THE EFFECT OF MARKET POWER ON BANK RISK TAKING IN TURKEY

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Abstract

The aim of this paper is to understand the role of market power on the loan risk and overall bank risk measures for Turkish banks during 2001-2009. Testing for this question is particularly important for the Turkish banking system, which experienced an intense regulation process after 2000 leading to a significant decrease in the number of banks and thereby possibly reducing competition. The results of the study provide some evidence regarding the competition-stability hypothesis.

Keywords: competition, banking

1 Introduction

Given the high costs of banking crises in general and the role of competition in the recent U.S. subprime crisis, determining the reasons for banking system fragility and characterizing the role of competition in financial stability are important issues. Howe-

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ver, there is no theoretical and empirical consensus on the role of competition on stability in banking.

There are two main hypotheses that are found in the literature about the relationship between competition and stability in banking: competition-fragility and competition-stability. The competition-fragility hypothesis argues that smaller banks, in more competitive environments, are more likely to take excessive risks and therefore competitive systems are more fragile than less competitive systems (see Keeley, 1990; Matutes and Vives, 2000; Caminal and Matutes, 2002; Martinez-Miera and Repullo, 2009 for further discussion). In contrast, the competition-stability hypothesis of Boyd and De Nicolo (2005) suggests that less competitive banking environment may cause fragility. Because a less competitive banking environments allow banks to increase the interest rate charged to firms (borrowers), which thus become more likely to have difficulties in repaying their loans, resulting in a higher probability of nonperforming loan ratios (NPL), more competitive environments are considered to be permit greater stability in banking systems (Beck, 2008)[1].

Empirical studies consider the fragility issue from different points of views. Some studies consider bank fragility from a macro perspective and take into account systemic banking crises (e.g. Beck, Demirguc-Kunt and Levine, 2006; and Schaeck and Čihak, 2006). Other studies consider bank fragility from a micro or managerial perspective and define it as the failure of an individual bank (e.g. Fungacova and Weill, 2009; and Bordo, Redish and Rockoff, 1993). There are also studies that consider fragility to be related to the risk-taking behavior of banks. These studies use the Z-index (e.g. Boyd and De Nicolo, 2006; and Berger, Klapper and Turk-Ariss, 2009) or the NPL ratios to measure risk (Jimenez, Lopez and Saurina, 2008). Macro studies mainly provide evidence for the competition-stability hypothesis while micro-based studies generally support the competition-fragility hypothesis. There is also no consensus about the methods for measuring competition. Some studies simply take the concentration ratios, while others use indices such as the Herfihndahl-Hirschman Index (HHI), Lerner, Tobin's q, and Panzar and Rosse's (1987) H-statistic. The empirical literature does not provide conclusive evidence in favor of either of the two hypotheses and the results of the individual studies are highly sensitive to the definition of fragility.

The relationship between competition and stability in banking has been investigated in many studies for the U.S. and mostly other advanced economies. However, little research has been carried out on this issue for developing economies, and previously there has been only one related study for Turkey: Tunay (2009). This is why our study is important. Tunay (2009) uses the NPL ratio as a measure of fragility and the three-bank concentration ratio, the ratio of privately owned bank assets to total assets of the system, and the ratio of foreign bank assets to total assets of the system as measures of competition for Turkish banking. Employing fixed and random effects models, he estimates the relationship between competition and fragility for the years between 1988 and 2007. The findings of Tunay (2009) indicate that there is no statistically significant relationship between concentration and fragility. Moreover the existence of foreign banks was found to decrease and domestic banks were found to increase fragility. The study provides some evi-

[1] See Boyd and De Nicolo (2009) for further discussion.

dence in favor of the competition-stability hypothesis for Turkey. However, the measurement of competition by concentration indices – as suggested by the structure conduct hypothesis in industrial organization literature – is a controversial issue. This is because competition and concentration refer to different concepts, and previous studies show that a concentrated banking system can be more competitive than a less concentrated one but also that a less concentrated banking system can be less competitive than a concentrated system (Claessens and Laeven, 2003; and Abbasoglu, Aysan and Gunes, 2007).

