Efficiency, Stability and Optimum Level of Bank Competition for Sustainable Development - A study of Sri Lankan Banking Sector

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Abstract: Traditional Industrial Organization models predict that restraining competitive forces should unequivocally produce welfare losses. However, recent empirical literature questions the conventional wisdom on the topic, and reveals that there is a trade-off between competition and stability of financial market when it focuses on a banking sector which supports sustainable development. This paper attempts to assess whether the current level of competition in the Sri Lankan banking sector is optimum as far as efficiency and stability of the banking sector are concerned. The sample covers a comprehensive set of panel data for the period from 1996 to 2013. Using bank level accounting data and applying Panzar-Rosse approach the study reveals that Sri Lankan banking sector is moderately competitive on average. Further, by using non parametric approach (Data Envelopment Curve analysis) study reveals a moderate level efficiency and as per Z- score high level of instability in the Sri Lankan banking sector. The results of the core analysis provide evidence for U shape relationships of bank competition with efficiency and stability in the Sri Lankan banking sector during the sample period. However the findings of the study do not point out a specific point as an optimum level of competition that should prevail in the banking sector. Rather, it supports to specify a minimum level of competition that should prevail in the Sri Lankan banking sector in order to support sustainable development of the economy by keeping the banking sector more efficient and financially stable. Hence, in conclusion a different approach emerges with underdeveloped countries giving a stronger role to competition authorities to understand the complex relationships between competition, efficiency and stability in the financial sector. Understanding these complexities particularly will help in developing strategies to achieve sustainable development of developing economies.

Keywords: *banking sector; efficiency; optimum competition; stability; underdeveloped countries*

Introduction

Competition is desirable for maximization of social welfare and efficiency. As in other industries, the degree of competition in the banking sector is important for the efficiency of the production of financial services, the quality of financial products and the degree of innovation in the sector. Hence, bank competition is a key indication of the financial sector development and a significant mechanism in achieving sustainable development of a country. In recent years, many theoretical and empirical works have marked a substantial convergence of research interest opening a debate on the economic role of competition in the banking industry. Traditional Industrial Organization models[1] such as Klein (1971), [1] predict that restraining competitive forces should unequivocally produce welfare losses. Therefore increased competition in the financial sector can be vital for access of firms and households to financial services and external financing, in turn affecting bank efficiency and overall economic growth.

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[1] Industrial organization (or industrial economics) is the subject which is concerned with the workings of markets and industries, in particular the way firms compete with each other.

Though competition is generally good, there is a trade-off between competition and financial market stability when it comes to banking. This is due to the unique features of the banking system such as increasing returns to scale, asymmetric information, liquidity and complexity issues. Therefore there is a current debate in banking literature regarding the effect of bank competition on the stability of the banking sector. This argument is brought forward by asymmetric information theory of bank competition. By taking the special role of information asymmetry between banks and borrowers, this group of theories highlights the effects of adverse selection and moral hazard problems which in turn affect the stability of the banking industry (Brocecker,1990;[2] Sharpe, 1990;[3] Petersen and Rajan, 1995[4]). However, more recent literature has arisen contrary to this argument and predicts positive implications of bank competition on financial stability. They argue that, more market power in the loan market may result in higher bank risk, as the higher interest rates charged to loan customers make it harder to repay loans and exacerbate moral hazard incentives of borrowers to shift into riskier projects (Boyd and De Nicolo, 2005[5]). Recent empirical work has documented conflicting results on the effects of bank competition on efficiency and stability of the banking sector.

The nexus between competition and stability is either positive or negative, understanding such relationships is highly important in policy perspectives. Because, appropriate industrial and trade policies are definitely necessary but not sufficient on their own to achieve sustainable and inclusive growth and development. Competition policy, if appropriately designed and effectively implemented according to the economic, social and environmental circumstances in a country, is expected to complement other government policies in achieving sustainable and inclusive growth and development (UNCTAD, 2015)[6]. The conflicting theoretical and empirical findings suggest the need for empirical investigations on the issue in unique settings. The present paper is an effort to investigate bank competition and its effects on efficiency and stability in one such unique setting; i.e. in the context of commercial banking sector of Sri Lanka. This paper tries to achieve two broad objectives. First, to estimate the level of bank competition, efficiency and stability of Sri Lankan commercial banking sector. Second, it attempts to investigate the optimum level of bank competition which helps sustainable development of the country through maximum efficiency and stability of the commercial banking sector of Sri Lanka. More specifically this paper attempts to assess whether the current level of competition in the Sri Lankan banking sector is optimum as far as efficiency and stability of the banking sector are concerned.

