Growth and Earnings Persistence in Banking Firms: A Dynamic Panel Investigation

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Abstract

We examine the classical Gibrat's law or Law of Proportionate Effects (LPE) using Blundel and Bond (1998)' s two-step Generalized Method of Moments dynamic panel model for a mixed sample of more than 1500 banks in 29 oecd and 36 non-oecd countries. Our analysis show that size distribution of banks in oecd countries has converged to lognormal distribution over the last ten years but still remains peaked for nonoecd countries. Our dynamic panel estimation results find no evidence of persistence in bank growth but find a significant persistence in profitability of banks. Similarly, we also show that larger banks in oecd countries grow at lesser rates.

JEL Classifications: *G21, G32, L25*

Keywords: *Bank Size, Bank Earnings, Earnings volatility, Bank Risk*

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I. Introduction

Literature on Bank Size and Growth is highly influenced by the Gibrat's Law of Proportionate Growth (LPE) as given in Gibrat (1931). The strong version of this law has three prepositions: (i) the growth rate of each bank over some period is independent of its size; (ii) The variability of growth rates is independent of the banks' size and (iii) the banks' growth rates in two consecutive periods are independent of each other. Together they imply that banks in the sample all draw their growth rates from the same distribution and that the growth rates follow a random walk.

In this paper we empirically test the above three hypotheses (and additionally one more hypothesis) each for growth and profit equation: (i) Is there any persistence in earnings (and growth) patterns in banking firms? (ii) Is earning (and growth) affected by the bank size? (iii) Is earning (and growth) volatility affected by the bank size? (iv) What are the inter-linkages between earning and growth pattern? Using Blundell and Bond (1998) Generalized Method of Moments (GMM) dynamic panel models, we extend the original analysis of Goddard et al. (2004b) which was for banks operating in five European countries for a large sample of banks operating in 65 emerging and developed economies for the period of 1997-2007.

We find significant differences between growth and profitability patterns in developed and emerging banking market. Our main results suggest there is no persistence in bank growth trend but profitability of banking firms persists. Additionally, we show that Large banks in developed economies, grow at slower speed but this is not true for emerging markets.

The structure of the paper is as follows: after introducing the research questions in section I, we discuss the literature on bank growth, earnings in section II and develop our model. We describe and analyze the data on bank growth, profitability and size distribution in

section III. In section IV, we will present the results and sensitivity analysis. Section V will conclude the paper.

II. Bank Growth and Earning Patterns

An influential paper on Law of Proportionate Effects was Tschoegl (1983) which empirically tested these propositions and supported the first proposition, rejected the second one and could not find any clear-cut results for the third one. His results implied that growth is independent of size, though its variability declines with increase in the latter. Moreover, he found that serial correlation of growth rates occurs but is inconsistent as to sign and statistically significant only when negative. His sample included 100 largest banks of the world with one year gap from 1969 to 1977

The original Gibrat's Law and previous paper focused only on growth and the analysis of growth and profitability in banking literature were two different strands for a long time. Though there are some interesting papers which analyzed the effect of size on bank profitability but their major focus was on the profitability itself instead of the persistence and size dynamics of earnings and special focus on this question in the context of emerging markets is almost absent except for some individual country studies..

Analyzing the effect of bank size on bank performance, Stein (2002) and Berger et al. (2005) point out better ability of small banks in capital allocation and collecting and acting on 'soft' information. However, Stever (2007) investigate lower betas of small banks and attribute these to lower diversification in these firms. Some papers indicate a lack of relationship e.g. Berger et al. (1995) and Athanasoglu et al. (2005) find no strong link between market structure and profitability. Athanasoglu et al. (2005) studies the effect of bank-specific, industry-specific and macroeconomic determinants of bank profitability using GMM technique for a panel of Greek banks covering period 1985-2001. They find that all bank-specific determinants, with the exception of size affect bank profitability significantly in the anticipated way. Based on the these studies, we still find

that variation in bank earnings is related to their market share and certain other control variables like leverage ratio and market share.

Goddard et al. (2004a) and Goddard et al. (2004b) use dynamic panel and cross-sectional regressions to estimate growth and profit equations, for a sample of banks from five European Union countries, during the mid-1990s. An important development by this paper was the unification of growth and profit strands. Inter alia, they find that (i) profit is an important prerequisite for future growth, (ii) as banks become larger in relative terms, their growth performance tended to improve further (iii) the persistence appears higher for savings and co-operative banks than for commercial banks.

Recently, Benito (2008) tested the Law of Proportionate Effects for Spanish banks using panel unit root tests and find that size-growth relationship is not stable over time but changes depending on the competitive environment. Their results indicated that smaller banks grew faster than larger banks in past but they predicted larger Spanish banks will grow at same or faster rate.

The basic model for the analysis of our hypotheses is the same as used by Goddard et al. (2004b) and Benito (2008) which are based on Gibrat's Law and Tschoegl (1983). The starting point for the model is that growth follows a random walk with drift if all the three propositions of Gibert's strong law hold consequently

$$S_{it} - S_{it-1} = \alpha_i + \delta_t + \varepsilon_{it} \qquad (1.1)$$

Where: S_{it} indicates Bank Size of Bank i in year t

: S_{it-1} indicates Bank Size of Bank I in year t-1

: $\alpha_i + \delta_t + \varepsilon_{it}$ indicates random walk with drift where $\alpha_i + \delta_t$ indicate individual bank and time effects respectively

Incorporating Bank Size we get

$$S_{it} - S_{it-1} = \alpha_i + \delta_t + (\beta - 1) S_{it-1} + \varepsilon_{it} \qquad (1.2)$$

Where parameter β indicates the relationship between bank size and annual growth. If we introduce lagged dependent variable in the model the equation 1.2 can be modified to

$$S_{it} - S_{it-1} = \alpha_i + \delta_t + (\beta - 1) S_{it-1} + \gamma(S_{it-1} - S_{it-2}) + \varepsilon_{it} \qquad (1.3)$$

Our first three hypotheses can be derived from this equation as follows:

Hypothesis 1: Effect of Bank Size on Growth

This hypothesis can be tested as

$$H_0 : \beta - 1 = 0$$
$$H_a : \beta - 1 \neq 0$$

It corresponds to first proposition of Gibret's LPE that the growth rate of each bank over some period is independent of its size. If this hypothesis holds the distribution of bank sizes will become highly skewed and concentration will increase purely by chance. If β >1 i.e. the bigger banks grow more quickly then concentration will actually increase even more quickly.

