

Working Paper No. 11-12

Economics and Finance Working Paper Series

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October 2011

Does Market Structure Matter on Banks' Profitability and Stability? Emerging versus Advanced Economies

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Abstract

We investigate the effects of market power, banking and bank-environment activities on profitability and stability (risk and returns) for a total of 1929 banks in 40 emerging and advanced economies over the sample period of 1999-2008. The model developed in this paper incorporates the traditional structure-conduct-performance (SCP) and the relative-market-power (RMP) hypotheses with the view to assessing the extent to which the bank performance can be attributed to non-competitive market conditions and pricing behaviour. The key findings are as follows; i) a greater market power leads to higher bank performance being biased toward the RMP hypothesis in advanced economies; ii) more concentrated banking systems in advanced economies may be more vulnerable to financial instability; iii) Neither of the hypotheses seems to be supported for the returns in the emerging banking sector; and iv) higher interest rate spreads increase profitability and stability for both types of economies, however, for emerging banks this seems to be one of the key elements to increase their profitability raising concerns on economies. Other interesting findings include that off-balance-sheet activities appear to present banks with a trade-off between risk and returns in advanced economies, and the effects of bank age, bank ownership status and regulation on risk and returns, depend on market power.

Keywords: Market structure; Concentration; Competition; Bank profitability; Risk; Emerging economies

JEL classifications: G01, G21, G28

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1. Introduction

Financial intermediation is essential for economic development. The international banking industry has undergone substantial structural reforms over the last two decades. There have been fundamental changes in the behaviour of banks with more emphasis on profitability and comprehensive asset management in recent period. It is particularly important for emerging countries to ensure that the banking system is stable and efficient. Such a banking development should lead to private and infrastructural projects being financed effectively and allocated efficiently. As Albertazzi and Gambacorta (2009) argue, because of phenomena such as globalization, growing international financial markets, deregulation and advances in technology, identifying the determinants of bank performance is an important predictor of unstable economic conditions. Athanasoglou et al. (2008) also point out that a profitable banking system is likely to absorb negative shocks, thus maintaining the stability of the financial system. In this respect, it is important to investigate the effectiveness of emerging banks. How banks are affected by increased competitive pressures, depends partly on how efficiently they are run. Banks can increase their profitability through either improvement of their cost efficiency or exerting their market power. The latter approach to make profit can reduce total social welfare.

This paper empirically investigate the effect of market structure in banks on profitability and stability, in particular whether banks, who are operating in concentrated markets generate more profit or not, whilst taking into account of the bank-specific characteristics; whether banks are efficiently managed. We also examine overall effect of financial structure and macroeconomic conditions; whether financial development and business cycles affect bank risk and returns. Making an allowance for the differences between banks operated in emerging and developed countries, identifying the factors that lead to these differences may explain the effectiveness of financial institutions and help us understand the banking industry in emerging economies.

We utilizes data from 23 emerging economies (10 Eastern Europe and 13 Middle East countries) and 17 Western European countries, containing a relatively large panel set with a total of 1929 banks over the period 1999-2008. Tests of market power hypotheses are performed by regressing bank performance indicators against measures of market power together with bank-specific characters, bank environment activities and financial structure variables.

The purpose of this study is to address some fundamental questions. Firstly, can the market power hypothesis be applied to the emerging market banking system? Secondly, why are banks operated in the emerging economies more profitable than their counterparts in advanced economies? Thirdly, to what extent are discrepancies in determinants of bank risk and returns due to variations in factors under the control of bank management and/or factors relating financial structures? To the best of our knowledge, no study has yet attempted to address these questions. We, systematically, compare the emerging market banking systems with their counterparts in advanced markets. Since there is a wide interest in the effect of augmented competition and deregulation on banking systems, the results of this study may help understanding the key determinants of banking performance in both developing and developed economies. Furthermore, the financial sector in emerging economies has been in transition and undergoing serious reforms, such as financial deepening, consolidation and liberalization, and that more economic insight is needed to support further development. There are also important implications for both microeconomic theory and antitrust policy.