Theoretical and empirical background

As financial intermediaries, banks maximize allocative efficiency with both the quantity of credit supply as well as their efficient allocation. Traditional Industrial Organization theory depicts that a competitive industry is characterized by a large number of small banks and the potential benefits are similar to those of competition in other industries. Subsequent empirical studies after Klein (1971)[1] confirm the positive effect of bank competition (Guzman 2000[7], Beck et al, 2004[8], Demetriades et al, 2008[9]). Guzman (2000)[7] compares two identical economies, one with a monopolistic bank and the other with a competitive banking sector. He shows that, a banking monopoly is more likely to result in credit rationing than a competitive banking market, hence leads to a lower capital accumulation rate. In particular, the study of Beck et al (2004)[8] confirms that credit rationing occurs more often in concentrated banking systems. Using a large cross section of countries Claessens & Laeven, (2003)[10] further confirm that they find no support for the view that market power is good for access to financing. The findings suggest that the degree of competition is an important aspect of financial sector development and, in turn, economic growth. Some empirical evidence finds very strong effect of bank competition on real economic activities. Specially, Smith (1998)[11] uses an equilibrium model to study the costs in terms of macroeconomic performance of imperfect competition in banking. His study reveals that increased bank competition raises the level of income and reduces the severity of business cycles. Moreover his conclusion is very strong and is worth quoting here. ".... the quantitative effect on macro-economic performance of less competition in banking can be large; for instance, an imperfectly competitive banking system can produce a worse macroeconomic outcome than if the economy had no banks." This also provides strong evidence of the allocative efficiency of bank competition.

In terms of productive efficiency (cost efficiency) in bank competition, traditional industrial organization approach posits that productive efficiency is obtained in perfect competition since outputs are produced at minimum cost. This will happen only if there are no economies of scale in the banking sector. Hannan (1991)[12] argues that borrowers in markets with higher concentration ratios pay higher interest rates for loans. Moreover, borrowers may also experience more difficulty obtaining access to credit. Loan and deposit rates in a banking market are studied by Besanko and Thakor (1992)[13] and found that loan rates decrease and deposit rates increase as more banks are

added to the market. With respect to the level of bank interest rates, Maudos and Guevara (2004)[14] show that an increase in banks' market power (i.e. a reduction in competitive pressure) results in higher net interest margins.

Dynamic efficiency refers to efficiency over time. It is therefore necessary for firms to constantly introduce new technology, processes and products and reduce costs over time to be dynamically efficient. In this regard, Wonglimpiyarat (2005)[15] study analyses the strategic move and the adoption of technology alongside the progress of the banking economy by focusing on the five major commercial banks in Thailand. The results show that the changes of technological innovation in the banking sector of Thailand is not revolutionary but evolutionary. This is the result of the rivalry between firms to increase market shares. Thus, competition may have the desirable effect of stimulating technological research and development in turn affecting dynamic efficiency. All these findings underline the fact that competitiveness in the banking sector enhances sustainable development through improved allocative, productive and dynamic efficiency.

Though competition is generally good, there is a trade-off between competition and financial market stability when it comes to banking. Most of the recent studies focused on the stability of the banking sector in a competitive environment. Therefore, a question is raised about the efficiency gain of bank competition. There are two main theoretical views in the literature as competition stability view and competition fragility view. The competition stability view predicts that high competitive markets are more stable. Or in other words, financial instability increases as the degree of competitiveness is lessened. Stiglitz and Weiss (1981)[16] show, that the moral hazard and adverse selection problems increase the risk of loan portfolio in a lower competitive market. Keeley (1990)[17] is the first to empirically show that competition in the U.S banking industry in the aftermath of financial deregulation erodes bank charter value and induces banks to take on more risk. Demsetz, Saidenberg and Strahan (1996)[18] also find supports for keeley's results and show that US banks with greater market power also have the largest solvency ratios and hence a lower level of asset risk. Koskela and Stenbacka (2000)[19], deduce that more intense competition in the lending market will lead to decreasing interest rates and less risky investment projects with a lower rate of return conditional on success, as long as the credit market does not face too many adverse selection problems.

Under competition fragility view, competition is considered as undesirable as more bank competition erodes market power, decreases profit margins, and results in reduced franchise value. The banks then encourage taking more risk to increase their profit margins. This has been empirically tested by Keeley (1990)[17], by analyzing the increased competition and deregulation following relaxation of state branching restrictions in the U.S. in the 1980s. The results show that increased competition during this period eroded monopoly rents and resulted in a surge of bank failures. More recently, a more comprehensive investigation was done by Berger *et al* (2008)[20], in order to analyze the effect of bank competitiveness on financial stability. They test both the competition stability and competition fragility theories by regressing measures of loan risk, bank stability, and bank equity capital on several measures of market power, using bank-level data for 8325banks in 23 industrial nations. Their results suggest that, consistent with the traditional "competition-fragility" view, banks with a higher degree of market power also have less overall risk exposure.