Hypothesis 2: Effect of Bank Size on Growth Variability

It is essentially similar to testing that

$$H_0 : \alpha_i = \alpha$$
$$H_a : \alpha_i \neq \alpha$$

It corresponds to second proposition of Gibret's LPE and indicates that volatility in growth is not affected by the Size parameter. It is similar to the absence of heteroscedastic growth rates

Hypothesis 3: Persistence in growth pattern in banking firms

It is essentially similar to testing that

$$H_0 : \gamma = 0$$
$$H_a : \gamma \neq 0$$

It corresponds to third proposition of Gibret's LPE and indicates that current growth does not depend on the previous growth pattern.

Goddard et al. (2004b) further extends this model by introducing the profit dynamics through the lagged profit as an explanatory variable.

$$S_{it} - S_{it-1} = \alpha_i + \delta_t + (\beta - 1) S_{it-1} + \gamma(S_{it-1} - S_{it-2}) + \varphi \prod_{it-1} + \varepsilon_{it} \qquad (1.4)$$

Where: $\prod_{it-1}$ indicates Bank Profit of Bank i in year t-1

This will help us examine our fourth hypothesis about the linkage between profitability and bank growth.

Hypothesis 4: Effect of Bank Profitability on growth

This hypothesis wants to test

$$H_0 : \varphi = 0$$
$$H_a : \varphi \neq 0$$

If this effect is zero then it shows that lagged profitability does not affect the growth of a bank.

To extend their model from bivariate to multivariate version Goddard et al. (2004b) examine the effect of various control variables like bank leverage, liquidity and bank share. As it can be interesting to look at the impact of these control variables on the existing results the model given in equation 1.4 can be extended

$$S_{it} - S_{it-1} = \alpha_i + \delta_t + (\beta - 1) S_{it-1} + \gamma(S_{it-1} - S_{it-2}) + \varphi \prod_{it-1} + \zeta X_{it} + \varepsilon_{it} \qquad (1.5)$$

Where: X_{it} indicates a control variable for Bank i in year t

A final modification that needs to be made is owing to Breitung and Meyer (1994) which suggests that in panel data with large N and small T (which is the case for our data) and allowing for individual effects with lagged dependent variables can result in biased estimates. So the model given in equation 1.5 needs to be modified as given

$$S_{it} - S_{it-1} = (\beta - 1)(S_{it-1} - S_{i0}) + \gamma(S_{it-1} - S_{it-2}) + \varphi \prod_{it-1} + \zeta X_{it} + \xi_{1it} \qquad (1.6)$$

Where: $\xi_{1it} = \alpha_i + \varepsilon_{it} + \beta S_{i0}$

In the similar way equation 1.7 gives the model for the dynamic analysis of Profit model

$$\prod_{it} - \prod_{it-1} = (\beta_\pi - 1)(\prod_{it-1} - \prod_{i0}) + \gamma_\pi (S_{it-1} - S_{it-2}) + \zeta_\pi X_{it} + \xi_{\pi 2it} \qquad (1.7)$$

Where: $\xi_{\pi 2it} = \alpha_{\pi i} + \varepsilon_{\pi it} + \beta_\pi \prod_{i0}$

The equations 1.6 and 1.7 give us the final models that we estimate for the multivariate dynamic models for growth and profitability.

III. Data Description and Analysis

We take most of the data for our analysis form Bureau Van Dijk Bankscope (December 2008) version. The data is for the period of 1997-2007 corresponding to commercial banks operating in more than 65 countries. A country-wise decomposition of the number of year-bank observations in sample has been provided in Table A1 in appendix. To avoid the problem of double-counting of banks because of consolidated against unconsolidated bank statements, we take only banks with consolidated statement. If no consolidated statement was available then only we consider banks with unconsolidated statements. Moreover, we include only commercial banks in our sample. We deliberately do not include Problem Banks, with extra-ordinary balance-sheet composition. For this, we exclude those banks which had negative equity to asset ratio on their balance sheet. After accounting for these changes and availability of data our final sample included more than 3900 observation for more than 1500 banks from 29 oecd and 36 non-oecd countries.

Table 1: Explanatory Variables Sources

Variable	Definition	Source
Assets	Bank Assets	Bankscope
Equity	Bank Equity	Bankscope
Asset Growth	$Log(Assets_t) - Log(Assets_{t-1})$	Bankscope
Return on Assets	Returns as a ratio of bank assets	Bankscope
Return on Equity	Returns as a ratio of bank equity	Bankscope
Overhead Costs/Net Income	The ratio of overhead bank costs to net income ratio. Overhead refers to expenses that are necessary to the continued functioning, but do not directly generate profits.	Bankscope
Recurring Earning Power	This ratio is a measure of before tax profits adding back provisions for bad debts as a percentage of total assets.	Bankscope
Equity/Assets	As equity is a cushion against asset malfunction, this ratio measures the amount of protection afforded to the bank by the equity they invested in it. The higher this figure the more protection there is.	Bankscope
Real GDP Growth	$Log(\mathrm{Re}al\,GDP_t) - Log(\mathrm{Re}al\,GDP_{t-1})$	World Development Indicators
Inflation	Change in Consumer Price Index. To adjust for extreme movements, we modify the inflation rate (P) as $\frac{P/100}{1+(P/100)}$	World Development Indicators
Concentration	Fraction of Assets held by three largest banks	Beck, Demirguc-Kunt, Levine (2000) - Financial Structures Database

Our main variables include bank assets as the proxy for the size and return on (average equity) as the proxy for bank profitability. The control variables in our model include bank-specific variables like leverage ratio, overhead costs to net income ratio (as a proxy for managerial efficiency) and recurring earning power (as a proxy for stable earning capacity). Additionally, to incorporate macroeconomic and overall financial sector situation, we include real GDP growth, inflation and bank concentration. Table 1 provides definitions of the dependent and explanatory variables and their sources.

