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Panel data and Rural Credit in Thailand after Economic Crisis

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Financial institutes as one engine promoting growth, the research examined closely to rural financial institutions. Rural financial institutions were classified by government-owned bank (Bank for Agriculture and Agricultural Cooperatives, BAAC), agricultural cooperatives and farmers' associations, central bank (Bank of Thailand, BOT), and commercial banks. As the major role of BAAC and commercial banks in providing rural credit, then the research focused on supply of credit provided by BAAC and commercial banks. Panel data analysis was used to estimate supply of credit provided by BAAC and commercial banks during pre and post crisis, using 1985-2004 data. The research found that during pre-crisis foreign borrowing and public deposit explained rural credit provided by BAAC and commercial banks, significantly at 95%. Firm effects had all variables providing correct positive sign, with 67.88% R^2. In the cases of firm effects and time effects, foreign borrowing and public deposit determined rural credit provided by BAAC and commercial banks, with 78.48% R^2 which was higher than the case of no effect. After employed Hausman test, the analysis found that time effects was more appropriated than firm effects. For post crisis, foreign borrowing determined rural credit provided by BAAC and commercial banks, significantly at 95% in the case of no effect. Even though slightly low R^2, 92.43%, in the case of firm effects, 2 variables determined the credit. When the analysis combined firm effects and time effects, the credit could be explained by 97.58% R^2 which was greater than no effect case. After employed Hausman test, the analysis found that firm effects were more appropriated than time effects.

Field of research: Financial Economics

1. Introduction

The paper is organized into two parts. Part 1 explains the role of rural financial institutions: the Central bank (Bank of Thailand, BOT), government –owed bank (Bank for Agricultural and Agricultural Cooperative, BAAC), agricultural cooperatives and commercial bank. Part 2 panel data analysis was used to compare BAAC and commercial banks supply of credit during pre and post economic crisis.

Literature review

Sattaphon and Kiminami (2004) analyzed the effects of Japanese foreign direct investment (FDI) on bilateral food trade in East Asia by applying the panel data econometrics approach. The results indicate the existence of a complementary effect in the cases of ASEAN4 countries and China.

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The promotion of inward Japanese food industry FDI policy in East Asia should be achived by more trade liberalization in the case of ASEAN4 and China but to a lesser extent in the case of NIEs. Benedictis and Vicarelli (2004) analyzed trade potentials in gravity panel data medels, changed substantially when country heterogeneity and dynamics were taken into account. Italy, Germany, France and Spain were analyzed. When they estimated a gravity equation through a dynamic estimator they obtained a better results in terms of standard error of regression. A dynamic specification with fixed- effects gave the analyst more reliable indications that the systematic difference between actual and fitted bilateral trade was not just the result of the poor specification of the model, but that was the of time-variant country-specific unobservable element which was hidden in the residuals and that gave rise to positive or negative trade potentials.

Kim, Lyn and Zychowicz (2003) analyzed 26 countries using panel data, positing that technology transfers depended on the attributes of FDI providers. Japan and the U.S. are two important sources of FDI where multinational corporations domiciled in the two nations exhibit distinct variation in these attributes. They found a positive role of FDI inflows from the advanced countries in increasing the economic growth of developing countries. They also found that the relationship between the economic growth of the host countries and FDI inflows was stronger for U.S. originated FDI than that Japanese originated FDI. This was consistent with the notion that U.S. multinational firms were more effective in generating technology transfer and spillovers to developing countries than did Japanese multinational firms.

Asteriou and Monastiriotis (2002) investigated the long-run relationship between trade unionism and economic growth using a panel data set comprising of 18 OECD economies. Much of the existing evidence on the effects of unionism on productivity derived from micro economic studies, with little attention to the dynamic s of this relationship and the economy-wide effects. Using mean group and pooled mean group estimation techniques on cross-country panel data, the paper offered support to the “enhancing-worker-morale face of unionism” hypothesis, revealing appositive relationship between trade union density and labor productivity.