The contemporary view however predicts neither direct positive nor a direct negative effect of bank competition on the financial sector stability. Thus, according to Matutes and Vives (1996)[21] competition per se, does not need to create instability. They argue that bank vulnerability to operate can emerge independently of competition in any market structure. The probability of bank failure is endogenously determined due to many reasons such as self fulfillment expectations and coordination problems among depositors etc. Allen and Gale (2000, 2004)[22] show that different models can provide different results regarding the trade-off between banking competition and stability. Because of the differences in the measurements and assumption made by these models, contradictory relationship between competition and stability has been found. Further, some models have focused only on one aspect of risk and have made conclusions. For example, though the findings of Jimenez, Lopez and Saurina (2007)[23] study support the franchise value paradigm and do not provide evidence for the risk shifting paradigm, their study only considers loan portfolio risk and does not examine the risk of the bank; as a result, it does not provide evidence on overall bank risk or financial fragility. Therefore, the proponents of this view show that the relationship between competition and stability is not straight forward as explained in both competition-fragility and competition stability views. Recently an interesting model was presented by Martinez-Miera and Repullo (MMR 2007)[24]. They identify that, in a lower competitive environment a risk-shifting effect accounting for more defaults when interest rates increase. However they realize that, at the same time, there is a margin effect that generates more revenue for the bank coming from those non defaulted borrowers who pay a higher interest rate. Therefore in their model, the

relation between competition and stability can be U-shaped; that is, as the number of banks increases, the probability of bank default first declines but increases beyond a certain point (MMR 2007).

Methodology

In order to achieve the objective of the study, the study employs a new empirical industrial organization approach to assess whether any deviations in efficiency and stability can be attributed to bank competition in Sri Lanka. Following Martinez-Miera and Repullo (2008)[24], non linearity between competition and efficiency as well as between competition and stability in banking is allowed in this study. Specifically, the two models of the efficiency competition relationship developed in this study are as follows:

$$Efficiency_{it} = f(Competition_t, Competition_t^2, Bu\sin essEnvironment_{it}) \text{--------- Eq. (1)}$$

$$Stability_{it} = f(Competition_t, Competition_t^2, Bu\sin essEnvironment_{it}) \text{-----------Eq. (2)}$$

In Eq.1, the effect of competition on efficiency is controlled econometrically by incorporating variables explaining business environment including some bank specific, industry specific and macroeconomic specific variables. The complete model after incorporating all these variables can be illustrated as Eq. 1a shown below.

$$Eff_{it} = \alpha_{it} + \beta_1 H_t + \beta_2 H_t^2 + \beta_3 MS_{it} + \beta_4 L/TA_{it} + \beta_5 Eff_{it} + \beta_6 BInter_t + \beta_7 CrPvt_t + \beta_8 TAgr_t + \beta_9 GDP_t + \beta_{10} Inf_t \text{ -- Eq.(1a)}$$

Market share (*MS*), size measured with total assets (*TA*) and operational risk measured with ratio of loan to total assets (*L/TA*) of the individual bank were incorporated in the Eq.1a to control such bank specific effects on efficiency . In order to control for the industry level effects on efficiency banking sector intermediation ratio (*BInter*), credit to private sector (*CrPvt*) and assets growth of the banking sector (*TAgr*) were used. To control any effect from macro environment, the general level of economic development (*GDP*) and real inflation rate (*Inf*) were incorporated to *Equation 1a*. The dependent variable of the model is efficiency (*Eff*) the value measured with DEA assuming variable return to scale.

Eq. 2 sets the relationship between the specified bank stability measure and the specified bank market competition measure, controlling for business environment with bank characteristics and the state of the business cycle. The elaborated model of Eq. 2 is shown as Eq. 2a.

$$Stab_{it} = \alpha_{it} + \beta_1 H_t + \beta_2 H_t^2 + \beta_3 MS_{it} + \beta_4 Crgr_{it} + \beta_5 Eff_{it} + \beta_6 CrPvt_t + \beta_7 TAgr_t + \beta_8 GDP_t + \beta_9 RInt_t \text{ ----------- (2a)}$$

Market share (*MS*), credit growth (*Crgr*) and bank efficiency (*Eff*) of individual bank were incorporated in the model to control for the bank specific effects. In order to control for the industry level effects on bank stability, credit to private sector (*CrPvt*), assets growth in the banking sector (TA*gr*) were used. To control any effect from macro environment, the general level of development (*GDP*) and real interest rate (*RInt*) were incorporated to the Eq. 2a. The dependent variable of the model is bank financial stability (*Stab*); the Z-score.