Table 2: Summary Statistics

Statistics	Mean	Std. Deviation	Minimum	Maximum	Observations
Assets *(in US$ 10000)*	25.70	280.84	0.00	9730.00	7783
Equity *(in US$ 10000)*	2.79	35.87	0.00	1250.00	7765
Asset Growth	0.17	0.47	-6.92	4.66	5759
Return on Assets	1.11	4.76	-111.13	73.17	7720
Return on Equity	9.85	30.87	-927.38	615.39	7699
Overhead Costs/Income	3.74	30.69	-1668.39	702.54	7526
Equity/Assets	15.68	17.96	0.00	100.00	7765
Real GDP Growth	0.03	0.02	-0.14	0.26	31414
Concentration	0.41	0.22	0.20	1.00	43209
Inflation	0.03	0.04	-0.09	0.61	35392
Recurring Earning Power	2.13	4.93	-81.09	96.30	7713

Table 2 provides summary statistics of our data and table A4 in appendix provides the correlation matrix of the variables. Our dataset from Bankscope is mainly for commercial banks and data availability for some banks is also not very consistent so it may be important to have a look that how far our sample represents the overall banking systems of the countries. For this purpose, we compare our sample of banks in terms of return on assets and return on equity from the similar variables of World Bank Financial Structure database of Beck, Demirguc-Kunt, Levine (2000). It may be important to mention that these two variables are common in both datasets. Table A2 in the appendix provides the comparison. Statistics show that our sample (based on bank-level) is quite comparable to the overall banking sector statistics, though not exactly similar. One other reason for the minor differences could be because of the fact that our sample is based on commercial banks only while World Bank sample is for all kinds of banks including investment, co-operative and micro-finance banks, for instance.

As we are using a large dataset on banking firms so it may be useful to discuss some properties and developments in the bank size in last ten years. As mentioned by many other studies (see e.g. Janicki and Prescott, 2006), Bank Size distribution as measured by assets is highly skewed towards the right i.e. there are many small banks and a few large banks with large assets. This pattern is so clear that a normal plot of bank size is visibly uninformative. A distribution that is quite helpful in this situation is the lognormal distribution. A random variable is lognormally distributed if the logarithm of the random variable is normally distributed. Gibrat (1931) found that lognormal distribution fit the firm sizes quite well. Janicki and Prescott (2006) check the distribution of banking firms in United States and find that particularly since 1980s and 1990s this does not hold true for US banking firms. We plot logarithmic bank sizes for all oecd and non-oecd banks in our sample over the period 1997-2007 in Figure 1 and Figure 2, respectively. Our findings suggest that over last ten-years period the size distribution of banks in oecd countries converged to lognormal distribution but same does not hold true for non-oecd countries. In oecd countries, there are marked changes in the bank size and higher kurtosis almost disappeared. On the other hand in non-oecd countries, a trend is visible towards reduction of kurtosis but logarithmic bank sizes are still peaked.