The aim of this paper is to understand whether competition promotes stability or fragility for Turkish banks. This question is particularly important for the Turkish banking system since it has experienced intensive regulation processes that have led to a decline in the number of banks and, possibly to changes in the competitive structure especially after the year 2000, an important turning point for Turkish banking. This paper employs mainly two different risk measures to account for loan risk and overall risk measures as dependent variables: the nonperforming loans to total loans and the Z-index to measure the risk taking behaviors of banks. Firstly, we employ the Lerner index and secondly the ratio of the difference between the total revenues and total cost to the total revenues (that does not specify any restriction on inputs and outputs) as proxies for the market power of individual banks during 2001-2009. To summarize, this paper contributes to the existing literature in different ways. Primarily, it is the first study to calculate the Lerner index for Turkish banks. Second, it is the first paper that considers competition as the ability to sell products above the marginal cost and then employs this to see the effect of competition on the risk-taking behaviors of banks in Turkey.

The paper is organized as follows. The next section describes the methodology that is used to calculate the Lerner index, and the risk taking variables are introduced. Later, sample and data used in the study are presented along with the descriptive statistics. This is followed by a discussion of the empirical results, and the final section concludes the paper.

2 Methodology

Many studies consider competition as a structural phenomenon and accordingly employ concentration ratios to measure competition. These studies argue that a greater concentration creates a less competitive banking environment that leads to higher profitability (Fungacova and Weill, 2009). Accordingly, competition can be measured by concentration indices such as the market share of the largest banks or by the HHI, which is defined as the sum of the squares of the market shares of the largest banks (Bikker and Haaf, 2000). However, it should be kept in mind that concentration and competition do not refer to the same thing.

Market power can be considered as the ability to sell products above the marginal cost. The Lerner index is one of the earliest and most popular indices for measuring market power as the difference between the price and marginal cost over the price (see Jimenez et al., 2008; Hainz et al., 2008; and Fungacova and Weill, 2009 for use of Lerner index in banking). The value of the index ranges from zero to one. In case of perfect competition, the price equals marginal cost and the value of the index becomes zero, and as the price

is determined above the marginal cost the value of the Lerner index increases. That is the more market power there is, the bigger is Lerner index.

In summary, we need two things to calculate the Lerner index: the price of bank production and the marginal cost. In this study, the price of bank production is calculated as the total revenues over the total assets. The disadvantage of the Lerner index is that the marginal cost function needs to be estimated. In this paper, the information related to marginal cost is obtained from the total cost function[2].

A cost function specifies the relationship between cost, input prices and output level. However Berger and Humphrey (1997) state that there is no consensus on input and output measures in banking. Nonetheless, there are two dominant approaches on this issue: the intermediation and production approaches. The production approach evaluates banks as production units that produce services to the depositors and borrowers. In this approach, the production factors such as land, labor and capital are used as inputs to produce banking services and the production is measured via the number of transactions or documents processed over a given time period. However, since this data is not easy to obtain the number of accounts have often been used as a proxy for banks' production in the previous literature (Denizer et al., 2000; and Berger et al., 1997). The intermediation approach on the other hand, considers deposit banks as financial intermediaries that collect deposits from the depositors and lend to borrowers and assumes that banks collect deposits and other purchased funds with the assistance of labor and physical capital and as intermediaries turn these sources of funds into loans (Kasman, 2002).

However, Turkish deposit banks have not fulfilled their intermediation duty during the studied period and it is difficult to obtain data on the number of transactions; hence, the total loans are considered as outputs, while labor, physical capital, and borrowed funds are used as inputs.

The price of labor represents the unit price of labor and it is obtained by dividing the personnel expenses (including severance payments) by the total assets. The price of physical capital is the ratio of other noninterest expenses (excluding personnel expenses and severance payments) to fixed assets. Finally, the price of funds represents the unit price of the funds and it is constructed as the ratio of interest expenses to borrowed funds and the deposit sum (Podpiera and Podpiera, 2005).

Under the cost function specification, the total cost (the sum of personnel expenses, other noninterest expenses and interest expenses) is estimated as a function of the output sum (total deposits, total securities, and total loans) and the three input prices. Table A1 gives the estimation results of the total cost function that is built in order to obtain the marginal cost.