Measuring bank competition

Panzar and Rosse (1987)[25] define a measure of competition, the H as the sum of the elasticities of the reduced-form revenue function with respect to factor prices. According to them, this statistic can reflect both the structure and the conduct of the market to which the firm belongs; it represents the percentage variation of the equilibrium revenue derived from the unit percent increase in price of all factors used by the firm. The Panzar-Rosse (P-R) revenue test is based on a reduced-form equation relating gross revenue to a vector of input prices and other control variables. The study estimates the PR model using the following, reduced form revenue equation.

$$\log TR_{it} = \alpha + \beta_1 \log IPL_{it} + \beta_2 \log IPF_{it} + \beta_3 \log IPC_{it} + \lambda_1 \log TA_{it} + \lambda_2 \log NPL_{it} + \lambda_3 DV + \lambda_3 BR + e_{it} \text{ ----- Eq.3}$$

In Eq. 3, banks are considered as employing three factor inputs namely labour, funds, and capital. Here, TRit is the ratio of gross interest revenue to total assets (proxy for output price of loans), IPLit is the ratio of personnel expenses to total assets (proxy for input price of labor), IPFit is the ratio of interest expenses to total deposits (proxy for input price of deposits), and IPC it is the ratio of other operating and administrative expenses to total assets (proxy for input price of equipment/fixed capital), TA (total assets), NPL, ratio of the number of branches of a bank to the total

number of branches (BR) were incorporated to control for potential effects of such variables on interest revenue. All of these variables are in logs, with the coefficients representing their respective elasticities. In addition, a dummy variables (DV) was included for foreign-owned banks.

Measuring efficiency

In analyzing banking firms, it is often important to measure their performance relative to other banks in the industry. Data Envelopment Analysis (DEA) is the most popular non-parametric approach to determine the level of efficiency. This paper uses DEA to derive efficiency scores for Sri Lankan commercial banks. It was developed by Charnes, Cooper and Rhodes (1978), The fundamental concept of DEA is to compare each commercial bank with the best bank. The best commercial bank will be assigned the efficiency score of 1 while the others are in between 0 and 1. The formulation of the model is represented below.

$$\text{Maximize } E_{ks} = \frac{\sum_{y} O_{sy} V_{ky}}{\sum_{x} I_{sx} U_{kx}} \quad \text{--------------- Eq. (4)}$$

$$\text{Subject to } E_{ks} \leq \forall \ firm \ s$$
$$U_{kx}, V_{ky} \geq 0$$

where E_{ks} is the efficiency score of firm s, using the weights of test firm k, O_{sy} is the value of output y for firm s; V_{ky} is the weight assigned to firm k for output y; I_{sx} is the value for input x of firm s; and U_{kx} is the weight assigned to firm k for input x.

Measuring Stability

In the empirical analysis to investigate the effect of bank competition in financial stability, the study focuses on individual bank stability rather than systemic stability. To proxy bank's financial Stabilty, the study uses the Z-index. The Z-Score combines several of the most significant variables in a statistically derived combination. Hence it provides useful interpretation about the overall risk of a firm. Z-score is calculated as;

$$Z = \left(\frac{ROA + E/A}{\sigma ROA} \right) \quad \text{-------------------- Eq.(5)}$$

Where *ROA* is the bank's return on assets, *E/A* is its equity to asset ratio and σROA is its standard deviation of return on assets computed over the sampling horizon. Unlike a single financial ratio, this index combines in a single indicator of the profitability, capitalization level or leverage, and return volatility. The Z-Index increases with profitability and capitalization level and decreases with return volatility of assets. Thus, a larger value of Z-Index indicates a smaller risk profile for a bank and higher bank stability**.** This has been extensively used in recent banking studies to measure bank stability or bank risk (e.g.Berger et al, 2008).

Results and Discussion

Level of bank competition, efficiency and stability

As the results of the estimated reduced form revenue equation (Eq. 3), the estimated *H* statistic is 0.55 for the sample period. This value does not lend support for a perfectly competitive banking market in Sri Lanka, as the estimated *H* statistic significantly differs from 1. This value is also significantly non-negative (closer to zero), thus offers no evidence for a monopoly in the banking market. The results suggest that for the observed period, the Sri Lankan banking sector is characterized by monopolistic competition according to the PR classification. This indicates that an increase in input prices will lead to a less than proportional increase in revenues, as the demand for banking facing individual banks is inelastic. As this value is in the range between 0.5 and 1, the estimated *H* statistic supports evidence for a moderately competitive market in the Sri Lankan banking industry.