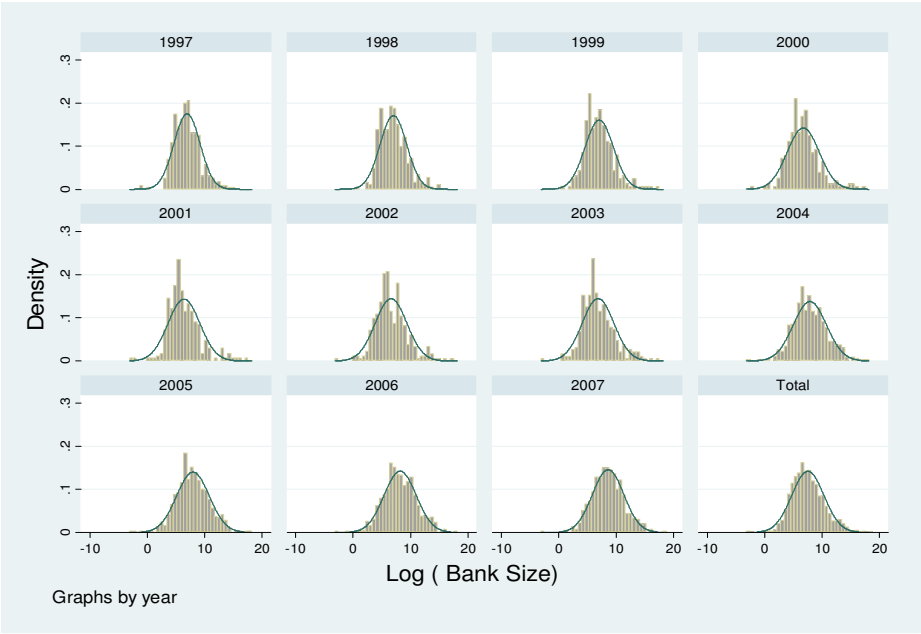

Figure 1: Density Plots of Logarithmic Bank Sizes for OECD countries

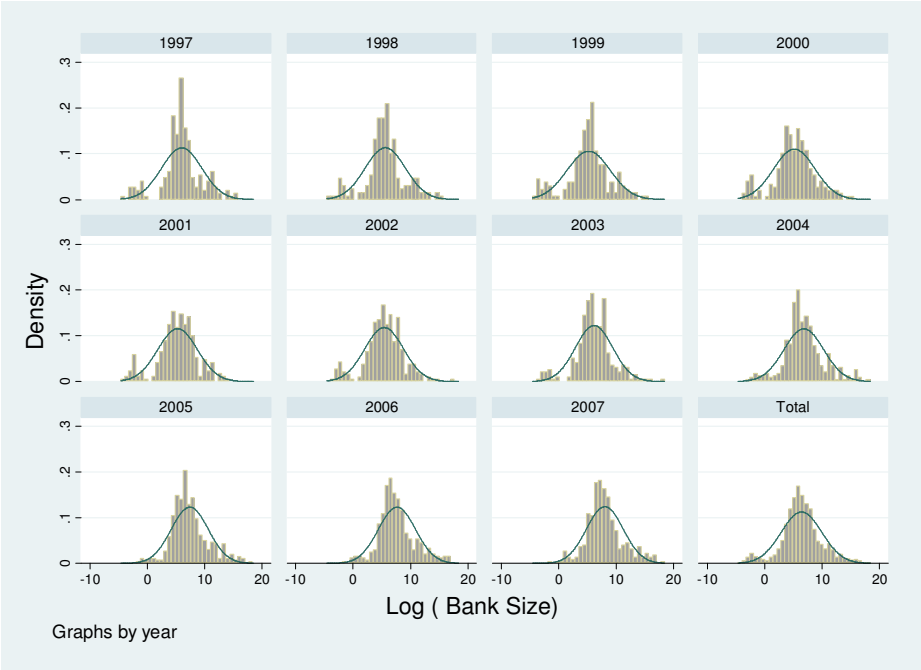

Figure 2: Density Plots of Logarithmic Bank Sizes for Non-OECD countries

IV. Results

We estimated our models given by equation 1.6 and 1.7 using system Generalized Method of Moments (GMM) dynamic panel analysis as given by Blundell and Bond (1998). Arellano and Bond (1991) show that the presence of individual bank effects and lagged dependent variable implies that ordinary least squares or fixed effects models cannot be used for such data. They show that performance of difference GMM is superior to the ordinary least squares and within groups models and these models exhibit least bias and variance. This approach has been followed by Goddard et al. (2004a) and Goddard et al. (2004b). But Blundell and Bond (1998) based on the approach of Arellano and Bover (1995) show that if our dependent variable is close to a random walk, then difference GMM approach performs poorly because past levels convey little information about future changes. Blundell and Bond (1998) approach is based on the solution that instead of transforming the regressors, it transforms their differences to make them exogenous to the fixed effects. Especially, in the case where data has a small T, large N case and unbalanced panel, Arellano and Bond (1991) produce biased estimates and Blundell and Bond (1998) is the superior methodology. As our data under investigation has both of these issues so we adopt for system approach instead of difference approach.

We implemented Blundell and Bond (1998) approach as implemented by Roodman (2006) with two-step system GMM approach for dynamic panel analysis. The overall results have been presented in Models 1 to 3 in Table 3 and Table 4 for growth and profitability models.

Table 3 provides results on growth model corresponding to equation 1.6. First model in the table corresponds to univariate version where growth in the bank size has been regressed on lagged growth and lagged size. In the second Model, we examine the bivariate version with lagged profitability as an additional explanatory variable. In the third and fully extended model, we use all of our explanatory variables. Wald Chi-squared test is significant at 1 percent level of significance and Hansen test of over-identifying restriction appears insignificant. It implies that the null hypothesis i.e. population moment conditions are correct is not rejected and indicates the validity and

exogeniety of instruments[1]. For the consistent estimation of the models, one primary condition is that error terms be serially uncorrelated. More specifically, $\Delta\xi_{it}$ should be uncorrelated[2] with $\Delta\xi_{i,t-k}$ for $k \geq 2$ and this can be implemented by Arellano-Bond test for first and second difference autoregressive processes. Arellano-Bond test for the first difference Autoregressive process appears significant and for the second difference appears insignificant which indicates this does not pose any problems for consistent estimation of our models.

Table 4 provides results for profitability models corresponding to equation 1.7. First model in the table corresponds to univariate version where profitability of a bank has been regressed on lagged profitability only. In the second Model, we examine the bivariate version with lagged bank size as an additional explanatory variable. In the third and fully extended model, we use all of our explanatory variables. Wald Chi-squared test is again significant at 1 percent level of significance and Hansen test of over-identifying restriction appears insignificant and indicates the validity and exogeniety of our instruments. Similar to Growth Models, Arellano-Bond test for the first difference Autoregressive process appears significant and the second difference appears insignificant. In the next sections, we will examine our hypotheses one by one for growth and profitability models.

Hypothesis 1: Effect of Bank Size on Growth and Profitability

To check the effect of Bank Size on Growth and Profitability, we can have a look at the co-efficient logarithmic bank size, which indicates β-1. For Growth, our overall models 1-3 as given in Table 3 indicate that this co-efficient appears with a negative sign which indicates that large banks grow less rapidly as compared to small banks. This finding partially explains our observation in the data analysis where density plots of logarithmic bank sizes converge to lognormal distribution. For Profitability equation results in Table

[1] It may be important to mention here that in some models, Sargan test for the instrument invalidity appears significant. However, as mentioned in literature (see, e.g. Roodman, 2006) Sargan test can be inconsistent e.g. because of the non-sphericity of errors and in that case a theoretically superior over identification test is the Hansen statistic from two-step estimate which we report in our table.

[2] If errors are serially uncorrelated $\Delta\xi_{i,t}$ are correlated with $\Delta\xi_{i,t-1}$ but not with $\Delta\xi_{i,t-k}$ for $k \geq 2$

4 and overall models 2-3, our results indicate that bank size does not affect the mean profitability. So we cannot reject the hypothesis that $\beta = 0$. This finding suggests that profitability is not affected by the bank size. This result is qualitatively very similar to Goddard et al. (2004a) and Athanasoglu et al. (2005) who also find no effect of bank size on profitability for banks, however, there sample coverage was very small and only for oecd banks in five countries and greek banks only .

Hypothesis 2: Effect of Bank Size on Variability of Growth and Profitability

To examine the effect of bank size on variability of growth and profitability, we plot the residuals of our models in figures A1 and A2 for growth and profitability respectively against logarithmic bank size. In growth models 1-3, we do not find any significant variation with respect to size. In growth model 3, we get a visual impression of some trend but looking at its decomposition by oecd versus nonoecd and testing for the normality of residuals indicates no significant trend. In overall profitability models, we find that variation in profitability is relatively higher at lower bank size. It may be important to mention here that two-step GMM estimator as implemented by Blundell and Bond (1998) allows for heteroskedasticity in error terms.