Calculating a Lerner index to be used as a proxy of market power is not an easy process and can possibly be subject to many misspecification biases. Firstly, it requires many assumptions on inputs and outputs, and secondly, it requires many assumptions on the calculation methods of input prices and output quantity, and finally it requires assumpti-

[2] See Christensen and Greene (1976), Ray (1982), Jimenez et al. (2008), Hainz et al. (2008), Carbo et al. (2009), and Fungacova and Weill (2009) for a detailed discussion of cost functions and application to the banking sector.

ons on the functional form of the cost function. Mountain and Thomas (1998) show that it is better to include no factor prices than to include miss-specified factor prices. Thus, in order to calculate the market power of the individual banks in Turkey, we use an *MP* ratio that does not specify any inputs and outputs, as well as a functional form that is simply of the difference between the total revenues and total cost to the total revenues.

Since, the aim of this paper is to understand whether competition leads to taking higher risks or not, the general empirical model for this question is:

$$\text{Risk taking of banks} = f(\text{market power, control variables}).$$

In order to measure the risk taking behaviors of banks, nonperforming loans, and Z-index are employed. The Z-index can be computed as $Z = (NPA+EA) / \sigma(NPA)$, where *NPA* is the net profit to the assets, *EA* is the equity to assets ratio and $\sigma(NPA)$ is the standard deviation of the Net Profits to the Assets. The Z-index goes up as the profitability and capitalization increase, and decreases as the variability of the earnings increases. Thus, there is a tradeoff between the Z-index and the bank's probability of failure (Berger et al., 2009: 106). The Z-index increases with higher profitability and capitalization levels, and decreases with unstable earnings that are reflected by a higher standard deviation of return on assets. In other words, it can be regarded as an inverse proxy of the bank's risk-taking.

3 Data and descriptive statistics

The period 1999-2001 can be considered years of transformation for Turkish banks. Within these three years, the Turkish economy was hit by two severe economic crises and a destructive earthquake in the most industrialized region of the country. Furthermore, the parliament approved the new banking law (no 4389) in 1999. The Government guarantee on deposits, which had been set at 100 % for the year 1994 was restricted to 100,000 Turkish liras in 2000 and was further restricted to 50,000 Turkish liras in 2001.

The Turkish Banking Restructuring Program was started in 2001. To build a stronger banking system after the two severe crises, this program was conducted under the control of the IMF. The aim of these actions was to create a more efficient banking system. However, the restructuring program has turned out to be one of the most costly restructuring programs in the world (Banks in Turkey, 2001).

In Turkey, there were 81 banks operating in 1999. Over the next decade this number fell drastically and as of April 2010 there are only 45 banks operating in Turkey. Of these, 32 are deposit banks and 13 are development and investment banks. Of the deposit banks, 3 are state-owned banks, 11 are privately-owned, 11 are foreign banks founded in Turkey, 6 are foreign banks having branches in Turkey, and there is one Saving and Deposit Insurance Fund[3].

[3] SDIF is a state institution that insures saving deposits and participation funds and resolves the banks and assets transferred to it in a proper way.

Banking has a distinctive place in the Turkish financial system and plays an important role in achieving financial stability in Turkey.[4] Although there has been a recent increase in the number and size of non-banking financial institutions, the system is still dominated by the deposit banks.

Data was drawn from the banks' balance sheets and income statements as reported to the Banks Association of Turkey (BAT) and covers 30 deposit banks operating during the 2001-2009 period[5], and the IPI data were obtained from the Turkish Central Bank (TCMB). As a measure of loan risk, the non-performing loans ratio (gross) and as a measure of overall bank risk Z-index are used. Table A3 gives the definitions and summary statistics of the variables employed in the empirical part of the study. The summary statistics show that our sample consists of very heterogeneous observations.

Two variables are employed in the study as proxies for market power. First, the Lerner index is derived from the marginal cost function and the price of the bank's production as explained in methodology section. Second, (*MP)* is calculated as the difference between the total revenue and total cost divided by the total revenue. Higher values of market power correspond to lower competition levels. Thus a negative coefficient is expected according to the competition-fragility view. On the other hand, the competition-stability view expects a positive relation. The *ASSETSHARE* variable measures the asset share of the individual bank in the sector. Total shareholders' equity divided by the total assets *(EA)* is the indicator of capital adequacy. Net profits (losses) divided by the total assets *(NPA)* is employed to control the effect of profitability on risk variables. Total revenues divided by the total expenses *(TRTE)* variable is employed to control for managerial efficiency.