The *H* statistic estimates over the stages move around 0.49 to 0.67 between 1996 and 2013 and do not have a persistent upward or downward trend. Rather it shows cyclical movements along the sample period. This particular pattern of competition in Sri Lankan banking industry can be further illustrated by using figure 1.
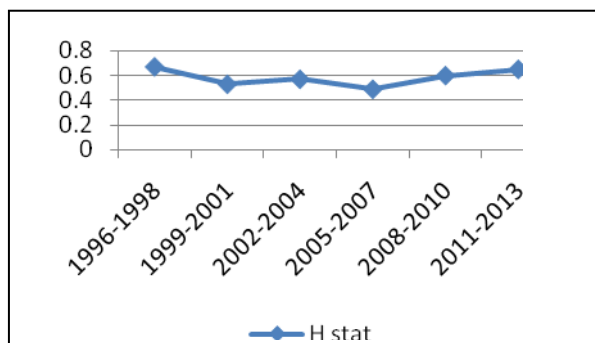

Figure 1
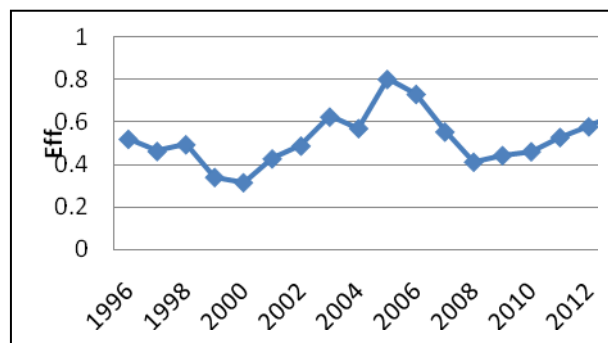*Trends in bank competition Sri Lanka 1996-2013*

Figure 2
Trends in bank efficiency Sri Lanka   1996-2013

The efficiency scores of the individual banks for the period were calculated by using DEA technique by using Eq. 4. Accordingly, the average efficiency score for the Sri Lankan commercial banking sector is calculated as 0.51 for the sample period. This score is an indication of moderate level efficiency of Sri Lankan commercial banking sector.
The analysis of the annual averages of efficiency scores reveals dynamic nature over the sample period (Figure 2). The score lies in range of 0.32 and 1, indicating the lowest efficiency year of the commercial banking sector as year 2000. The average efficiency scores shows a declining trend in the first 5 years of the sample period and gradual increase thereafter, until it reaches its highest in year 2005 at a score of 0.8. However, this increasing efficiency again started to decline after year 2007. The evidence of financial crisis started at the end of 2007 and its effects on banking sector efficiency is also observed in the analysis.

Effect of bank competition on efficiency

In order understand the optimum level of bank competition the Eq. 1a and 2a were solved as non-linear regression analysis. These were estimated with fixed effect panel regression analysis. Because it is possible that unobservable bank characteristics are correlated with the bank efficiency levels. Therefore bank specific fixed effects were included in the model instead of constant. There is a significant degree of persistence in the efficiency variable, since the average value of the first-order autocorrelation is 0.96. Hence, the lagged dependent variable was included as an explanatory variable. Assuming the correlation of a time series with its own past and future values in bank revenues, following Ordinary Least Squires (OLS) to estimate the revenue model seems to be problematic. Thus, in estimating the equation, the study followed an Estimated Generalized Least-Squares (EGLS) procedure instead of applying the method of (OLS) because estimators of the former are more efficient with a large sample. In the EGLS procedure, the estimation was done with the cross section weights which correct for the presence of cross-section heteroskedasticity. This has been chosen to explore the correlation between the bank efficiency scores, stability scores and identified explanatory variables in equation 1a and 2a.

In the initial regression analysis coefficients of both *TA* and *L/TA* found as statistically insignificant. This says that the size of the bank and operational risk have no effect on the efficiency level of banks. This result suggests applying the general to specific approach in order to pick the best regression equation. Accordingly, the regression was re-estimated by excluding the non significant variables; *TA,* and *L/TA* respectively. The results oif the regression analysis given in table 1.

Table 1
Regression results – Equation 1a

Variable	Coefficient
Constant	0.760*** (3.75)
H	-2.304** (-2.37)
H^2	3.235*** (2.91)
Inflection point	*0.36*
CrPvt	-0.334** (-1.97)
$Eff_{(t-1)}$	0.837*** (15.98)
Adjusted R^2	0.72
D-W stat	1.97

Note: The dependent variable is efficiency score calculated with DEA. H = the competition measure, H^2 = the square value of competition measure, $CrPvt$=credit by commercial banking sector to the private sector $Eff_{(t-1)}$=lag dependent variable. t values for coefficient are in parentheses. ***, **, and * indicate a significant difference from zero at 1%, 5%, and 10%, respectively.

According to the results of the regression analysis of efficiency model, competition measured with both H statistics and the square of H statistics are strong and statistically significant. Since the H statistics bears negative sign and H squared bears a positive value, the collective results provide evidence for a U shape relationship between bank competition and efficiency. Accordingly the level of bank efficiency falls with competition at initial stages and further increase in competition causes efficiency to rise with competition. As the calculated inflection point is given, this relationship can be more clearly explained. That is, the level of bank efficiency falls at an increasing rate with increased competition to its minimum until the degree of competition equals to 0.36. The decreasing trend of efficiency slows down thereafter and starts to rise with increased competition.