Table 3 : Dynamic Panel Estimation of Bank Growth Models										
		Overall			OECD Countries			Non-OECD Countries		
		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Bank Growth (t-1)	Co-efficient	0.33	0.009	-0.015	0.143	0.23	0.012	0.817***	0.112	-0.187*
	Std. Error	0.215	0.243	0.044	0.675	0.413	0.047	0.306	0.25	0.101
Bank Size (t-1)	Co-efficient	-0.095***	-0.058*	-0.515**	-0.094*	-0.084***	-0.458***	-0.054	-0.049	-0.203
	Std. Error	0.027	0.032	0.202	0.056	0.024	0.11	0.048	0.034	0.148
Return on Equity (t-1)	Co-efficient		0.069**	-0.097		0.009	-0.035		0.081***	-0.01
	Std. Error		0.032	0.068		0.041	0.054		0.025	0.081
Leverage Ratio	Co-efficient			-0.038**			-0.042***			-0.028*
	Std. Error			0.019			0.013			0.016
Overhead Costs/Income	Co-efficient			-0.032			0			0.046*
	Std. Error			0.029			0.008			0.023
Real GDP Growth	Co-efficient			2.381			9.428			1.344
	Std. Error			2.248			6.765			1.518
Inflation	Co-efficient			0.251			-8.087			1.56
	Std. Error			2.477			12.261			2.476
Recurring Earning Power	Co-efficient			0.009			-0.001			-0.076
	Std. Error			0.029			0.015			0.051
Concentration	Co-efficient			-0.306			-0.482			0.576
	Std. Error			0.771			0.751			0.717
Number of Observations		3972	3484	1879	2390	2054	1014	1582	1430	865
Number of Banks		1569	1451	838	989	908	449	580	543	389
Number of Instruments		13	21	19	12	18	19	13	21	19
AB test for AR(1)		-2.095	-1.664	-1.201	-0.707	-1.471	-1.532	-2.57	-1.556	-1.417
Prob (AB test for AR(1))		0.036	0.096	0.23	0.479	0.141	0.126	0.01	0.12	0.156
AB test for AR(2)		0.996	0.202	0.423	0.181	0.583	-1.064	0.287	0.901	1.069
Prob (AB test for AR(2))		0.319	0.84	0.672	0.856	0.56	0.287	0.774	0.368	0.285
Hansen Test of Over identifying Restrictions		14.345	20.568	9.592	8.301	12.151	5.745	11.85	19.504	3.674
Prob (Hansen Test of Over identifying Restrictions)		0.214	0.302	0.477	0.599	0.668	0.836	0.375	0.361	0.961
Wald Chi2 Test		107.295***	141.082***	35.387***	93.687***	95.410***	98.976***	121.063***	119.207***	32.370***

*** represents significance at 1%, while ** represents significance at 5% and * represents significance at 10%
Standard Errors reported are heteroskedasticity-robust.

Table 4 : Dynamic Panel Estimation of Bank Profitability Models										
		Overall			OECD Countries			Non-OECD Countries		
		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Return on Equity (t-1)	Co-efficient	0.916***	0.959***	0.655***	0.943***	0.977***	0.591***	0.850***	0.908***	0.926***
	Std. Error	0.029	0.035	0.172	0.034	0.075	0.078	0.058	0.078	0.181
Bank Size (t-1)	Co-efficient		-0.031	0.048		-0.024	-0.094		-0.109	0.014
	Std. Error		0.053	0.038		0.105	0.107		0.103	0.034
Bank Growth (t-1)	Co-efficient			0.926**			0.828*			0.11
	Std. Error			0.445			0.485			0.332
Leverage Ratio	Co-efficient			-0.001			-0.007			-0.008**
	Std. Error			0.003			0.009			0.003
Overhead Costs/Income	Co-efficient			-0.022**			-0.031***			-0.014*
	Std. Error			0.009			0.006			0.008
Real GDP Growth	Co-efficient			1.385			8.995***			-0.922
	Std. Error			1.72			2.559			1.643
Inflation	Co-efficient			2.86			2.546			-0.435
	Std. Error			2.169			2.407			1.086
Recurring Earning Power	Co-efficient			0.061***			0.045***			0.068***
	Std. Error			0.011			0.006			0.013
Concentration	Co-efficient			0.962***			0.660**			0.431
	Std. Error			0.357			0.277			0.585
Number of Observations		4625	4625	1763	2766	2766	945	1859	1859	818
Number of Banks		1522	1522	795	953	953	425	569	569	370
Number of Instruments		8	16	21	8	14	20	8	16	21
AB test for AR(1)		-7.803	-7.864	-4	-5.997	-5.734	-2.775	-5.092	-4.97	-3.027
Prob (AB test for AR(1))		0	0	0	0	0	0.006	0	0	0.002
AB test for AR(2)		0.994	0.983	-1.176	1.256	1.249	0.239	0.176	0.163	-0.743
Prob (AB test for AR(2))		0.32	0.326	0.24	0.209	0.212	0.811	0.86	0.871	0.457
Hansen Test of Over identifying Restrictions		1.94	17.445	17.348	6.11	14.139	5.103	3.379	20.989	14.296
Prob (Hansen Test of Over identifying Restrictions)		0.963	0.233	0.137	0.527	0.292	0.926	0.848	0.102	0.282
Wald Chi2 Test		966.360***	3180.503***	16647.399***	787.501***	3906.085***	5719.356***	216.047***	1868.898***	7750.279***

*** represents significance at 1%, while ** represents significance at 5% and * represents significance at 10%
Standard Errors reported are heteroskedasticity-robust.

Hypothesis 3: Persistence in Bank Growth and Profitability

For overall models, we do not find any evidence of persistence in growth trend but persistence in profitability is significant at 1% level of significance. This result is also quite close to Goddard et al. (2004a) and Goddard et al. (2004b). It may be important to mention here that Goddard et al. (2004b) do find that for cooperative banks, for instance growth persistence can be significantly different from zero but for commercial banks (which results is comparable to us) they also find no evidence of persistence. Similarly, they also find that profitability in commercial banks of five European countries persist. Our results extend this finding to 65 countries. The results imply that in all three univariate, bivariate and multivariate models of growth, lagged bank growth cannot predict the current year bank growth. However, persistence in profitability cannot be rejected.

Hypothesis 4: Inter-linkages between Growth and Profitability

Our results also examine the effect of lagged profitability on growth and lagged growth on profitability. In Table 3 of model for growth equation, we find that profitability can predict growth but that result is not robust and in the full extended model this significance is rejected. However in profitability model, effect of lagged growth on profitability is significant at 5% level of significance.

Impact of Other Control Variables

We also examine the effect of other control variables on bank growth and profitability like leverage ratio, overhead costs to income ratio, real GDP growth, inflation and recurring earning power, in addition to concentration. For growth model, our results indicate that higher leverage has a negative impact on the bank growth. This result is significant at 5% level of significance. It could be because of the failure of increase in equity owing to the asset growth. Other variables do not appear significant. For profitability, we find that increase in overheads costs to income ratio, decreases the profitability in banking firms. However, increase in recurring earning power increases the

profitability and increased concentration also results in more profitability. An explanation for the positive relationship between concentration and profitability can be the lesser competition and increased profit margin because of this.