Al-Qenae, Li and Wearing (2002) investigated the incremental information content of earnings and other macroeconomic variables for share prices within the prices leading earnings framework, using a balanced panel data model of 34 firms. They found evidence supporting the phenomenon of prices leading earnings for the Kuwait Stock Exchange (KSE) after controlling for basic macroeconomic indicators. That was, the estimated earnings response coefficient was found to be sensitive (and significant) to the leading periods and it increased when more leading period were included. The results suggested that prices anticipate earnings and hence provide useful information to KSE investors.

Fitchett (1999) investigated on the Bank for Agriculture and Agricultural Cooperatives (BAAC), using descriptive analysis. He found that the BAAC rapidly expand its lending services in rural areas. Exploiting the comparative

advantage of its branch network and the close links to the rural BAAC also had developed its deposit base remarkably quickly. The financial and economic crisis, which had rocked the country since mid-1997, had put much of the development and the achievements of the past decade at stake. The financial sectors faced serious problems, with no effective solutions in sight. So far, BAAC had been far less affected than the commercial banks in terms of deposit volume, loan portfolio quality and profitability. However, they believed the worst was still to come as the crisis was unfolded and deepened, especially in the rural areas where BAAC's client live and work.

As above literature papers, panel data was used for this paper. Since BAAC and commercial banks were competing as loan providers. Firms effects and time effects would be investigated.

Classification of Rural Financial Institutions

Rural financial institutions in Thailand can be classified into 4 institutions. There are government-owned bank, agricultural cooperatives, central bank and commercial banks.

1) Government-owned bank (Bank for Agriculture and Agricultural Cooperatives, BAAC).
2) Agricultural Cooperatives
3) Central bank (Bank of Thailand, BOT).
4) Commercial banks, providing agricultural credit.

Government-owned bank (Bank for Agriculture and Agricultural Cooperatives, BAAC)

The bank was established by the BAAC Act of B.E. 1966, and operations started from 1st November in that year. In 1971, the BAAC started providing credit by group guarantee without collateral. Since then, BAAC could numerously expand the credit throughout agricultural cooperatives and farmer groups. The BAAC obtained its funds from various domestic and foreign sources, some of them at subsidized interest rates, including those from the commercial banks. A strong political pressure keep its lending rates low which it can manage to lend off only by making almost no profits. It implies that the BAAC is following an average-cost pricing rule, rather than a marginal-cost pricing rule. Throughout its life, the BAAC however has never made any losses. There are no collateral requirements. Individual farmers can obtain credit by group guarantee. Cooperatives receive credit by using institutional guarantee. Credit services on behalf of government agencies are responsible by government organizations. There are other roles beside providing loan of the BAAC: crop pledging scheme, marketing assistance to farmers and farmer institutions, implementation of central agricultural markets, fertilizer sales to assist farmers.

There are 4 major sources of operation fund; share holder equity, deposits from the public, deposits from commercial banks, and borrowing. In 1996, the percentage of source of fund were 7% , 76%, 3% and 14% of share holder

equity, deposits from the public, mandatory deposits from commercial banks and borrowing, respectively. The BAAC had borrowed from several sources: the Japanese Government's Oversea Economic Cooperation Fund (OECF), the Asian Development Bank , overseas financial markets, the Government Savings Bank, and the Bank of Thailand.

i) Lending channels

Lending channels to client farmers, and agricultural cooperatives are direct lending. While lending to farmer associations is coordinated with governmental projects. Agricultural cooperatives re-loan the credit to their members. Borrowers are 3 types: client farmers, agricultural cooperatives, and farmer associations. Therefore, micro-finance is client farmers.

Credit scheme – 1 Provision of credit services to individual farmers
Credit scheme – 2 Provision of credit services to institutions
Credit scheme – 3 Provision of credit services to government policies

Type of loans

(1)Short term loans for agricultural production
(2) Loans for postponement of farm product sale.
(3) Medium term loans
(4) Cash credit loans
(5) Long term loans for refinancing old debts
(6) Long term loans for agricultural investment

1.2 Agricultural Cooperatives

Cooperatives were first introduced into Thailand in 1916, from the government intention to stop the farmer heavy indebtedness. In 1928, there was the Cooperative Societies Act, B.E. 1928.

i) Structure of Cooperatives

In Thailand, cooperatives are vertically organized at three levels: primary level at the district level, secondary level at the provincial level and the national apex.