Within this model, less competition among banks could result in higher interest rates charged on loans, and market power of few banks which might raise the efficiency of only such banks but undermining the efficiency of the banking sector as a whole. However, the competition among the individual banks increases when other banks also react to capture the market. At this initial stage of competition, banks try for a minimum, i.e. to survive in the market. In such scenario they need to squeeze down their interest margins and spend more on technology and new promotional campaigns to capture the market.

Effect of competition on banking sector stability

There is a significant degree of persistence in the stability variable, since the average value of the first-order autocorrelation is 0.65. Hence, the lagged dependent variable was included as an explanatory variable. Both competition variables (*H & H2*) were found as strong and statistically significant. In addition, only the variable *RGDP* shows positive and significant relationship to the stability of the banking sector, indicating the importance of macro economic development and stability. None of the bank specific variables were found as significant in explaining stability in Sri Lankan banking sector. Applying general to specific approach resulted in a final model (Table 2) that best explains the stability of the banking sector.

Table 2
Regression results of stability model-Equation 2a

Variable	Coefficient
Constant	0.36*** (3.06)
H	-1.74*** (-3.38)
H^2	2.00*** (3.46)
Inflection point	*0.42*
RGDP	0.967*** (3.65)
$Stab_{(t-1)}$	0.793*** (6.64)
Adjusted R^2	0.79
D-W stat	1.89

Note: The dependent variable is bank stability measured with Z score. H = the competition measure, H^2 = the squire value of competition measure, and *RGDP* is the inflation adjusted annual growth rate of gross domestic production. $Stab_{(t-1)}$=lag dependent variable. t values for coefficient are in parentheses. ***, **, and * indicate a significant difference from zero at 1%, 5%, and 10%, respectively.

As in the case of efficiency model, both H and H^2 are strong and significant in explaining the stability of Sri Lankan banking sector. H negatively correlates with stability whereas H^2 positively correlates. This provides sufficient evidence for a U shape relationship between competition and stability in the Sri Lankan banking sector. Accordingly, stability falls with competition up to a certain point and starts to rise thereafter. The point where this relationship inflects is found as 0.42. This says that stability of the banking sector keeps on falling until the degree of competition (h statistic) reaches 0.43, and rising until its maximum with the increased competition. The results of the analysis thus suggest higher degree of competition for higher bank stability.

The findings of the analysis support 'competition fragility' view at the initial stages of bank competition. Because, when the monopoly power is exercised in the banking sector, banks limit their risk-taking in order to protect the quasi-monopoly rents granted by their government charters. However when other banks gradually come to compete in the market with various strategies, the banks with more market power lose their market shares. Accordingly more bank competition erodes market power, decreases profit margins, and results in reduced franchise value of all the banks. As a result the banks are encouraged to take on more risk to increase returns. This encouragement of banks to increase their overall risk exposure, creates financial instability in the bank market. These results supports for franchise value paradigm at the initial stages of bank competition in Sri Lanka. One other reason could be brought to explain this negative trade-off between competition and financial stability in a less competitive environment. That is, at the initial stages of competition, the activities of banks, their lending behavior become more complex and supervision and monitoring may become a little difficult. In addition, according to Allen and Gale (2004)[22], when the competition among banks increases, bank has a minimum incentive to properly screen their borrowers, as the bank earns only fewer informational rent from the relationship with their borrowers. This again increases the risk of fragility. Another channel which affects the fragility in a competitive banking environment is inter-bank market and payment system. Banks in a highly competitive banking industry are price takers. Therefore there is no incentive to provide liquidity to a bank troubled with a temporary liquidity problem (Allen and Gale, 2000)[22]. This will then cause the failure of the troubled bank, ultimately affecting the system as a whole.

The findings of the study support the U shape relationship between bank competition and stability predicted by Martinez-Miera and Repullo (MMR 2007)[24]. As they identify, in a lower competition environment a risk-shifting effect accounting for more defaults when interest rates increase. However the present study's explanation for higher competition is quite different from that of MMR. According to them, there is a margin effect that generates more revenue for the bank coming from those non defaulted borrowers that pay a higher interest rate. This study argues that the positive effect in higher competitive environment stemmed as an effect of franchise value paradigm. The reasons for such argument are twofold. First, when all the banks are equally competitive no bank would take excessive risk in granting loans, but making all necessary precautions as their fear of decreased franchise value (as the franchise value itself is a competitive advantage). The decreased franchise value in turn acts as a signaling effect that would badly affect banks' deposit market. Second, competition is further promoted with necessary regulations and supervisions which have developed after experiencing fragility in the banking sector at early stages of competition.

