

COMPETITION AND LEADER-FOLLOWER INTERACTIONS: PANEL ESTIMATES ON INDONESIAN BANKING

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Abstract

This paper discusses banking competition and leader-follower relationship. Banking competition is investigated using some specification from Monti-Klein model that allows leader-follower (i.e. Stackleberg) relationship, the possibility of Cournot competition and other form of competition. We use monthly observations across 119 banks listed in Indonesia using the standard panel fixed effect methodology to absorb time-invariant unobserved heterogeneity and dynamic panel data to minimize the risks of endogeneity. The estimation suggests the leader-follower relationship among banks exist both on loan and deposit markets. The results are mostly consistent across different groups and on full sample estimates, although are quite different in magnitudes. While leader-follower relationship is dominantly occur in credit market, there are some evidence of simultaneous appearance of both leader-follower and Cournot interactions on the deposit market.

Keywords: Banking, monetary policy

JEL Classifications: C70, E50, G21

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I. INTRODUCTION

Our preliminary investigation indicates that the response of deposit interest rate and lending rate towards monetary policy in Indonesia has been asymmetric. The response of deposit rate has been relatively proportional and timely, whereas the response of lending rate has been lagging and relatively rigid. This could be an indication of uncompetitive market (Cottarelli dan Kourelis, 1994; Borio and Fritz, 1995). Moreover, responses towards monetary policy among group of banks with different assets are heterogenous. Therefore, it indicates that some behavior related to individual market power and interaction among banks affect the industry response.

Those problems, which related to competition behavior in banking industry, are likely to affect the monetary policy transmission, particularly through interest rate channel and lending channel. Further, competition is also a relevant factor to increase efficiency (Hafidz dan Astuti, 2013) and to determine interest rates (Muljawan et. al. 2014).

Previous literatures conduct empirical estimates on this issue by applying widely-used competition indicators such as Lerner Index (Amidu and Wolfe, 2013), Hirschman-Herfindahl Index (Adams and Amel, 2011), Panzar and Rosse H-Statistic (Gunji et. al, 2007; Oliviero et. al., 2011) and Boone Indicator (van Leuvensteijn, 2013). This method, particularly by using Lerner, Boone Indicator or H-Statistic can indicate "conduct and performance" effect, whereas HHI only capture market structure effect. However, those approaches are generally explains competition on the whole industry, and does not capture asymmetrical interactions among individual banks.

Ariefianto (2009) suggest estimating specification that derived from Monti-Klein model that allows possible indication of leader-follower or Cournot interactions. This model is originally based on Cournot interactions (see Klein, 1971; Frexias and Rochet, 2008). In addition, Toolsema-Veldman and Schoonbeek (1999) had derived a Stackleberg version of this model. However, Ariefianto (2009) estimates are based on arbitrary choice of samples.

This research will examine competition in banking industry using industrial organization approach, also by improving methods to determine sample selection. Further, this research will model interest rate setting on a bank towards monetary policy using game theory and analyze the implications on monetary policy transmissions. Particularly, this research tries to answer three questions; first, how is the competition behavior on Indonesian banking industry? Second, if the leader(s) exist, how the followers will respond to leader's decisions? Third, how does the bank competition indirectly affect monetary policy transmissions?

This research is aim to contribute a more interactive indication about competition behavior on banking industry. In addition, this research potentially indicates a recommendation to increase the effectiveness of monetary policy transmission. We limit the analysis on the case of Indonesia.

II. THEORY

Bank competition is essential to be discussed. Competition between banks tends to raise efficiency (Hafidz and Astuti, 2013). Empirically, the degree of competition is one of determining factors of interest rate (Muljawan et. al. 2014). Moreover, a more concentrated banking industry has more rigid interest rate movement (Hannan and Berger, 1991; Neumark and Sharpe, 1992). However, Adams and Amel, (2011) said that the relationship between banking competition and monetary policy response are ambiguous.

Previous empirical studies conduct estimates on this issue by applying a widely-used competition indicators such as Lerner Index (Amidu and Wolfe, 2013), Hirschman-Herfindahl Index (Adams and Amel, 2011) and Panzar and Rosse H-Statistic (Gunji et. al, 2007; Oliviero et. al., 2011). This method, particularly by using Lerner or H-Statistic can indicate “conduct and performance” effect, whereas HHI only capture market structure effect. However, those approaches generally provide insights on the industry as a whole, and cannot capture asymmetrical interactions among individual banks.

Ariefianto (2009) suggest estimating specification that derived from Monti-Klein model that allows possible indication of leader-follower relationship or Cournot interactions. This model is originally based on Cournot interactions (see Klein, 1971; Frexias and Rochet, 2008). In addition, Toolsema-Veldman and Schoonbeek (1999) had derived a Stackleberg version of this model.

