOB	-.138	.337	-0.41	.683	-.801	.526	
GO	.951	.251	3.80	.000	.458	1.445	**
CS	-.368	.095	-3.87	.000	-.555	-.18	**
DC	.014	.002	7.65	.000	.01	.018	**
Constant	1.909	.547	3.49	.001	.832	2.987	**
R-squared			0.460	Prob > F		0.000	

*** $p < .01$, ** $p < .05$, * $p < .1$

Table 6

Random Effect Model

Innovation	Coef.	S.E.	t-value	p-value	L.L.	U.L.	Sig
ROA	.95	.188	5.06	.000	.582	1.319	**
NOB	-.039	.201	-0.19	.846	-.433	.355	
GO	.597	.197	3.03	.002	.211	.983	**
CS	-.032	.062	-0.51	.611	-.154	.091	
DC	.015	.002	8.50	.000	.012	.019	**
Constant	.357	.436	0.82	.413	-.498	1.212	
Overall r-squared			0.312	Prob > chi2		0.000	

*** $p < .01$, ** $p < .05$, * $p < .1$

The Hausman test is run to check which model is suitable among the random and fixed effect, and findings show that the probability value is lower than 0.05 and reject the null hypothesis regarding

the random effect is suitable. Table 7, given below, show the results of the Hausman test.

Table 7

Hausman Test

	Coef.
Chi-square test value	11.743
P-value	.038

The regression analysis with logistic approach used to test the hypotheses of the paper and findings show that the beta of deposit capital (DC), profitability (ROA), growth opportunities (GO) and corporation size (CS), has positive sign that shown positive link with innovation but number of branches (NOB) has negative sign that is the indication of negative link with innovation. While t value is higher than 1.64 and probabilities values are less than 0.05 in case of deposit capital (DC), profitability (ROA), growth opportunities (GO) and corporation size (CS) that show significant link but in case of number of branches (NOB), t value is less than 1.64 and probability value is higher than 0.05 that show insignificant link with innovation. Table 8 mentioned below shows the regression analysis with the logistic approach.

Table 8

Regression Analysis logistic Model

Innovation	Coef.	S.E.	t-values	P>t	L.L.	U.L.
ROA	1.037	0.128	8.070	0.000	0.754	1.320
NOB	0.438	0.231	1.900	0.034	0.647	0.372
GO	0.951	0.210	4.540	0.001	0.490	1.413
CS	0.668	0.217	3.078	0.002	0.844	0.109
DC	0.014	0.003	4.530	0.001	0.007	0.021
_cons	1.909	0.922	2.070	0.039	0.340	4.159

5. Discussions and Conclusion

The outcomes show that profitability has increased the ability of the banks in ASEAN

countries to increase innovation in the banking system. Similarly, deposit capital enhances the funds in the organization that also raise the ability of the firm to implement no ideas in the business. Likewise, growth opportunities enhance the business ability to cope with innovation and improve their processes for customer satisfaction and also gain a competitive advantage. In addition, corporation size also allows coping with innovation. A large organization has much ability to obtain innovation than the small institutions in the ASEAN countries. Finally, a number of branches have an insignificant link with innovation because of more capital invested in the branches that decrease the finance for the innovation processes in the ASEAN countries.

5.1 Policy Recommendation

The current study is suitable for the banking sector policymakers that they enhance the factors in the organization that enhance the innovation within the institution because innovation brings the competitive advantage as well as increase the performance of the institutions. The present study recommended to the regulators that they put more intension on to bring the innovation in the organization that increases the competitive advantage as well as increases the performance of the institutions.

5.2 Limitations and Future Directions

This study has few and valuable limitations such as it take only five factors to measure the banking competition and further study may include more elements in their studies. Moreover, this study take the 2005 to 2016 time period under investigation and further studies may add more period in their analysis.

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