The Optimum level of bank competition

The efficiency and stability were modeled separately in order to identify any effect of bank competition on each of them individually. Results of both models supported strong evidence for the effect of competition on efficiency and stability of the banking sector. The efficiency model revealed a U shape relationship between competition and efficiency with the inflection point at 0.36. These results suggest that the degree of competition above 0.36 (i.e. H statistics above 0.36) is favorable as the bank efficiency starts improving from this point onwards. The stability model too supports a U shape relationship with the level of competition in the Sri Lankan banking sector. However, the inflection point found in the stability model is 0.42 of H statistics. This suggests that the degree of competition above the level of 0.43 is favorable as far as stability of the banking sector is concerned. Achieving efficiency is not the only objective of bank competition. The favorable outcome which is gained through competition would be offset if the increased competition hinders the financial stability of the banking sector. Therefore competition should be promoted as far as both efficiency and stability are better off. Thus, what should be the optimum level of competition in the Sri Lankan banking market when both efficiency and stability are concerned? This can be clearly explained with the aid of figure 3.
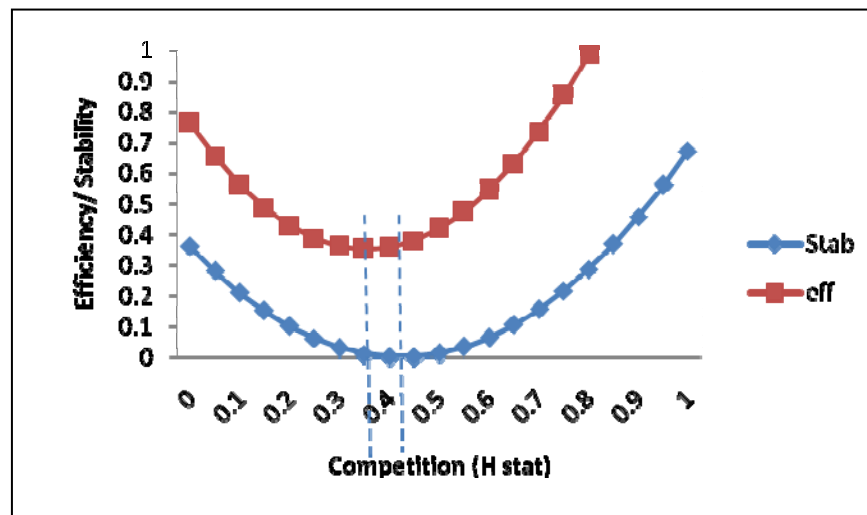
Figure 3: Relationship between Competition efficiency and stability
Note: Eff = 0.76 + 3.23h^2 – 2.3h
Stab = 0.36 + 2h^2 – 1.7h

In the above graph the X axis denotes the level of competition (H statistics) and Y axis denotes the efficiency scores and the stability scores (Z score). The graph shows the competition and efficiency/ stability relationship in an environment assuming other factors constant. Point A on the above graph is the point where the efficiency of the banking sector starts increasing, thus beyond this point competition enhances efficiency. However as shown in the graph, financial stability of the banking sector is decreasing even after this point and starts to increase once it reaches the point B at which the degree of competition is 0.42. This result suggests that, the degree of competition should further increase after the level 0.36 as at this point the banking sector is unstable even though the level of efficiency improves. Hence, the degree of competition after point B would be best as after this both efficiency and stability of the banking sector are rising. Thus the findings of the study do not point out a specific point as an optimum level of competition that should prevail in the banking sector. Rather, it supports to specify a minimum level of competition that should prevail in the Sri Lankan banking sector in order to keep the banking sector efficient and financially stable. The evidence suggests the level of competition in the Sri Lankan banking sector should exceed 0.42 so as to enhance both efficiency and stability. Moving towards a higher competition enables banking sector to achieve its highest efficiency and a higher level of stability to a maximum Z score at 0.67 (This is the highest level of stability that can be achieved in the context of Sri Lanka with the existing economic conditions).

When an industry falls to competition, the failures coming through competition suggest some corrective actions. The findings of the study too confirm this common wisdom. The deteriorating bank stability slowly starts improving with further increased competition. This supports 'competition stability' view, which predicts high competitive markets are more stable. As the found inflection point is 0.43 and majority of H statistics lie above this point, competition stability is more confirmed in the findings of the present study. In a high competitive environment banks are price takers, so they have to squeeze down their interest rates in order to protect their market share. The lower interest rates formed in the higher competition encourage safer loan customers for borrowing and other borrowers are induced to choose less risky projects and hence are likely to face a lower probability of default. The volume of nonperforming loans would then decrease, improve financial stability. This probability of risk shifting to the bank by the borrower is limited when the banks are more mature with competition. On the other hand, when the banking systems like Sri Lanka, which is comprised of a few large bank firms, the policy makers have to concentrate more on the failure in the financial system. Closer supervision on excessive risk taking, capital requirements regulations and other financial infrastructures are also strengthened with the increased competition. These factors could have affected the positive link between competition and stability of the Sri Lankan banking sector.