We recall a form of Monti-Klein model, by noting the following assumptions:

1. Two bank products, deposit and credit, are homogenous. Bank 1 and bank 2 have linier function of deposit and credit demand:

$$r_L = \alpha - \beta L ; L = L_1 + L_2 \tag{1}$$

$$r_D = a + bD ; D = D_1 + D_2 \tag{2}$$

2. Banks using deposit and credit quantities as strategic instrument
3. Linier cost function:

$$C_1 (L_1, D_1) = \gamma_{L,1}L_1 + \gamma_{D,1}D_1 \tag{3}$$

$$C_2 (L_2, D_2) = \gamma_{L,2}L_2 + \gamma_{D,2}D_2 \tag{4}$$

4. Interbank money market rate (r) is exogenous variable as it affected by monetary policy of Bank Indonesia.

5. Profit function of bank:

$$\pi_i = r_L L_i - r_D D_i - r(L_i - D_i) - C_i(L_i, D_i) \tag{5}$$

Combining equations (1) to (5) above, obtained maximization utility function of bank:

$$\begin{aligned} \max_{L_i, D_i} \pi_i = & (\alpha - \beta(L_1 + L_2 + L^P))L_i - \\ & (\alpha + b(D_1 + D_2 + D^P))D_i - r(L_i - D_i) - \gamma_{L,i}L_i - \gamma_{D,i}D_i \end{aligned} \tag{6}$$

First partial differentiation of (6) to lending and credit variable derives equation (7) and (8) as follows:

$$L_i = \frac{\alpha - r - \gamma_{L,i}}{2\beta} - \frac{1}{2}L^P - \frac{1}{2}L_{-i} \tag{7}$$

$$D_i = \frac{r - \alpha + \gamma_{D,i}}{2b} - \frac{1}{2}D^P - \frac{1}{2}D_{-i} \tag{8}$$

Equation (7) and (8) show that the quantity of credit (deposit) of a bank is affected inversely by that the quantity of credit (deposit) of the leader and those of other competitor.

III. METHODOLOGY

3.1. Empirical Specification

For the first analysis, we use a general specification that allows leader-follower (i.e. Stackleberg) relationship, the possibility of Cournot competition and other form of Competition, as in Ariefianto (2009).

From (7) and (8), we have basic understanding that one bank's lending (deposit) depends on its leader and other bank's lending (deposit). Combining (7) and (8) with macroeconomics and banking variables, where $X \in (L, D)$, the general specification can be represent as follows:

$$X_{it} = \alpha + \beta_1 X^p_{-i,t} + \beta_2 X_{-i,t} + \sum_k \gamma_k Y^k_t + \sum_m \mu_m Z^m_{it} + u_{it} \tag{9}$$

X_{it} is the amount of loan (deposit) of a particular bank i at t , $X^p_{-i,t}$ is the amount of loan (deposit) supplied by the leader, $X_{-i,t}$ is the amount of loan (deposit) supplied by the rest of followers, Y^k_t is the k^{th} panel-invariant factor, Z^m_{it} is the m^{th} panel-variant factor, and u_{it} is the stochastic error. α is a constant.

The possible key hypotheses on Equation (9) are as follows: 1. If $\beta_1 < 0$ and $\beta_2 < 0$, it indicates that the leader and other competitor are significant to affect bank's quantity of credit/deposit; 2. If $\beta_1 < 0$ and $\beta_2 = 0$, then the market is indicated to be consistent to leader-follower relationship (i.e. Stackleberg competition). 3. If $\beta_2 < 0$, $\beta_1 = 0$, then the market is indicated to be consistent with Cournot model, or it can be inferred that there is no leader exist. 4. If $\beta_1 > 0$ and/or $\beta_2 > 0$, it may indicate other form of competition that is not usually predicted.

Control variables, the "panel variant" or "panel invariant" factors consists of macroeconomic variables (GDP, inflation, exchange rates, and benchmark interest rates), specific internal bank variables (non-performing loans, capital adequacy ratio, etc), and industry variables (HHI). This list of control variables are partly based on Claessens and Laeven (2004) and Angellini dan Certorelli (2003). Further details of these variables are reported on the appendix.

We use two approaches to estimate Equation (9), namely: 1. the standard panel fixed effect methodology to absorb time-invariant unobserved heterogeneity (by replacing α_i with α_i); 2. dynamic panel data as in Arellano-Bond (1991) to minimize the risks of endogeneity (by replacing α with X_{it-1}).