V. Extensions and Robustness

To check the robustness of our results, we also use the 2SLS or one-step GMM model. Our main results are based on two-step GMM Model which results in more efficient estimation. However, to check the robustness of our results, we also apply the alternative method. The results have been presented in Tables A5 and Table A6 in appendix for growth and profitability models respectively. The results are quite similar to two-step GMM method. It implies there is not much efficiency-loss in either case.

As shown in the data analysis section banking system of oecd and non-oecd countries vary significantly in structure. So it was important to have a look on the non-oecd sample separately. Work on the similar issue for oecd countries has already been done though for five countries as against 29 for this paper but the same for non-oecd countries is altogether missing. Consequent upon these issues, we separately model oecd and nonoecd countries. We find a number of variations in both samples though many results remain robust.

In growth models, we present results for oecd countries in model 4-6 and for nonoecd countries in models 7-9 of Table 3. The main difference between the results is that we do not find any evidence of significance of bank size in all models of Bank Growth for non-oecd countries, however, for oecd countries this results holds as the main result. Similarly, leverage ratio appears more significant at 1 percent level for non-oecd countries as compared to 10 percent level of significance for non-oecd countries. In the mixed sample, this result was significant at 5 % level of significance. The significance of models, exogeniety of instruments and Arellano-Bond test results imply no problems in estimation.

In profitability results Table 4, models remain robust as indicated by 1% level of significance of Wald-Chi-square test. Similarly instruments are exogenous and Arellano-

Bond test results for difference in first-order and second-order autoregression process indicate no autoregressive process at second stage, similar to main results. Here the effect of lagged profitability, bank size remains robust for both types of models, like the main model. However, impact of lagged growth on profitability does not appear significant for nonoecd countries. A possible explanation for this result can be the weakness in the banking firms which cannot channel growth into profitability. The behaviour of control variables remain robust. However, one interesting finding is that concentration does not result in higher profitability. It could be because of the few large unprofitable banks. As pointed out by literature, some nonoecd countries have large state-run banks with poor profitability. Another interesting result is that real GDP growth appears significant for only banks in oecd countries with expected positive sign and not for nonoecd banks.

VI. Conclusions

We examine the law of proportionate effect for the bank growth and profitability for a mixed sample of 65 oecd and nonoecd countries and find no evidence of the persistence in bank growth but results indicate a persistence in profitability. Moreover, our results indicate, in line with theoretical literature that large banks grow at lesser speed but the same does not hold true for nonoecd countries. Similarly, we find that higher costs to income ratio reduces profitability. Additionally, we show that bank size distribution has converged to lognormal distribution, for nonoecd countries, over the last ten years period but it still remains skewed for nonoecd countries.

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Appendix:

Table A1: Country-wise Distribution of Banks in Sample			
Country	**Banks**	**Country**	**Banks**
ARGENTINA	81	KOREA REP. OF	10
AUSTRALIA	24	KUWAIT	1
AUSTRIA	163	LUXEMBOURG	79
BANGLADESH	25	MALAYSIA	36
BELGIUM	32	MALI	3
BELIZE	8	MEXICO	48
BRAZIL	281	MOROCCO	18
BURUNDI	2	NETHERLANDS	69
CANADA	73	NEW ZEALAND	7
CHAD	2	NIGERIA	105
CHILE	34	NORWAY	26
CHINA-PEOPLE'S R	154	OMAN	4
COLOMBIA	33	PAKISTAN	35
CROATIA	54	PANAMA	143
CYPRUS	10	PHILIPPINES	43
CZECH REPUBLIC	28	POLAND	68
DENMARK	52	PORTUGAL	31
EGYPT	6	QATAR	5
ESTONIA	8	ROMANIA	52
FINLAND	10	SINGAPORE	12
FRANCE	182	SLOVAKIA	28
GABON	3	SOUTH AFRICA	38
GERMANY	160	SPAIN	79
GHANA	25	SRI LANKA	11
GREECE	37	SWEDEN	63
HUNGARY	30	SWITZERLAND	169
ICELAND	7	TURKEY	45
INDIA	98	UNITED ARAB EMIR	2
INDONESIA	38	UNITED KINGDOM	205
IRELAND	46	USA	359
ITALY	236	VENEZUELA	87
JAMAICA	21	VIETNAM	36
JAPAN	92	**Total**	**3972**

Table A2: Comparison of Samples					
		Bankscope Sample		World Bank Sample	
	Statistics	Return on Assets	Return on Equity	Return on Assets	Return on Equity
Non OECD Countries	Mean	1.68	11.85	1.31	11.92
	Std. Deviation	5.36	36.46	2.12	11.14
	Maximum	73.17	615.39	8.57	57.65
	Minimum	-111.13	-927.38	-13.66	-50.55
	Observations	2991	2989	8076	8076
OECD Countries	Mean	0.76	8.58	1.01	10.30
	Std. Deviation	4.30	26.64	0.74	6.15
	Maximum	73.01	558.26	5.95	102.70
	Minimum	-82.58	-321.46	-8.48	-124.22
	Observations	4729	4710	35033	35033
Total	Mean	1.11	9.85	1.06	10.61
	Std. Deviation	4.76	30.87	1.14	7.38
	Maximum	73.17	615.39	8.57	102.70
	Minimum	-111.13	-927.38	-13.66	-124.22
	Observations	7720	7699	43109	43109

Table A3 : Sample Countries			
OECD Countries		**Non-OECD Countries**	
AUSTRALIA	NETHERLANDS	ARGENTINA	KUWAIT
AUSTRIA	NEW ZEALAND	BANGLADESH	MALAYSIA
BELGIUM	NORWAY	BELIZE	MALI
CANADA	PORTUGAL	BRAZIL	MOROCCO
CZECH REPUBLIC	SLOVAKIA	BURUNDI	NIGERIA
DENMARK	SPAIN	CHAD	OMAN
FINLAND	SWEDEN	CHILE	PAKISTAN
FRANCE	SWITZERLAND	CHINA-PEOPLE'S R	PANAMA
GERMANY	TURKEY	COLOMBIA	PHILIPPINES
GREECE	UNITED KINGDOM	CROATIA	POLAND
HUNGARY	USA	CYPRUS	QATAR
ICELAND		EGYPT	ROMANIA
IRELAND		ESTONIA	SINGAPORE
ITALY		GABON	SOUTH AFRICA
JAPAN		GHANA	SRI LANKA
KOREA REP. OF		INDIA	UNITED ARAB EMIR
LUXEMBOURG		INDONESIA	VENEZUELA
MEXICO		JAMAICA	VIETNAM