On one hand the information asymmetry between the banks and the borrowers is very high in imperfect competition. As a consequence, banks have to implement some mechanisms to solve the resulting problems such as adverse selection and moral hazard. This will in turn increase the monitoring cost of the banks. This channel of inefficiency

is more validated for transition economies like Sri Lanka. If the market power of the few banks decreases and competition increases further, the efficiency levels of all the banks become closer to each other, denoting higher relative efficiency scores. This is because, a heightened competition encourages banks to reduce their costs, i.e. their cost inefficiencies. Hence, decreasing efficiency at initial stages and increasing efficiency at latter part of increased competition in the banking sector. The above model supports evidence for this particular trade-off between competition and efficiency in Sri Lankan banking sector.

On the other hand when an industry falls to competition, the failures coming through competition suggest some corrective actions. The findings of the study too confirm this common wisdom. The deteriorating bank stability slowly starts improving with further increased competition. This supports 'competition stability' view, which predicts high competitive markets are more stable. As the found inflection point is 0.43 and majority of H statistics lie above this point, competition stability is more confirmed in the findings of the present study. In a high competitive environment banks are price takers, so they have to squeeze down their interest rates in order to protect their market share. The lower interest rates formed in the higher competition encourage safer loan customers for borrowing and other borrowers are induced to choose less risky projects and hence are likely to face a lower probability of default. The volume of nonperforming loans would then decrease, improve financial stability. This probability of risk shifting to the bank by the borrower is limited when the banks are more mature with competition. On the other hand, when the banking systems like Sri Lanka, which is comprised of a few large bank firms, the policy makers have to concentrate more on the failure in the financial system. Closer supervision on excessive risk taking, capital requirements regulations and other financial infrastructures are also strengthened with the increased competition. These factors could have affected the positive link between competition and stability of the Sri Lankan banking sector.

Now it is worthwhile to analyse the degree of competition in the Sri Lankan banking sector during the sample period with respect to the findings of the above analysis. For this, the time series pattern of annual H statistics for the sample period (1996-2013) depicted in Figure 3 is considered. There, H statistics for the Sri Lankan banking sector ranges from 0.49 to 0.67. Hence, according to the above analysis, the degree of bank competition in Sri Lanka during 1996-2013 has been exceeded the minimum level of competition that should prevail in order to achieve both efficiency and stability objectives of the banking sector. Accordingly, competition in the banking sector during the period 1996-1998 had been comparatively efficient and stable than the rest of the years of the sample period.

Conclusion

This study provides new and rather scarce evidence of effects of banking sector competition and its economic impact in Sri Lanka. By applying the new empirical industrial organization approach, the study finds that Sri Lankan banking market is moderately competitive. The moderate level of bank efficiency and financial stability of the banking sector are attributed to the moderate level of competition in Sri Lankan banking industry. Statistical Evidence of effect of the bank competition on bank efficiency suggests that greater competition has a significant impact on efficiency improvement in the banking sector. This relation in the short run was found as U shaped indicating falling efficiency at the initial stage of competition and rising thereafter. The effect of competition on financial stability of the banking sector too supports a U shape relationship in the short run. However, the turning point of stability, as an effect of competition is a little higher than that of efficiency. These results are suggestive of a degree of bank competition in the country higher than 0.42 (H statistics) in order to enhance both efficiency and stability. But empirical evidence of the current study does not provide sufficient evidence for long run effect of bank competition on banking sector stability. Thus, the study supports 'competition stability view' in the short run, and does not support any evidence on 'competition fragility view'.

Hence, the findings of the study revealed that the degree of bank competition prevails at present is above the minimum but not the optimum, as far as efficiency and stability of the banking sector are concerned. The major argument brought throughout the present study is that, most traditional studies of competition in banking fail to capture the complexity and dynamics involved in retail banking in countries like Sri Lanka. In order to be stable, economies of scale (size of the bank) are increasingly important in today's banking markets. Freedom to expand will realize the necessary scale especially for small banks. Therefore, authorities need to take all these concerns in developing the competition policy of the country. A competition policy based on traditional analyses could easily lead to the wrong conclusions which can have highly undesirable results on the economy. Hence, in conclusion a different approach emerges with underdeveloped countries giving a stronger role to competition authorities to understand the complex relationships between competition, efficiency and stability in the financial sector.

Understanding these complexities particularly will help in developing strategies to achieve sustainable development of developing economies.

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