3.2. Grouping of Observations

Observations consist of monthly data of 119 banks listed in Indonesia. The main data source are Bank Indonesia and CEIC. Observations are grouped based on an identification of whether banks compete on a relevant market, where the products across banks have a high degree of interchangeability. This step is crucial as competition is the central issue in this paper. To facilitate this matter, on estimations on credit market we use degree of similarity on credit across economic sectors between each bank and the leader candidate, using the following formula:

$$Xi = \sum_k^K \left| \frac{x_{ik}}{\sum_k x_{ik}} - \frac{x_{lk}}{\sum_k x_{lk}} \right| \tag{10}$$

x_{ik} is bank i 's lending on sector k , and x_{lk} is bank leader's lending on the corresponding sector. This formula was modified and inversed from trade complementary index (Michaely, 1996), which is used generally in international trade analysis. The leader candidates are Bank A, Bank B, Bank C, Bank D, and Bank E.

Similarly, for estimations on deposits, we use degree of similarity on deposit spatially (i.e. individual bank's deposit distribution across provinces) between each bank and its leader candidate, using following representation:

$$Xi = \sum_m^M \left| \frac{x_{im}}{\sum_k x_{im}} - \frac{x_{lm}}{\sum_k x_{lm}} \right| \quad (11)$$

x_{im} is bank i 's deposits on province m , and x_{lm} is the leader's quantity of deposits on the corresponding province.

Each group estimates applies to a group of observations that consists of 30 banks with the lowest value of Xi . As we have 5 suspected leaders (Bank A, B, C, D, E), then we have 5 groups (Group A, B, C, D, E, respectively) to estimate. In addition, we conduct estimation using all observations as a robustness test for omitted variable bias regarding omitted competitors across groups. To note, for full-sample estimations, we define the quantity of leaders' deposit/credit is the sum of those of all leader candidates.

IV. RESULTS AND ANALYSIS

4.1. Credit Market

The results of fixed effect panel regression (Table IV.1-1) shows that four groups of banks, each with Bank A, Bank B, Bank D, and Bank E as the leader respectively, follow Stackleberg competition, without any indication of Cournot competition. The highest follower response to the leader's choice of credit quantity is indicated on the group of banks with Bank B as the leader (i.e. Group B). Moreover, GDP have positive impact to dependent variables with elasticity close to unity. Non-performing loan (NPL) has negative impact to bank lending.

	Group A	Group B	Group C	Group D	Group E
VARIABLES					
Leader Credit	-0.0189** (0.00799)	-0.0557** (0.0232)	-0.0107 (0.0307)	-0.0175* (0.00923)	-0.0292* (0.0148)
Follower Credit	0.0961 (0.204)	0.0209 (0.168)	-0.110 (0.253)	0.215 (0.285)	0.375 (0.345)
CONTROL VARIABLES					
1. Macroeconomics	GDP, inflation rate, interbank rate, exchange rate				
2. Structural	HHI, credit diversification, credit to PDB ratio				
3. Internal bank	NP L, CAR, BOPO				
Constant	-4.483*** (1.107)	-3.426* (1.601)	-4.104*** (1.236)	-3.940*** (1.196)	-3.360 (3.170)
Observations	420	525	525	525	525
R-squared	0.902	0.862	0.914	0.900	0.720
Number of bank	12	15	15	15	15
Hausman Prob	0.008	0.099	0.093		0.000
Dependent variable: Log (Credit) (...) = Robust standard errors Significance level: *** p<0.01, ** p<0.05, * p<0.1					

Table 2.
Dynamic Panel Estimation for Credit

	Group A	Group B	Group C	Group D	Group E	Full Sample
VARIABLES						
Leader Credit	-0.0638** (0.0263)	-0.0585*** (0.0184)	-0.0447** (0.0197)	-0.134** (0.0680)	-0.0247** (0.0108)	-0.208* (0.121)
Follower Credit	-0.0084 (0.0414)	-0.122** (0.0521)	-0.167*** (0.0419)	-0.0834 (0.0942)	-0.0422 (0.0541)	0.163 (0.138)
CONTROL VARIABLES						
1. Macroeconomics	GDP, inflation rate, inter-bank rate, exchange rate					
2. Structural	HHI, credit diversification , credit to PDB ratio					
3. Internal bank	NPL, CAR, BOPO					
Constant	0.983*** (0.00495)	0.997*** (0.00595)	0.992*** (0.0102)	0.983*** (0.00611)	0.970*** (0.0105)	0.965*** (0.00647)
Observations	913	945	945	832	840	3,521
Number of bank	27	27	27	26	24	105
Sargan test prob	0.331	0.278	0.212	0.267	0.514	0.898
Arellano-Bond						
AR(2) prob	0.967	0.762	0.393	0.105	0.413	0.110
Dependent variable: Log(Credit) (...) = Robust standard errors Significance level: *** p<0.01, ** p<0.05, * p<0.1						

Dynamic panel data for credit indicates a leader-follower relationship for all groups estimated, and also consistent for full-sample estimates, that contain all banks in the industry.