In this study, the industrial production index *(IPI)* is used to control for the changes in the economic environment. When *IPI* is increasing, borrowers (firms and consumers) are considered to be earning more and to be able to repay loans more easily, thus the *IPI* has a negative expected relationship for *NPLG,* and has a positive expected sign for the empirical model for which the Z-index is the dependent variable.

4 Empirical results

The average Lerner index is calculated as 0.9674. This indicator implies that the banks in Turkey do not operate in a competitive environment, and enjoy monopoly rents. This result is consistent with Abbasoglu et al. (2007) who provide evidences for a monopolistic competitive structure in the Turkish banking system from 2001 to 2005. With this calculation of market power, it is seen that Turkey has a less competitive banking sector than, particularly, the EU economies. In a recent study Carbo et al. (2009) calculate the average Lerner index for EU countries as 0.16.

An interesting result observed from the correlation matrix is the correlation between *LERNER, MP* and *ASSETSHARE* variables. There is a weak correlation between *ASSETS-*

[4] Total assets of the banking system account for nearly 90 percent of the total assets of the financial sector and deposit banks held 97 percent of the total banking system assets in 2008 (Banks Association of Turkey, 2008).

[5] See table A2 for the list of banks included in the study.

HARE and the *LERNER* 0.08 and a 0.1 correlation between *ASSETSHARE* and *MP*. This preliminary result contradicts the structure-conduct-performance hypothesis used in industrial organization theory. This hypothesis argues that as concentration increases, the banking environment becomes less competitive, which results in higher monopoly rents; accordingly, competition can be measured by the concentration indices. However, the number of studies challenging this hypothesis increased recently (Claessens and Laeven, 2003; and Abbasoglu et al., 2007).

Tables A5-A8 summarize the results of the static and dynamic empirical models. Under the static models fixed-effects, random-effects and GMM models are estimated. The first two techniques assume the market power variable is exogeneous. However market power can be endogeneously determined. That is to say market power can also be a function of level of risk. The Durbin Wu Hausman test is conducted to test for endogeneity. Except for the first group of estimations (table A5) *LERNER* is found to be exogeneously determined. For all the other remaining regressions *LERNER* and *MP* are endogeneous. In order to avoid the biased coefficient estimations caused by endogeneity, 2SLS or GMM techniques are applied in the literature (Berger et al., 2009; and Shaeck and Cihak, 2007). However, Baum and Schaffer (2003) indicate that if the errors are heteroscedastic, the GMM technique will give more efficient estimates than the 2SLS. In order to test for the homoscedasticity assumption the Breusch-Pagan test employed and the errors are found to be heterosedastic. Consequently, the GMM technique can be considered superior to the other static estimation techniques when endogeneity of market power proxies is present.

Under the dynamic models, two specifications of the GMM method proposed by Arellano-Bond (1991) are used: in the first, market power variables are exogenously determined, and endogeneously in the second model. In the models where the market power variables are endogenously determined, one-period lagged values of the market power variables are used as instruments. However, coefficients of the lagged dependent variables are insignificant in all specifications in tables A5-A8, which indicate the superiority of the static models.

To sum, among the static models, since the market power variables are endogeneous and heteroscedasticity is present, the GMM technique is superior to the other specifications of tables A6, A7 and A8. For models in table A5, where *NPLG* is the dependent and *LERNER* is the independent variable, the Durbin Wu Hausman endogeneity test indicates the absence of endogeneity. Thus random or fixed effects models are superior to static GMM. However the Hausman test is indifferent between the random and the fixed effects model at 5%. Moreover the results of the fixed and random effects models are quite similar.