The market structure matters for the bank's power in setting interest rates that can directly affect its performance. A positive statistical relationship between measures of market structure, such as concentration or market share, and profitability has been reported by many banking studies (e.g. See Molyneux and Thornton, 1992; Berger, 1995). Berger (1995) advocates two hypotheses which support such a relationship. One of them is the traditional structure-conduct-performance (SCP) paradigm, which confirms that, in highly concentrated markets, firms set prices that are less favourable to consumers, as a result of imperfectly competitive markets. In the concentrated markets, a bank can impose higher interest spreads, by setting higher lending rates and lower deposit rates. The other one is the relative-market-power (RMP) paradigm where firms with well-differentiated products can exercise their market power in pricing products, thus earning supernormal profits. Moreover, such a positive relationship could also be explained in terms of efficiency. In Berger (1995), two efficient-structure hypotheses are utilised in explaining why market power can lead to higher profits. The x-efficiency asserts that firms with superior management of production and technologies have lower costs and therefore higher profits. The scale-efficiency hypothesis claims that firms tend to have equally good management and technology, but some simply produce at more efficient scales than others, and as a result, have lower unit costs and higher unit profits. One question that arises here is whether profitability in emerging banks can be explained by the SCP and/or RMP hypothesis. A number of studies have examined the

effects of market concentration on competitive conditions and bank risk and returns in developed markets, but not for emerging economies.

Another question which we attempt to answer is why bank profitability in emerging markets is higher than those observed in advanced markets. In effect, we assess to what extent relatively high bank profitability in emerging banks can be attributed to a low degree of efficiency or to non-competitive market conditions. Moreover, an inadequate regulatory banking environment with a higher degree of information asymmetry can lead to high profitability. In this context, high profits are indicative of high risk premium, which can cause financial instability (Hellmann et al., 2000). Therefore, our research objective is to analyse whether the relatively high returns of banks operating in emerging countries in the Middle East and the Eastern European countries are caused by a low degree of cost for given market conditions or by exerting market power due to weak regulatory constraints.

In order to elaborate the level of profitability and market structure in both types of economy, we measure return on assets for 308 selected banks² located in developing countries (Eastern Europe and Middle East) and 1621 selected banks in developed countries (Western Europe) over the sample period. Figures 1 illustrates the trend of returns on average assets (ROAA) in emerging and advanced banks during the period 1999-2008. Bank profitability in the emerging economies was extremely high, compared to that observed for mature economies. It is evident that the average ROAA in the emerging economies is almost three times higher than that in advanced economies. Furthermore, the ROAA in emerging banks increased gradually from 1.2 in 1999 to 1.8 in 2007, although it decreased significantly between 2007 and 2008. By contrast, the return on average assets for banks in advanced economies remains to be constant being around 0.5 till 2007. The main question in this respect one might want to address is that what explains such differences in bank profitability between two different markets?

[Figure 1]

One possible answer could be the market structure in these economies. In order to analyse market structure, we compute market share and market concentration for the abovementioned banks, which are presented in Figures 2, 3 and 4. Figure 2 displays the

² See Data Section for more information regarding bank selecting procedure

Lorenz Curve for market share³. The horizontal and vertical axes show the proportion of banks and market share respectively for both economies. As observed, 10 percent of emerging banks, which accounts for 23 banks, have nearly 40 percent of the market share. The same 10 percent of advanced banks accounting for 116 banks that amounts to as much as 70 percent of market share. Figures 3 and 4 show the 4-firm concentration⁴ (CR_4) and normalized Herfindahl- Hirschman index⁵ ($NHHI$). The right-hand axes on each figure show the percentage of CR_4 and $NHHI$, respectively. It can be seen from Figure 3 that the degree of concentration (CR_4) in emerging market banking systems decreased dramatically from 85% in 1999, to 67% in 2008. Conversely, in the advanced banking system, with the exception of some fluctuations between 2001 and 2006, CR_4 remains constant at around 51 percent. Regarding $NHHI$, again, it declined considerably in emerging economies during the period under consideration from 0.19 to 0.10, while in advanced economies, it increased significantly from nearly 0.05 in 1999 to 0.1 in 2008.