Bank C and Bank B groups follows Stackleberg and Cournot competition model simultaneously. The highest response to the leader’s decision is indicated on the group of banks with Bank D as the leader. GDP have positive impact with short term elasticity 0.14 – 0.30. Interbank money market rate and NPL variables are negative, tends to be inelastic. The lag dependent parameters are estimated below unity, thus indicate dynamic stability.

4.2. Deposit Market

The fixed effect panel data regression shows that a leader-follower relationship occurs in all groups of observations, except for the groups of observations with Bank C and Bank A as the leader, respectively. Cournot competition model applies for all groups, except for the group of banks with Bank A as the leader. The highest follower response to the leader’s decision occurs on the group of banks with Bank D as the leader. GDP have positive impact to quantity of deposit with elasticity that close to unity, especially in groups of banks with Bank C, Bank A, and Bank D the leader, respectively. Non-performing loan (NPL) has a negative impact to bank’s deposit amount.

Table 3
Fixed Effect Panel Estimation for Deposit

	Group A	Group B	Group C	Group D	Group E
VARIABLES					
Leader deposits	-0.106 (0.138)	-0.122** (0.0421)	-0.0968 (0.103)	-0.359** (0.127)	-0.166** (0.0639)
Follower deposits	-0.607 (0.426)	-0.887** (0.316)	-0.831* (0.390)	-1.893*** (0.562)	-0.974* (0.461)
CONTROL VARIABLES					
1. Macroeconomics	GDP, inflation rate, interbank rate, exchange rate				
2. Structural	HHI, credit diversification, credit to PDB ratio				
3. Internal bank	NPL, CAR, BOPO				
Constant	17.76** (6.755)	14.50*** (3.571)	8.653*** (2.630)	23.26*** (3.152)	4.441 (7.023)
Observations	391	408	408	380	403
R-squared	0.430	0.558	0.493	0.526	0.271
Number of bank	12	12	12	12	14
Hausman Prob.	0.000				0.029
Dependent variable: Log(Deposits) (...) = Robust standard errors Significance level: *** p<0.01, ** p<0.05, * p<0.1					

In general, dynamic panel regression indicates that Stackleberg and Cournot competition models apply simultaneously for all group estimates and full-sample estimates.

The highest response occurs on the group of banks with Bank D as the leader (i.e. Group D), where 10% increase on Bank D's deposit will be responded by, on average, 3.6% decrease

Table 4.
Dynamic Panel Estimation for Bank's Deposit

	Group A	Group B	Group C	Group D	Group E	Full Sample
VARIABLES						
Leader deposits	-0.466*** (0.0541)	-0.269*** (0.0419)	-0.185*** (0.0455)	-0.298*** (0.0711)	-0.209*** (0.0402)	-0.471*** (0.128)
Follower deposits	-0.231*** (0.0860)	-0.165* (0.0851)	-0.370*** (0.116)	-0.256*** (0.0900)	-0.777*** (0.170)	-0.339*** (0.0582)
CONTROL VARIABLES						
1. Macroeconomics	GDP, inflation rate, interbank k rate, exchange rate					
2. Structural	HHI, credit diversification, credit to PDB ratio					
3. Internal bank	NPL, CA R, BOPO					
Lag dependent	0.989*** (0.00834)	0.991*** (0.00797)	0.992*** (0.00968)	0.999*** (0.0122)	0.937*** (0.0250)	0.988*** (0.0171)
Observations	798	822	774	846	754	3,212
Number of bank	25	25	25	25	26	106
Sargan Test Prob	0.228	0.202	0.363	0.181	0.569	0.147
Arellano Bond						
AR(2) prob	0.512	0.632	0.733	0.515	0.394	0.429
Dependent variable: Log (deposits) (...) = Robust standard errors Significance level: *** p<0.01, ** p<0.05, * p<0.1						

on follower’s deposit. GDP have positive impact to deposit variables. Herfindahl–Hirschman Index (HHI) has negative impact with small effect. Lag dependent coefficients below 1 indicates dynamic stability of the model.

V. CONCLUSIONS

The estimation results suggest a leader and follower relationship among banks on most of the grouped observations, although with some variations in magnitude. Generally, competition between followers is insignificant on credit market, but is significant on deposit market. Leader and follower competition result can be viewed on Table 3 below. Control variables, such as: GDP, inflation rate, interbank rate, exchange rate, HHI, credit diversification, credit to PDB ratio, and operational bank ratios are generally show consistent parameters as expected. All-sample estimates also suggesting similar results, and hence confirming the robustness of selected-sample regressions. For estimates using dynamic panel regressions, all estimations fulfill dynamic stability and well represent the data variations. Moreover, the estimations met the exogeneity assumptions for instrumental variables.