Fixed and random effects estimations of table A5 indicate no significant relationship between *NPLG* and *LERNER.* In contrast to this finding, in table A6 where *NPLG* is the dependent and *MP* is employed as the independent variable, a positive and statistically significant relationship is found in the static GMM specification of the model. Both static and dynamic GMM estimations where *LERNER* is treated endogeneous in table A7 indicate the presence of a negative and statistically significant relationship between *LERNER*

and *Z.* Since *Z* can be regarded as an inverse measure of risk, these results suggest that as the market power of a bank increases the risk level of that bank increases. Thus, as market power decreases, competition creates less risky banks, and following this, the stability of the whole system can be realized. However in table A8 the static GMM model fails to find a significant relationship between *MP* and *Z.*

The positive and significant coefficient estimates of *EA* in random and fixed effects models of table A5 and in the static GMM model of table A6 reveal the effect of capitalization for risk levels of banks. As shareholder equity to total assets ratio grows banks become more likely to take excessive risk. This may be due to offsetting risk by higher capitalization levels.

The negative and significant (10%) coefficient estimates of *NPA* in the random effects model of table A5 and the static GMM model of table A6 reveals that as profitability increases banks are less likely to have higher loan risk levels. However this finding should not be considered very important since the fixed effects estimate of the coefficient in table A5 is insignificant.

As for the effects of ownership structure on loan and overall risk levels of banks, the three state-owned banks are found to be more likely to have higher risk levels than private banks in all superior specifications of tables A5-A8. As for the effect of the foreign ownership, foreign banks are found less risky in the models of table A5, A6 and A7. Finally, the *IPI* variable has no explanatory power in any of the models, which indicates loan and overall risk levels of banks are not affected by the macro economic conditions.

5 Conclusion

The aim of this paper was to examine the relationship between the market power and risk-taking behaviors of banks in Turkey between 2001 and 2009. As dependent variables, non-performing loans and Z-index are employed as measures of loan and overall risk levels respectively, and the market power is first measured by the Lerner index. However, calculation of the Lerner index can be subject to many misspecification biases in banking. Thus secondly, in addition to the standard Lerner index, the difference between the total revenues and total cost over the total revenues (which does not specify any restriction on inputs and outputs or a cost function to estimate the marginal cost) is used as another proxy for the market power.

Employing both static and dynamic panel data estimation techniques, some evidence supporting the competition-stability hypothesis is found in the empirical part. However the findings of the study indicate that the effect of the market power on the risk-taking behaviors of banks is not crystal clear in Turkey after the year 2000. Another finding is related to the negative relationship between profitability and fragility. This finding suggests that a fall in profitability – measured by the ratio of net profit (loss) to assets – leads to increases in loan risk levels of banks. Capitalization measured by the shareholders' equity divided by the total assets plays a positive role on the risk-taking of banks. This can be due to banks' attempts to offset risk by higher capitalization levels. That is

to say, the loan risk and the overall risk levels tend to be higher in better capitalized and less profitable banks.

As a proxy for macroeconomic environment, the industrial production index does not have any explanatory power on the risk-taking behaviors of banks in Turkey. Regarding the ownership structure and risk taking behaviors of banks, the three state-owned banks are found to be more likely to have higher risk levels than private banks. Additionally there is some little evidence supporting the idea that the foreign banks are less risky than the domestic ones. To sum up, our main result of the competition-stability hypothesis is in line with findings of the previous study of Tunay (2009) on Turkish banking.

Some policy suggestions can be derived from the results of the study. First of all there is a huge gap between the average market powers of EU and Turkish banking systems. Banks in Turkey operate nearly in a non-competitive environment compared to the EU economies. In addition to this fact, the disadvantages of having less competition and "too big to fail" policies in banking are especially important for an emerging economy like Turkey. Thus competition should be fostered in the sector in order to have a system composed of less risky banks and a consequent lower probability of financial crisis. The current system is composed of powerful banks (with higher price-cost margins), and the entrance of smaller banks (lower price-cost margin) should be encouraged. In this way, a more competitive banking system can be created and the investment level of the economy might be increased with lower prices on the loan side.

This paper can be extended by employing the banking crises as fragility indicator, moreover other competition measures such as the Panzar and Rosse's H-stat, the Herfihndahl–Hirschmann, and Boone indices can be used to analyze the competitive structure of Turkish banking.