In short, these figures illustrate that in general banks in emerging markets have a higher profit rate than banks in the developed markets. Although there has been a fall in the concentration in emerging economies, the structure is still highly concentrated at around 67% measured by CR_4 that can be very conducive to price collusion. We have motivated by these comparative illustrations to investigate further whether the high level of profits in emerging banks is indeed explained by market structure or other factors.

The importance of our comparative study of bank behaviours between emerging economies and Western countries lies in the development and improvement of the banking sector in emerging economies. For example, the improvement of the banking environment in the Middle East would provide more opportunities to enter into the international markets. For banks in the Former Eastern Europe, the legal and financial infrastructures need to be established in order to penetrate into the major EU markets. The existence of geographically limited markets offers researchers the advantage of comparing profitability and concentration across markets, without the confounding influences of inter-industry differences. However,

³ In designing Lorenz Curve and measuring market share some of banks were dropped. For example number of emerging banks reduced from 308 to 234 due to missing observation

⁴ CR_4 is calculated as the total assets of four largest banks to the total assets of all banks in the country.

⁵ If MS_i represents the market shares by firm i and N is the number of firm in the market then $HHI = \sum (MS_i)^2$ and

$$NHHI = \frac{(HHI - \frac{1}{N})}{(1 - \frac{1}{N})}$$

there are some problems in comparing different regional banking sectors, such as different regulations (e.g. entry barriers, interest rate restrictions and credit ceilings) and the substantial differences in accounting practices and legal forms of banks in various parts of the world.

Numerous studies have attempted to measure the determinants of bank profitability in the EU banking system, e.g. Bourke (1989), Molyneux and Thornton (1992), Girardone et al. (2004), Goddard et al. (2004b), Kosmidou et al. (2005), Athanasoglou et al. (2006) and Athanasoglou et al. (2008). Also, in the new global economy, there has been an increasing interest in measuring profitability in emerging markets, see e.g. Hassoune (2001) and Ben-Khadiris (2009). However, studies of the profitability-market power relationship in emerging markets have been considerably less rigorous, lacking in detailed studies of the determinants of bank profitability. This paper fills the gap by widening the scope in explanatory variables; not only market structure, but also other factors such as bank-specific characteristics, overall financial market performance and macroeconomic conditions, which systematically compare with those of advanced economies. It is noted that another novelty in this paper is the investigation of the risk in banking sector, using the same explanatory variables applied to returns. It is crucial to understand the causes of instability for, yet, unstable emerging banks.

Different determinants call for different policy actions. If profitability determinants can be effectively identified in relation to the market structure of developing countries, fundamental reform could be undertaken by central banks. If, on the other hand, determinants were dominated by bank-level variables, promoting more stakeholder power would be desirable. If determinants are clearly identified macroeconomic variables, actions in terms of bank reform would be undertaken by macroeconomic policy makers.

The main empirical findings are as follows. As with many studies presented in the banking literature, we find a positive statistical relationship between profitability and market share in advanced economies: banking systems in developed countries are generally biased toward the RMP hypothesis. However, the data do not seem to support the effect of market structure on bank performance in emerging market banking systems. Bank-specific variables and financial structure seem to exert a significant effect on both types of banks; however, the effect of some of these variables alters by interacting with market power. In particular, higher interest rate spreads increase profitability and stability for both types of economies, however, for emerging banks this seems to be one of the key elements to increase their profitability

raising concerns on economies. The macroeconomics variables have a robust effect on banks' profitability in advanced countries, but less so for emerging economies.

The remainder of this paper is structured as follows. Section 2 presents a literature review of related studies. Section 3 specifies the model for estimation and describes the variables used for this study. Section 4 summarises the data descriptive statistics with the data sources. The empirical results are reported in Section 5. Section 6 concludes and provides a number of policy implications.