**Table 5.
Group Summary**

Panel Data		Lending	Deposit
Fixed Effect	Competition	Stackleberg, Except Group C	Stackleberg and Cournot, Except Group C and Group A
Arellano-Bond	Highest Response	Group B	Group D
	Competition	Stackleberg with Cournot for Group C and Group B	Stackleberg and Cournot
	Highest Response	Group D and Group B	Group D
Arellano-Bond	Competition	Stackleberg	Stackleberg and Cournot simultaneously

Although our results indicate that leader-follower relationship is generally hold on both credit and deposit market, either in separate groups or full sample, this paper still put restrictive assumptions on the leaders’ behavior. The interactive responses between leaders have yet to be analyzed without any prior restrictions. The suggestion for further research is to improve the empirical specification. For instance, to use credit/deposit similarities as a weight matrix that attached to the leader-follower coefficients to allow multiple leaders at once as well as to allow heterogeneous response towards each leader’s decisions.

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APPENDIX

Table 1. List and Notes of Dataset		
Variables	Source	Notes
Main Variables		
Credit	Bank Indonesia	Total credit of individual bank data
Deposit	Bank Indonesia	Total deposit of individual bank data
Credit/deposit of the leader	Bank Indonesia	5 banks as candidate (Bank A, B, C, D, E)
Credit/deposit of the followers	Bank Indonesia, authors' calculation.	Industry data – data on a particular bank observed
Macroeconomics		
GDP	CEIC	Nominal, interpolated to monthly using quadratic match sum
Inflasi	CEIC	Year-on-year terms
Interest rate	CEIC, Bank Indonesia	Interbank call money
Exchange rates	CEIC	
Industry		
HHI	Bank Indonesia, authors' calculation.	Using credit/deposit approach
Credit to GDP ratio	Authors' calculation	As a proxy to indicate the industry
Internal Bank		
NPL	Bank Indonesia	significance on the economy
CAR	Bank Indonesia	Share of credit with quality 3 to 5
BOPO	Bank Indonesia	
Credit to asset ratio	Bank Indonesia, authors' calculation	Operational cost / revenues As a proxy to indicate business diversification

Table 2. Fixed Effect Estimates on Credit Market					
	Group A	Group B	Group C	Group D	Group E
VARIABLES					
Kredit leader	-0.0189** (0.00799)	-0.0557** (0.0232)	-0.0107 (0.0307)	-0.0175* (0.00923)	-0.0292* (0.0148)
Kredit follower	0.0961 (0.204)	0.0209 (0.168)	-0.110 (0.253)	0.215 (0.285)	0.375 (0.345)
Variabel kontrol					
1. Makroekonomi					
PDB	1.041*** (0.236)	1.124*** (0.208)	1.185*** (0.230)	0.908*** (0.280)	0.933*** (0.199)
Inflasi	-0.000251 (0.00135)	-0.00365 (0.00298)	-0.000910 (0.00200)	0.000500 (0.00164)	0.000488 (0.00417)
Suku bunga PUAB	-0.00530 (0.00556)	-0.00556 (0.0113)	-0.0127* (0.00652)	-0.0116 (0.00935)	-0.00582 (0.0231)
Real Exchange Rate	-0.182* (0.0836)	-0.355*** (0.0730)	-0.214*** (0.0575)	-0.211 (0.131)	-0.250** (0.105)
2. Struktural					
HHI	-0.000474 (0.000411)	0.000980 (0.000663)	0.00102** (0.000437)	-8.79e-05 (0.000573)	-0.00108 (0.000646)
Diversifikasi	-0.199*** (0.0459)	-0.238*** (0.0688)	-0.125*** (0.0324)	-0.148*** (0.0454)	-0.0771 (0.0813)
Rasio kredit/PDB	0.0694*** (0.0180)	0.0685*** (0.0209)	0.107*** (0.0190)	0.0661*** (0.0150)	0.144* (0.0695)
3. Internal bank					
NPL	-0.0197** (0.00648)	-0.0288*** (0.00416)	-0.00764 (0.00826)	-0.0280*** (0.00151)	-0.0248** (0.00956)
CAR	-9.92e-05*** (1.31e-05)	0.000721 (0.00162)	-0.00197 (0.00362)	-0.00249 (0.00376)	-0.00345 (0.00669)
BOPO	1.91e-05 (0.000271)	0.000229 (0.000165)	0.000250** (9.83e-05)	0.000244 (0.000200)	-0.000663 (0.000514)
Constant	-4.483*** (1.107)	-3.435* (1.795)	-4.104*** (1.236)	-3.940*** (1.196)	-5.745 (4.673)
Observations	420	525	525	525	525
R-squared	0.902	0.862	0.914	0.900	0.720
Number of bank	12	15	15	15	15