The activities of agricultural cooperative are agricultural credit service, processing and marketing of farm supplies and products, extension services and other occupational promotion services.

1.3 The Central bank (Bank of Thailand, BOT) and Commercial bank

The Central bank (Bank of Thailand, BOT) has not supplied credit directly to farmers or cooperatives but BOT regulates the commercial banks.

1.3.1 Applying the agricultural credit policies, during 1975 and 1986

In 1976, the BOT set up the agricultural credit target by using the previous year total deposit of each commercial bank to set up the supplied credit. 7% of total deposit of each bank in 1975 was assigned to be provided to farmers in 1976.

The credit had to be increased each year at 2% at the end of 13% of total deposit target. If the bank could not implement as a target, the bank had to deposit the difference to the BAAC.

1.3.2 After replacing the agricultural credit policies by the rural credit policies, 1987-present

As unsuccessful providing loan by the commercial banks and a reduction of agricultural role, the BOT replaced "the agricultural credit policies" by "the rural credit policies". The BOT increased the assigned loans from 13% of total deposit to 20% of total deposit. From 20% of total deposit, 14% of total deposit is loaned to farmers, agricultural industry, any other rural activities, working in foreign countries etc. 6% of total deposit is financed to agricultural business.

1.4 Supply of Credit Provided by BAAC

BAAC as the major credit providing in Thailand, table 3-4 presented number of households and loan amount receiving from BAAC. Table showed in 1987 BAAC provided loan at 35% and increased to 75% in 2004. In 1998 there were 4.88 households receiving loan from BAAC and the number of households increased to 5.35 households in 2003. In 1999 loan amount was 215 billion baht and the amount increased to 322 billion baht in 2004. Table 5 shows comparison of loan outstanding classified by institutions. In 1987 commercial banks provided loan at 63.8% and loan proportion declined to 25.4% in 2004. By contrast, BAAC loan proportion in 1987 was 35% and loan proportion increased to 74.5% in 2004.

Table 1 Comparison of Outstanding Credit, Classified by the Institution Roles, 1987-2004 (billion baht)

Year	Com bank	BAAC	Finance	Total
1987	45.8 (63.8%)	25.1 (35.0%)	0.9 (1.2%)	71.8 (100%)
1992	13	65	4.	20

	1.0 (65.4)	.2 (32.6%)	0 (2.0%)	2.2 (100%)
1996	159.2 (47.5)	176 (52.5%)	-	335.2 (100%)
1997	156.6 (44.9)	192 (55.1%)	-	348.6 (100%)
1998	148.3 (41.6)	208 (58.4%)	-	356.3 (100%)
1999	134.9 (38.5)	215.4 (61.4)	-	350.3 (100%)
2000	12	23	-	35

	0.6 (33.5)	8.5 (66.4)		9.1 (100%)
2001	105.2 (28.2)	267.4 (71.7)	-	372.6 (100%)
2002	107.7 (27.6)	282.4 (72.3)	-	390.1 (100%)
2003	101.8 (26%)	289 (73.9%)	-	390.8 (100%)
2004	110.1 (25.4)	322 (74.5%)	-	432.1 (100%)

Source: Bank of Thailand and BAAC, various issues.

2. Theoretical Framework and Model Specification

Theoretical framework

Supply of credit depends on sources of fund of the banks and risk. Sources of fund are capital fund, reserve, profit, public deposit, interest rate and borrowings. This research employed panel data analysis since BAAC and commercial banks are major sources of rural credit in Thailand. Moreover, their sources of fund can be both cross-section and time series related. The combination of time series with cross-sections can enhance the quality and quantity of data in ways that would be impossible using only one of these two dimensions.(Yaffe, 2003) Panel data analysis endows regression analysis with both spatial and temporal dimension. The spatial dimension pertains to a set of cross-sectional units of BAAC and commercial banks. The temporal dimension pertains to periodic observations of set of variables characterizing these banks over a particular time span.