APPENDIX

Table A1: Total cost function estimation results Dep. Var.: log(TC)

Variables	Coefficient (std. errors)
Constant	-2.09 (.72)***
Output	.216 (.035)***
Pk	.453 (.064)***
Pl	.193 (.144)
Pf	.353 (.124)***
½(output)^2	-.027 (.003)***
Pk*Pl	-.077 (.046)*
Pk*Pf	-.085 (.022)***
Pl*Pf	.007 (.036)
Pl*output	-.058 (.015)***
Pk*output	-.017 (.11)
Pf*output	.075 (.013)***
Overall significance	Wald chi2(8) = 1492.35 Prob > chi2 = 0.00
Number of observations	262

*Notes: (a) *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.*
(b) Output implies the log of total loans.
(c) Pk, Pl and Pf stand for logs of the prices of capital, labor and funds respectively.

Table A2: List of banks used in the study

Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	Arap Türk Bankası A.Ş.
Türkiye Halk Bankası A.Ş.	Citibank A.Ş.
Türkiye Vakıflar Bankası T.A.O.	Denizbank A.Ş.
Adabank A.Ş.	Deutsche Bank A.Ş.
Akbank T.A.Ş.	Eurobank Tekfen A.Ş.
Alternatif Bank A.Ş.	Finans Bank A.Ş.
Anadolubank A.Ş.	Fortis Bank A.Ş.
Şekerbank T.A.Ş.	HSBC Bank A.Ş.
Tekstil Bankası A.Ş.	ING Bank A.Ş.
Turkish Bank A.Ş.	Millennium Bank A.Ş.
Türk Ekonomi Bankası A.Ş.	Turkland Bank A.Ş.
Türkiye Garanti Bankası A.Ş.	ABN AMRO Bank N.V.
Türkiye İş Bankası A.Ş.	Bank Mellat
Yapı ve Kredi Bankası A.Ş.	Société Générale (SA)
Birleşik Fon Bankası A.Ş.	WestLB AG

Table A3: Summary statistics

Variable	Definition	Obs	Mean	Std. dev	Min	Max
Nplg	Loans under follow-up (gross) / Total loans (%)	265	35.62	241.6	0	3759
Z	(NPA+ EA) / std. dev(NPA)	270	2.78	2.59	-3.06	15.07
Lerner	Lerner index (Price-Marginal Cost) / Price	262	0.9674	0.096	0.021	0.995
Mp	(Total Revenues-Total Cost) / Total revenues (%)	269	0.9921	0.0025	0.971	0.9992
Assetshare	Asset share in the sector (%)	270	3.214	4.78	0.0001	19.4
Npa	Net profit (losses) / Total assets (%)	270	0.983	6.84	63.2	32.2
Ea	Shareholders' equity / Total assets (%)	270	18.07	16.36	-2.67	84.9
Trte	Total revenues / Total expenses (%)	269	144.2	91.1	34.63	1290.8
Ipi	Industrial production index	270	125	17.2	94.43	146.32

Table A4: Correlations

	Nplg	Z	Lerner	Mp	Assetshare	Npa	Ea	Trte	Ipi
Nplg	1								
Z	0.21	1							
Lerner	-0.25	-0.23	1						
Mp	-0.06	0.51	0.21	1					
Assetshare	-0.07	-0.15	0.08	0.1	1				
Npa	-0.49	0.44	0.26	0.67	0.07	1			
Ea	0.49	0.89	-0.39	0.23	-0.21	-0.004	1		
Trte	0.17	0.73	0.03	0.57	-0.05	0.52	0.56	1	
Ipi	-0.009	0.11	0.21	0.16	0.03	0.23	0.01	0.08	1