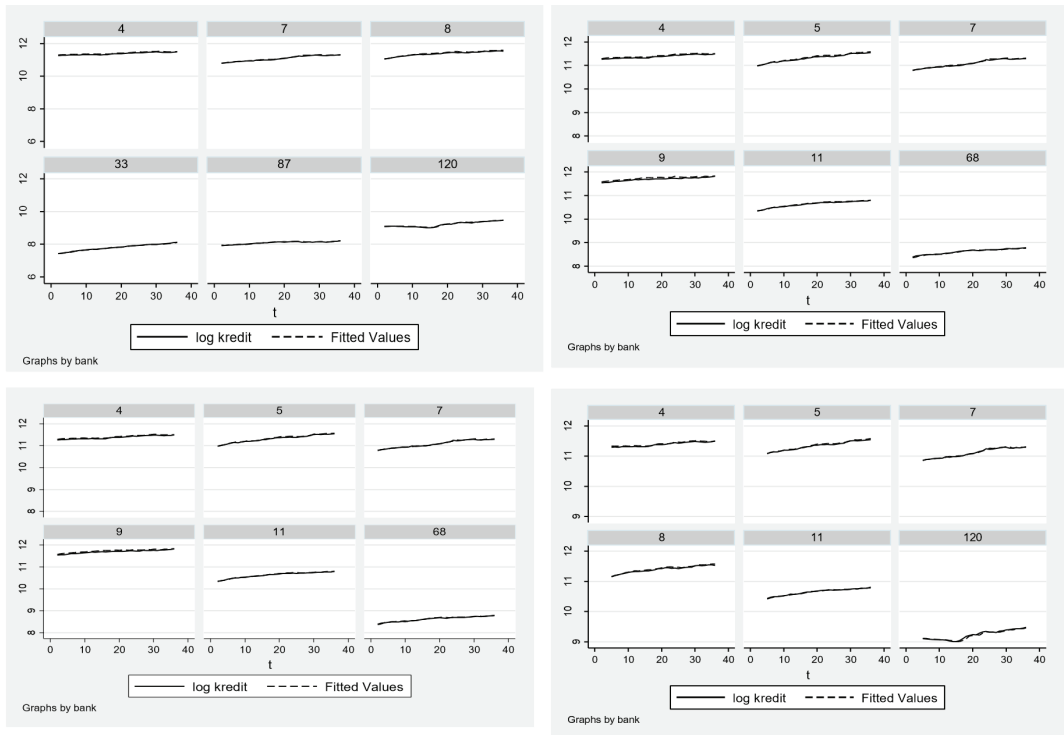
Table 3.
Dynamic Panel Estimates on Credit Market

	Group A	Group B	Group C	Group D	Group E	Full Sample
Variabel						
Kredit leader	-0.0638** (0.0263)	-0.0585*** (0.0184)	-0.0447** (0.0197)	-0.134** (0.0680)	-0.0247** (0.0108)	-0.609* (0.314)
Kredit follower	0.00843 (0.0414)	-0.122** (0.0521)	-0.167*** (0.0419)	-0.0834 (0.0942)	-0.0422 (0.0541)	0.642* (0.365)
Variabel kontrol						
1. Makroekonomi						
PDB	0.131** (0.0545)	0.205*** (0.0632)	0.305*** (0.0545)	0.189*** (0.0487)	0.144** (0.0731)	0.0970 (0.0847)
Inflasi	0.00279* (0.00148)	0.000804 (0.000889)	0.00250*** (0.000825)	-0.000652 (0.000915)	0.00178 (0.00163)	-0.000783 (0.00165)
Suku bunga PUAB	-0.0157** (0.00643)	-0.0155*** (0.00449)	-0.0236*** (0.00513)	-0.0176*** (0.00474)	-0.0178** (0.00759)	-0.0109* (0.00640)
Exchange Rate	-0.111 (0.0698)	-0.142*** (0.0492)	-0.251*** (0.0541)	-0.0198 (0.0486)	-0.115 (0.0812)	0.0374 (0.0473)
2. Struktural						
HHI	-0.000484* (0.000280)	0.00055*** (0.000202)	-5.84e-06 (0.000188)	0.00075*** (0.000211)	-0.000501 (0.000321)	0.00104** (0.000522)
Rasio kredit/PDB	0.00409* (0.00241)	0.000956 (0.00156)	0.00460 (0.00402)	0.00719*** (0.00222)	0.00609 (0.00457)	0.00516** (0.00248)
Diversifikasi	-0.0131 (0.0111)	0.00464 (0.00459)	-8.21e-05 (0.00584)	0.0120*** (0.00380)	0.0174*** (0.00496)	-0.00155 (0.00350)
3. Internal bank						
BOPO	-0.000100 (0.000197)	5.70e-05 (0.000125)	-0.000195 (0.000152)	-0.000186 (0.000155)	5.03e-05 (0.000154)	-2.89e-05 (0.000102)
NPL	-0.00170 (0.00128)	-0.00558*** (0.00157)	-0.0064*** (0.00208)	-0.0070*** (0.00139)	-0.00219 (0.00379)	0.00305 (0.00643)
CAR	-0.0007*** (0.000243)	0.00113** (0.000526)	0.000980 (0.000717)	-6.58e-05 (8.72e-05)	-0.000149 (0.000722)	-0.00086*** (0.000310)
Lag dependen	0.983*** (0.00495)	0.997*** (0.00595)	0.992*** (0.0102)	0.983*** (0.00611)	0.970*** (0.0105)	0.986*** (0.00939)
Observations	913	945	945	832	840	3,319
Number of bank	27	27	27	26	24	105