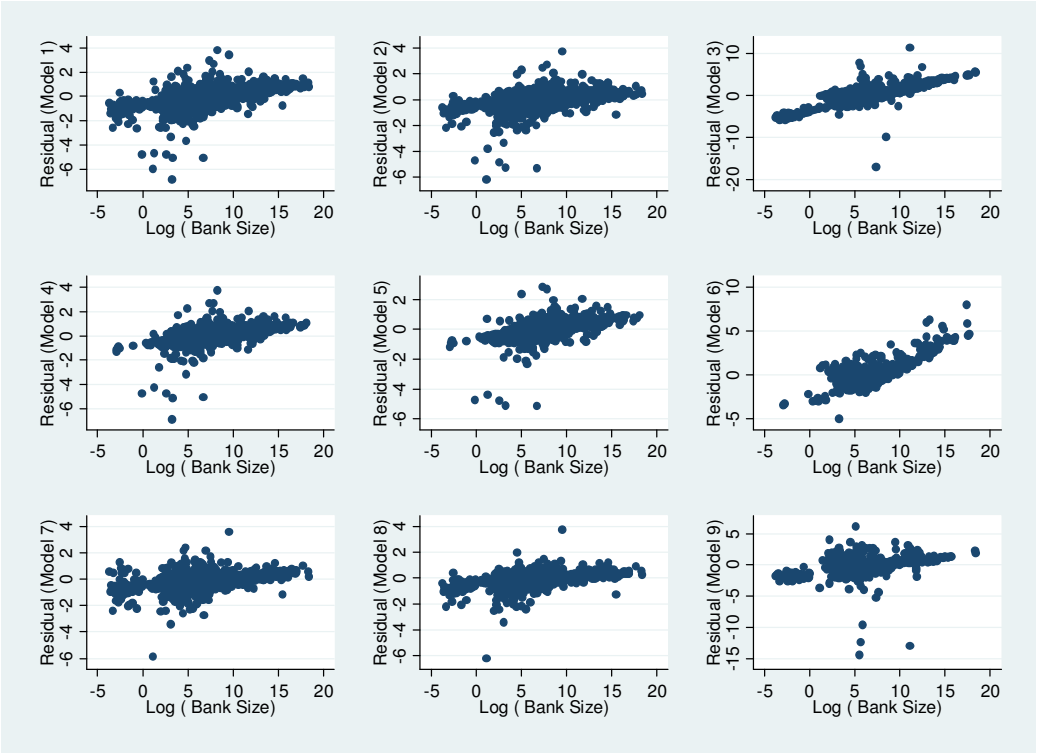

Figure A1: Residual Plots of Growth Regressions against Bank Size

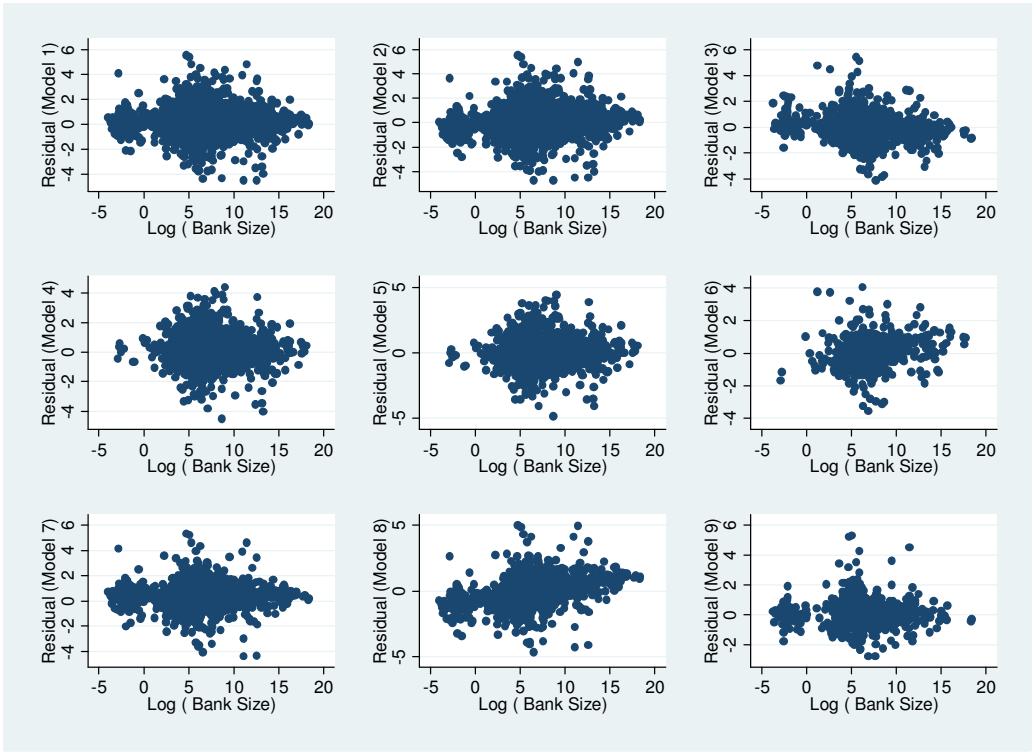

Figure A2: Residual Plots of Profitability Regressions against Bank Size

Table A4: Correlation Matrix											
	Assets	**Equity**	**Asset Growth**	**Return on Assets**	**Return on Equity**	**Overhead Costs/Income**	**Equity/Assets**	**Real GDP Growth**	**Concentration**	**Inflation**	**Recurring Earning Power**
Assets	1.000										
Equity	0.952	1.000									
Asset Growth	0.014	0.012	1.000								
Return on Assets	0.009	0.013	0.079	1.000							
Return on Equity	0.011	0.012	0.096	0.528	1.000						
Overhead Costs/Income	-0.003	-0.003	0.011	0.006	0.007	1.000					
Equity/Assets	-0.025	-0.011	-0.185	0.095	-0.076	0.000	1.000				
Real GDP Growth	0.035	0.038	0.127	0.005	0.096	0.004	-0.111	1.000			
Concentration	0.014	0.009	0.087	-0.011	0.000	0.008	0.034	-0.005	1.000		
Inflation	0.079	0.044	0.050	0.072	0.043	0.021	0.089	-0.177	0.124	1.000	
Recurring Earning Power	0.007	0.012	0.049	0.790	0.376	0.003	0.143	-0.040	-0.045	0.124	1.000