Table A5: Estimation results: dep var=nplg and market power=Lerner

Dep var: NPLG	**Static models**			**Dynamic models**	
	Fixed effects (a)#	**Random effects (a)#**	**GMM (b)**	**GMM (c)**	**GMM (d)**
Lag.nplg				.37 (1.16)	1.87 (1.22)
Lerner	95.59 (233.5)	-18.58 (257.2)	-923.3 (736.6)	-585.8 (488.3)	-128.1 (295.35)
Assetshare	4.25 (10.1)	-.44 (1.78)	.38 (.96)	55.3 (37.0)	26.5 (33.76)
Trte	.86 (.56)	1.01 (.54)*	1.19 (.32)	1.13 (.34)***	.88 (.23)***
Ea	4.23 (2.21)*	4.81 (1.62)***	4.93 (2.25)**	-.37 (4.14)	-4.90 (4.45)
Npa	-25.73 (16.6)	-26.76 (14.7)*	-35.21 (10.2)***	-49.9 (13.35)	-48.4 (12.4)***
Ipi	2.1 (1.43)	1.95 (1.25)	.061 (.50)	.12 (.96)	.24 (.79)
Foreign		-48.8 (24.5)**	-25.6 (16.8)		
State		28.67 (13.7)**	30.6 (14.7)**		
Constant	-504.6 (196.4)**	-368.1 (291.9)	746.2 (699.8)	322.8 (511.9)	36.3 (364.6)
Number of obs	261	261	229	201	201
Overall significance	F(6,29) = 7.23***	Wald chi2(9) = 492.8***	F(8, 220) = 6.20***	Wald chi2(7) = 109.7***	Wald chi2(7) = 61.6***
R-squared	within = .43 between = .88 overall = .53	within = .42 between = .90 overall = .55	Centered = .77 Uncentered = .78		
Hansen J statistic			1.69 Chi-sq(1) P-val = .192		
Hausman test	chi2(6) = 12.45 Prob>chi2 = 0.05				

*Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.*
Wooldridge test for the serial correlation indicates absence of serial correlation.
Heteroscedasticity robust std. errors are presented in parentheses.
(a) FE and RE estimators that assume Lerner exogeneous.
(b) GMM estimators that assumes Lerner endogeneous.
(c) differenced GMM estimator that assumes all independent variables except the lagged dependent variable are exogeneous.
(d) differenced GMM estimator that assumes Lerner and lagged dependent variable are endogeneous.
(e) # denotes the preferred models according to results of Durbin Wu Hausman endogeneity test, Hausman specification test.

Table A6: Estimation results: dep var=nplg and market power=MP

Dep var: NPLG	**Static models**			**Dynamic models**	
	Fixed effects (a)	**Random effects (a)**	**#GMM (b)#**	**GMM (c)**	**GMM (d)**
Lag.nplg				.05 (1.40)	1.48 (1.21)
Mp	17569.3 (14419.7)	18486.1 (12616.7)	18428.4 (7948.6)**	16528.3 (15264.4)	28139.3 (13612.2)
Assetshare	1.67 (10.19)	-1.76 (1.48)	-1.22 (1.04)	51.1 (32.8)	34.3 (29.08)
Trte	.78 (.43)*	.80 (.35)**	.99 (.26)***	1.03 (.40)**	.80 (.31)**
Ea	3.31 (2.65)	4.93 (1.72)***	5.82 (2.29)**	2.64 (4.45)	-3.36 (4.25)
Npa	-28.02 (18.3)	-29.1 (15.7)*	-37.3 (10.4)***	-50.41 (17.7)***	-51.4 (16.4)***
Ipi	2.01 (1.24)	1.81 (1.09)*	-.13 (.51)	-.091 (.97)	.22 (.66)
Foreign		-51.8 (20.8)**	-25.6 (18.1)		
State		31.04 (15.3)**	42.8 (14.9)***		
Constant	-18670.8 (12599.6)	-18670.8 (12659.4)	-18395.8 (7902.3)**	-16629.6 (15190.4)	-28028.81 (13514.9)**
Number of obs	264	264	234	205	205
R-squared	within = .43 between = .89 overall = .54	within = .42 between = .92 overall = .56	Centered = .76 Uncentered = .77		
Overall significance	F(6,29) = 10.98	Wald chi2(8) = 260.1***	F(8, 225) = 14.18***	Wald chi2(7) = 147.14***	Wald chi2(7) = 33.7***
Hansen J statistic			1.361 Chi-sq(1) P-val = 0.243		

*Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.*
Wooldridge test for the serial correlation indicates absence of serial correlation.
Heteroscedasticity robust std. errors are presented in parentheses.
(a) FE and RE estimators that assume MP exogeneous.
(b) GMM estimator assume MP endogeneous.
(c) differenced GMM estimator that assumes all independent variables except the lagged dependent variable are exogeneous.
(d) differenced GMM estimator that assumes MP and lagged dependent variable are endogeneous.
(e) # denotes the preferred model according to results of the Durbin Wu Hausman endogeneity test.