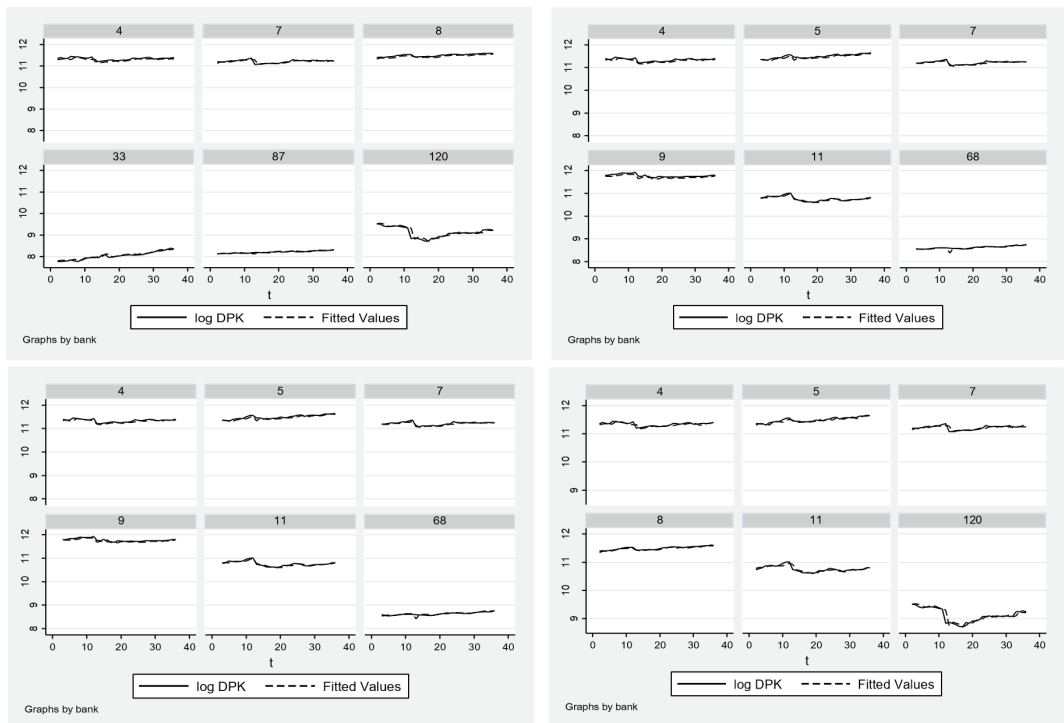
Table 4. Fixed Effect Estimates on Deposit Market					
	Group A	Group B	Group C	Group D	Group E
VARIABLES					
DPK leader	-0.106 (0.138)	-0.122** (0.0421)	-0.0968 (0.103)	-0.359** (0.127)	-0.166** (0.0639)
DPK follower	-0.607 (0.426)	-0.887** (0.316)	-0.831* (0.390)	-1.893*** (0.562)	-0.974* (0.461)
Variabel kontrol					
1. Makroekonomi					
PDB	0.222 (0.336)	1.078*** (0.301)	1.575*** (0.429)	1.580** (0.628)	2.199*** (0.523)
Inflasi	-0.0365*** (0.0107)	-0.00629** (0.00277)	-0.0103 (0.00690)	-0.0170*** (0.00314)	-0.0121* (0.00569)
Suku bunga PUAB	0.179** (0.0788)	0.0574*** (0.0140)	0.0312 (0.0207)	0.128*** (0.0154)	-0.00557 (0.0331)
Exchange Rate	0.0575 (0.235)	-0.489** (0.158)	-0.749*** (0.228)	-0.491** (0.204)	-0.855* (0.443)
2. Struktural					
HHI	-0.00513** (0.00166)	-0.00624*** (0.00118)	-0.00669*** (0.00170)	-0.00620*** (0.00127)	-0.0150*** (0.00437)
Diversifikasi	0.124*** (0.0307)	0.215*** (0.0443)	0.0191 (0.0610)	0.0762*** (0.0216)	0.0228*** (0.00370)
Rasio kredit/PDB	0.164*** (0.0395)	0.121*** (0.0273)	0.105*** (0.0331)	0.165*** (0.0367)	0.418 (0.270)
3. Internal bank					
NPL	-0.000784 (0.0246)	0.00186 (0.0141)	-0.0185 (0.0172)	0.0156 (0.0154)	0.00430 (0.0314)
CAR	0.00509*** (0.000583)	-0.0159*** (0.00454)	-0.0187*** (0.00414)	-0.000991 (0.000869)	-0.0111** (0.00386)
BOPO	0.000440 (0.000889)	4.76e-05 (0.000387)	0.000648 (0.000605)	0.000629 (0.000538)	-4.96e-05 (0.000194)
Constant	17.76** (6.755)	14.50*** (3.571)	8.653*** (2.630)	23.26*** (3.152)	4.441 (7.023)
Observations	391	408	408	380	403
R-squared	0.430	0.558	0.493	0.526	0.271
Number of bank	12	12	12	12	14