Table A5 : Dynamic Panel Estimation of Bank Growth Models (One - Step Estimation)										
		Overall			OECD Countries			Non-OECD Countries		
		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Bank Growth (t-1)	Co-efficient	0.334	0.111	0.024	0.06	0.158	0.022	0.627***	0.233	-0.16
	Std. Error	0.258	0.292	0.053	0.391	0.384	0.092	0.166	0.225	0.12
Bank Size (t-1)	Co-efficient	-0.093***	-0.05	-0.409***	-0.102***	-0.035	-0.433***	-0.074***	-0.035	-0.171
	Std. Error	0.033	0.032	0.14	0.038	0.03	0.098	0.023	0.028	0.203
Return on Equity (t-1)	Co-efficient		0.061*	-0.031		0.049	-0.007		0.078**	-0.027
	Std. Error		0.035	0.081		0.042	0.092		0.033	0.103
Leverage Ratio	Co-efficient			-0.044**			-0.051***			-0.043***
	Std. Error			0.022			0.015			0.016
Overhead Costs/Income	Co-efficient			-0.024			-0.005			0.031
	Std. Error			0.016			0.01			0.032
Real GDP Growth	Co-efficient			1.741			3.734			1.731
	Std. Error			3.599			15.087			3.078
Inflation	Co-efficient			-0.673			-10.139			0.928
	Std. Error			2.772			13.463			3.107
Recurring Earning Power	Co-efficient			-0.007			-0.002			-0.064
	Std. Error			0.035			0.033			0.052
Concentration	Co-efficient			-0.104			-0.114			1.193
	Std. Error			0.838			1.643			1.21
Number of Observations		3972	3484	1879	2390	2054	1014	1582	1430	865
Number of Banks		1569	1451	838	989	908	449	580	543	389
Number of Instruments		13	21	19	12	18	19	13	21	19
AB test for AR(1)		-1.887	-1.605	-1.759	-0.944	-1.467	-2.108	-3.421	-1.969	-1.055
Prob (AB test for AR(1))		0.059	0.108	0.079	0.345	0.142	0.035	0.001	0.049	0.292
AB test for AR(2)		0.817	0.573	0.367	0.047	0.474	-0.62	0.328	1.006	0.674
Prob (AB test for AR(2))		0.414	0.567	0.714	0.962	0.636	0.535	0.743	0.314	0.5
Hansen Test of Overidentifying Restrictions		14.345	20.568	9.592	8.301	12.151	5.745	11.85	19.504	3.674
Prob (Hansen Test of Overidentifying Restrictions)		0.214	0.302	0.477	0.599	0.668	0.836	0.375	0.361	0.961
Wald Chi2 Test		86.732***	148.365***	31.903***	31.969***	74.015***	124.674***	90.412***	140.462***	23.045***

*** represents significance at 1%, while ** represents significance at 5% and * represents significance at 10%
Standard Errors reported are heteroskedasticity-robust.

Table A6 : Dynamic Panel Estimation of Bank Profitability Models (One- Step Estimation)										
		Overall			OECD Countries			Non-OECD Countries		
		Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**	**Model 8**	**Model 9**
Return on Equity (t-1)	Co-efficient	0.893***	1.051***	0.743***	0.908***	0.971***	0.724***	0.864***	0.909***	0.918***
	Std. Error	0.034	0.115	0.155	0.057	0.067	0.176	0.048	0.077	0.191
Bank Size (t-1)	Co-efficient		0.09	-0.005		-0.016	-0.121		-0.102	0.008
	Std. Error		0.165	0.062		0.105	0.149		0.1	0.054
Bank Growth (t-1)	Co-efficient			0.815**			1.240**			-0.087
	Std. Error			0.409			0.519			0.244
Leverage Ratio	Co-efficient			-0.003			-0.002			-0.008***
	Std. Error			0.004			0.011			0.003
Overhead Costs/Income	Co-efficient			-0.022***			-0.037***			-0.013**
	Std. Error			0.007			0.007			0.006
Real GDP Growth	Co-efficient			0.12			5.392			-0.56
	Std. Error			1.761			4.252			1.846
Inflation	Co-efficient			1.247			1.573			-0.646
	Std. Error			2.027			4.054			1.796
Recurring Earning Power	Co-efficient			0.055***			0.037***			0.068***
	Std. Error			0.012			0.01			0.014
Concentration	Co-efficient			0.674			0.133			0.477
	Std. Error			0.42			0.489			0.562
Number of Observations		4625	4625	1763	2766	2766	945	1859	1859	818
Number of Banks		1522	1522	795	953	953	425	569	569	370
Number of Instruments		8	16	21	8	14	20	8	16	21
AB test for AR(1)		-7.735	-6.492	-3.691	-5.811	-5.741	-2.189	-5.141	-5.003	-2.829
Prob (AB test for AR(1))		0	0	0	0	0	0.029	0	0	0.005
AB test for AR(2)		0.988	1.004	-1.28	1.237	1.229	-0.041	0.177	0.163	-0.566
Prob (AB test for AR(2))		0.323	0.315	0.2	0.216	0.219	0.967	0.86	0.87	0.571
Hansen Test of Over identifying Restrictions		1.94	17.445	17.348	6.11	14.139	5.103	3.379	20.989	14.296
Prob (Hansen Test of Over identifying Restrictions)		0.963	0.233	0.137	0.527	0.292	0.926	0.848	0.102	0.282
Wald Chi2 Test		671.202***	3150.490***	17332.440***	257.243***	2060.829***	5519.670***	328.853***	1666.450***	10181.669***
*** represents significance at 1%, while ** represents significance at 5% and * represents significance at 10% Standard Errors reported are heteroskedasticity-robust.										