Model Specification

The basic linear unobserved effects panel data model is

$$y_{it} = X_{it}\beta + c_i + u_{it}$$

$y_{it} =$ Rural credit provided by BAAC and commercial banks

$X_{it} =$ Foreign borrowing, Domestic borrowing, Public deposit

$c_i =$ deviation from constant of cross sectional unit (firm effects)

$u_{it} =$ random error

Comparison of rural credit provided by BAAC and commercial banks during pre and post crisis, using data 1985-1996 and 1998-2005. Thailand was the center of economic crisis in Asia since 1997. In August 1997, Thai currency depreciated from 1$= 27 baht to 1$= 38-45 baht. The research hypothesized foreign borrowing, domestic borrowing and public deposit positively explained rural credit provided by BAAC and commercial banks.

Before panel analysis was employed, the research test the effects of the fixed effects model. The pooled regression model was used as the baseline for the comparison. Fixed effects (firm effects, BAAC and commercial banks) was test, using an F test resembling the structure of the F test for R-square change.

$$Ftest = \frac{\left(R^2_{fixed} - R^2_{pooled}\right)/(n-1)}{\left(1 - R^2_{fixed}\right)/(nT - n - k)}$$

T=total numer of temporal observations
N=the number of groups
K=number of regressors in the model

If there is significant improvement in the R^2, then there is statistically significant firm effects.

$$F = \frac{(.6788 - .7430)/(2-1)}{(1-.7430)/(24-2-3)}$$

$$F = -4.7463$$

There was statistically significant firm effects for the data set. The F-test rejected pool ability across firms, indicating that there was a heterogeneity effect across firms. Then the research had to compare weather this heterogeneity across firm could be explained by the variability in the error term or by the randomness in the parameters.

Therefore this research had Hausman specification test. The Hausman test is whether the firm effects or time effects should be used. The research question is whether there is significant correlation between the unobserved specific random effects and the regressors. If there is no such correlation, then the time effects should be more powerful than firm effects. If there is such a correlation, the time effects model would be inconsistently estimated and the firm effects model would be the model of choice.

Table 3 Cross Equation with Fixed Firm and Period Effects, during Pre crisis, 1985-1996

	Parameter Estimates				
Specification	β_1	β_2	β_3	β_4	R^2
No Effects	1.65735	0.90978**	-0.39286	0.69823**	0.7430
	(0.65074)	(0.11345)	(0.14886)	(0.20633)	
Firm effects	1.39970	0.38206*	0.42540	0.34318	0.6788
	(0.57631)	(0.21991)	(0.33103)	(0.22342)	
Time effects	5.66869	0.455287*	-0.99750	0.33172	0.8672
	(1.79573)	(0.22425)	(0.26353)	(0.26625)	
Firm and Time effects	1.65735	0.90978**	-0.39286	0.69823**	0.7848
	(0.65074)	(0.11345)	(0.14886)	(0.20633)	
Hausman test	RE				

Source: analysis
Note: ** statistical significant at 95%
* statistical significant at 90%
Standard error are in parenthesis.

Table 4 Cross Equation with Fixed Firm and Period Effects, Post-crisis, 1998-2004

Specification	Parameter Estimates β_1	β_2	β_3	β_4	R^2
No effect	5.81687	0.12911*	-0.04089	-0.23400	0.9477
	(0.57340)	(0.06348)	(0.11407)	(0.03800)	
Firm effects	4.07322	0.22345**	0.13796*	-0.15868	0.9243
	(0.49240)	(0.04115)	(0.07492)	(0.02681)	
Time effects	4.39481	0.24279	0.26788*	-0.17350	0.9874
	(0.78071)	(0.07007)	(0.16255)	(0.04189)	
Firm and Time effects	5.81687	0.12911*	-0.04089	-0.23400	0.9758
	(0.57340)	(0.06348)	(0.11407)	(0.03800)	
Hausman FE test					

Source: analysis
Note: ** statistical significant at 95%
* statistical significant at 90%
Standard error are in parenthesis.