Table 5.
Dynamic Panel Estimates on Deposit Market

	Group A	Group B	Group C	Group D	Group E	Full Sample
VARIABLES						
DPK leader	-0.466*** (0.0541)	-0.269*** (0.0419)	-0.185*** (0.0455)	-0.298*** (0.0711)	-0.209*** (0.0402)	-0.471*** (0.128)
DPK follower	-0.231*** (0.0860)	-0.165* (0.0851)	-0.370*** (0.116)	-0.256*** (0.0900)	-0.777*** (0.170)	-0.339*** (0.0582)
Variabel kontrol						
1. Makroekonomi						
PDB	0.857*** (0.0963)	0.394*** (0.114)	0.643*** (0.153)	0.652*** (0.156)	0.903*** (0.188)	0.776*** (0.218)
Inflasi	0.00259 (0.00269)	0.00409* (0.00240)	0.00252 (0.00231)	0.00539** (0.00262)	-0.00336 (0.00609)	-0.00392 (0.00315)
Suku bunga PUAB	0.0161** (0.00799)	0.0328*** (0.0110)	0.0149* (0.00837)	-0.0178 (0.0109)	0.0602** (0.0236)	0.0380** (0.0190)
Exchange Rate	-0.0597 (0.0856)	0.419*** (0.123)	-0.0256 (0.0966)	-0.205* (0.119)	0.351* (0.196)	0.240 (0.169)
2. Struktural						
HHI	-0.00352*** (0.000461)	-0.00266*** (0.000462)	-0.00206*** (0.000495)	-0.000923 (0.000591)	-0.00369*** (0.00118)	-0.000771 (0.00114)
Rasio kredit/PDB	0.00301 (0.00209)	0.00318 (0.00253)	0.00245 (0.00234)	0.00505 (0.00532)	0.0763** (0.0344)	0.00844 (0.00541)
Diversifikasi	-0.0137*** (0.00519)	-0.00451 (0.00768)	0.00949* (0.00516)	0.0133 (0.0124)	-0.00125 (0.00194)	-0.00322** (0.00154)
3. Internal bank						
BOPO	0.000596 (0.000379)	0.000765** (0.000366)	0.000229 (0.000344)	0.000398 (0.000506)	0.000542* (0.000327)	0.00101* (0.000590)
NPL	-0.00265 (0.00261)	-0.00428*** (0.00158)	-0.00225 (0.00150)	-0.00583 (0.00532)	-0.0161 (0.0129)	0.0109 (0.00853)
CAR	0.000204 (0.000298)	0.000230 (0.000292)	-0.000343 (0.000355)	-0.000152 (0.000396)	-0.000823 (0.00117)	0.00778*** (0.000680)
Lag dependen	0.989*** (0.00834)	0.991*** (0.00797)	0.992*** (0.00968)	0.999*** (0.0122)	0.937*** (0.0250)	0.988*** (0.0171)
Observations	798	822	774	846	754	3,212
Number of bank	25	25	25	25	26	106



Graph 1. Credit Market: Dynamic Panel Actual Vs. Fitted Values



Graph 2. Deposit Market: Dynamic Panel Actual Vs. Fitted Values

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