Table A7: Estimation results: dep var=z and market power=Lerner

Dep var: z	**Static models**			**Dynamic models**	
	Fixed effects (a)	**Random effects (a)**	**#GMM (b)#**	**GMM (c)**	**GMM (d)**
Lag.z				-.007 (.12)	-.004 (.088)
Lerner	-5.08 (3.08)	-6.23 (2.24)***	-7.93 (3.56)**	-4.37 (3.92)	-7.16 (3.11)**
Assetshare	-.15 (.13)	-.055 (.046)	-.043 (.016)***	-.044 (.24)	-.01 (.21)
Trte	.01 (.002)***	.013 (.002)***	.014 (.003)***	.003 (.0009)***	.004 (.001)
Ea					
Npa					
Ipi	.014 (.007)*	.013 (.006)**	.002 (.006)	-.01 (.01)	-.001 (.009)
Foreign		.11 (.58)	.064 (.21)		
State		-.31 (.19)	-.33 (.108)***		
Constant	4.67 (3.09)	5.13 (2.19)**	8.06 (3.42)**	7.89 (3.74)	9.23 2.91)***
Number of obs	262	262	229	201	201
R-squared	within = .33 between = .58 overall = .48	within = .32 between =.79 overall = .57	Centered = .58 Uncentered = .83		
Overall significance	F(4,29) = 23.98***	Wald chi2(6) = 590.4***	F(6, 222) = 11.77***	Wald chi2(5) = 54.32***	Wald chi2(5) = 52.09***
Hansen J statistic			3.463 Chi-sq(1) P-val = 0.062		

*Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.*

Wooldridge test for the serial correlation indicates absence of serial correlation.

Heteroscedasticity robust std. errors are presented in parentheses.

(a) FE and RE estimators that assumes Lerner exogeneous.

(b) GMM estimator that assume Lerner endogeneous.

(c) differenced GMM estimator that assumes all independent variables except the lagged dependent variable are exogenous.

(d) differenced GMM estimator that assumes Lerner and lagged dependent variable are endogeneous.

(e) # denotes the preferred models according to results of Durbin Wu Hausman endogeneity test.

Table A8: Estimation results: dep var=z and market power=MP

Dep var: z	**Static models**			**Dynamic models**	
	Fixed effects (a)	**Random effects (a)**	**#GMM (b)#**	**GMM (c)**	**GMM (d)**
Lag.z				-.045 (.24)	.16 (.16)
Mp	331.5 (138.5)**	315.8 (137.2)**	152.6 (118.2)	255.1 (75.5)***	211.8 (84.2)**
Assetshare	-.26 (.16)	-.17 (.09)*	-.128 (.032)***	-.26 (.18)	-.21 (.19)
Trte	.007 (.001)***	.007 (.001)***	.013 (.004)***	.0028 (.0009)***	.0026 (.0007)***
Ea					
Npa					
Ipi	.010 (.008)	.010 (.007)	.007 (.008)	-.0008 (.02)	.001 (.012)
Foreign		-.68 (.96)	-.61 (.37)*		
State		-.13 (.42)	-.33 (.14)**		
Constant	-327.6 (137.6)**	-312.06 (136.1)**	-150.8 (117.06)	-249.5 (75.9)***	-207.5 (84.1)**
Number of obs	269	269	239	210	210
R-squared	within = .38 between = .30 overall = .33	within = .38 between = .40 overall = .40	Centered = .43 Uncentered = .75		
Overall significance		Wald chi2(6) = 331.34***	F(6, 232) = 11.91***	Wald chi2(5) = 81.02***	Wald chi2(5) = 73.09***
Hansen J statistic			0.235 Chi-sq(1) P-val = 0.628		

*Notes: *, ** and *** denote statistical significance at 10%, 5% and 1% respectively.*

Wooldridge test for the serial correlation indicates absence of serial correlation.

Heteroscedasticity robust std. errors are presented in parentheses.

(a) FE and RE estimators that assume MP exogeneous.

(b) GMM estimators that assumes MP endogeneous.

(c) differenced GMM estimator that assumes all independent variables except the lagged dependent variable are exogenous.

(d) differenced GMM estimator that assumes MP and lagged dependent variable are endogeneous.

(e) # denotes the preferred models according to results of Durbin Wu Hausman endogeneity test.

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