β_1 = coefficient of constant term
β_2 = coefficient of foreign borrowing, in log form and million baht
β_3 = coefficient of domestic borrowing, in log form and million baht
β_4 = coefficient of public deposit, in log form and in million baht

3. Empirical Results

The research found that during pre-crisis foreign borrowing and public deposit explained rural credit provided by BAAC and commercial banks, significantly at 95%. Using ordinary least square (no effect) even though provided high value of 74.30% R^2. Firm effects had all variables providing correct positive sign, with 67.88% R^2. As credit provider both BAAC and commercial banks could had firm effects and time effects. Therefore panel analysis would be employed. In the cases of firm effects and time effects, foreign borrowing and public deposit determined rural credit provided by BAAC and commercial banks, with 78.48% R^2 which was higher than the case of no effect. These correspond to the fact that during pre- crisis Thai bank sources of fund came from foreign borrowing and public deposit. Particularly to commercial banks after the crisis in 1997, these foreign borrowing led to commercial banks NPL. After employed Hausman test, the analysis found that time effects was more appropriated than firm effects.

For post crisis, foreign borrowing determined rural credit provided by BAAC and commercial banks, significantly at 95% in the case of no effect. Considering firm effects, foreign borrowing and domestic borrowing determined rural credit. Even though slightly low R^2, 92.43%, in the case of firm effects, 2 variables determined the credit. In the case of time effects, domestic borrowing

determined rural credit supply provided by these banks. When the analysis combined firm effects and time effects, the credit could be explained by 97.58% R^2 which was greater than no effect case. After employed Hausman test, the analysis found that firm effects was more appropriated than time effects. In addition, during pre-crisis period interest rate in Thailand was approximately 12 %, yet after the crisis, interest rate approximately 5%. For example saving deposit was as low as at 1% in year 2004%. These could confirmed that public deposit could determined credit supply during pre crisis, but it was not the case during post crisis due to low interest rate of deposit.

4. Conclusion

As the major role of BAAC and commercial banks in providing rural credit, then the research focused on supply of credit provided by BAAC and commercial banks. Panel data analysis was used to estimate supply of credit provided by BAAC and commercial banks during pre and post crisis, using 1985-2004 data. The research found that during pre-crisis foreign borrowing and public deposit explained rural credit provided by BAAC and commercial banks, significantly at 95%. Firm effects had all variables providing correct positive sign, with 67.88% R^2. In the cases of firm effects and time effects, foreign borrowing and public deposit determined rural credit provided by BAAC and commercial banks, with 78.48% R^2 which was higher than the case of no effect. After employed Hausman test, the analysis found that time effects was more appropriated than firm effects for pre-crisis data set. For post crisis, foreign borrowing determined rural credit provided by BAAC and commercial banks, significantly at 95% in the case of no effect. Even though slightly low R^2, 92.43%, in the case of firm effects, 2 variables determined the credit. When the analysis combined firm effects and time effects, the credit could be explained by 97.58% R^2 which was greater than no effect case. After employed Hausman test, the analysis found that firm effects was more appropriated than time effects.

References

Asteriou, D. and Monastiriotis, V. 2004. " Trade Unionism and Growth: A Panel Study",

Bank of Thailand. 1995-1998. *Quarterly Economic Bulletin*.

Bank for Agriculture and Agricultural Cooperatives. 1986-1997. *Annual Report*.

Benedictis. D.L. and Vicarelli, C. 2004. "Trade Potentials in Gravity Panel Data Models", Istituto Di Studie Analisi Economica, *Working Paper Number 44*.

Department of Agricultural Economic. 1998-2005. *Aricultural Statistics of Thailand*.

Fitchett, D. 1999. "Bank for Agriculture and Agricultural Cooperatives (BAAC), Thailand(Case Study)", *CGAP Working Group on Saving Mobilization*.

Greene, W. 2003. Econometric Analysis, Fifth Edition. Prentice Hall.

Kim, W.S., Lyn, E. and Zychowicz, E. 2003. "Is the Source of FDI Important to Emerging Market Economies? Evidence from Japanese and U.S. FDI?" *Multinational Finance Journal*.

Poramacom, N. 2002. "Agricultural Credit in Thailand", *Asian Production Organization*.

Sattaphon, W. and Kiminami, A., 2004. "The Effects of Japanese FDI on Bilateral Food Trade in East Asia", The University of Tokyo.

Siamwalla, A. 1991. Rural Credit in Thailand , Thailand Development Research Institute.

Siamwalla, A, 1993. Rural Credit and Rural Poverty, Thailand Development Research Institute.