2. Literature review

The literature on the concentration–returns relationship adopts one of two broad approaches: the market power (MP) and the efficiency structure (ES) paradigms. In the MP paradigm, the direction of causality between concentration and profitability runs from the market structure of an industry to behaviour which affects its performance. A concentrated structure is conducive to the use of market power in ways that may enhance bank profitability. The ES paradigm, by contrast, sees the causality as running from individual firm efficiency to their market share and profitability. Within the MP paradigm, as Berger (1995) emphasizes, two distinct approaches can be identified: the structure–conduct–performance (SCP) hypothesis, and the relative market power (RMP) hypothesis. Similarly, there are also two approaches within the ES paradigm: the X-efficiency and the scale-efficiency hypotheses. By adding a direct measure of efficiency, an extensive debate has been found over the market-power versus efficient-structure explanations of the returns-structure relationship. Berger (1995) finds some support for the RMP hypothesis, in which market share is positively related to profitability. He also reports partial support for the X-efficiency approach.

Most research into the determinants of bank performance, such as Bourke (1989) is based on the traditional SCP paradigm. The SCP or collusion hypothesis postulates that market structure influences the conduct or behaviour of firms through, for instance, pricing and investment policies, and this in turn influences corporate performance. Bourke (1989) found a positive relationship between market concentration and bank profitability in Europe, North America, and Australia. For European banking markets, Maudos and de Guevara (2004) found a statistically significant positive correlation between concentration and bank interest margins for the period 1993–2000. A positive relationship between concentration and

profitability was also reported by Demircug-Kunt and Huizinga (1999) for banks throughout the world, Molyneux and Thornton (1992) for Europe and Short (1979) for Canada, Western Europe and Japan. By contrast, Smirlock (1985) reported that concentration does not explain bank profit rates for 2700 state banks operating in the USA. Also Goldberg and Rai (1996) fail to find a positive relationship between concentration and profitability for a sample of large banks located in 11 European countries for the period 1988–1991.

There is also a considerable literature focusing for the single country studies for Colombia (e.g. Barajas et al., 1999), Malaysia (e.g. Guru et al., 1999), Italy (e.g. Girardone et al., 2004), Greek (e.g. Kosmidou and Pasiouras, 2005), Australia (e.g. Williams, 2003), UK (e.g. Kosmidou et al., 2005), Korea (e.g. Park and Weber, 2006), Hong Kong (e.g. Wong et al., 2007), Philippines (e.g. Sufian and Chong, 2008), China (e.g. Sufian and Habibullah, 2009), and Turkey (e.g. Sayilgan and Yildirim, 2009). For the panel of countries, see also Goddard et al. (2004b); Beckman (2007); Pasiouras and Kosmidou (2007); and Flamini et al. (2009).

Some studies looked at other factors as determinants of bank profitability. Kosmidou et al (2005), for example, analysed the UK commercial banking sector over the period 1995-2002, reporting that the cost to income ratio, liquidity, and loan loss reserves affect profitability significantly. Capital adequacy appears to be one of the main determinants of bank profitability. In addition, they noted that macroeconomic factors such as inflation and GDP growth, and variables used as proxies of the relative development of the banking industry and the stock market, are positively associated with bank performance. Pasiouras and Kosmidou (2007) measured the effects of 10 internal and external variables on profitability, including the capital ratio, cost to income ratio, loans to customers and short-term funding, bank size, inflation, GDP growth, concentration, and three determinants reflecting the development of banking and stock markets on bank returns for 584 domestic and foreign commercial banks in the 15 developed EU countries over the period 1995-2001. The effects of all variables are found to be significant, regardless of bank ownership status except for the concentration ratio.

So far, the most comprehensive study of bank performance with the largest sample of countries was conducted by Demircug-Kunt and Huizinga (1999). They measured the effects on profitability of a variety of bank and market characteristics, such as taxation, the structure of financial systems, and financial regulations. Using commercial bank-level data from 80

developed and developing countries over the period 1988-1995, they emphasised that banks with larger assets and/or lower concentration ratios are more profitable. They also reported that in developing countries, the domestic banks earn smaller profits than foreign ones, while the converse applies in developed countries. Furthermore, they find that banks with higher non-interest-earning assets tend to be less profitable; inflation and interest rate have a positive impact on profitability, particularly in developing countries. In their extended work in (Demirguc-Kunt and Huizinga, 2000) on financial structure and bank profitability among many developed and developing countries, they concluded that “greater bank development brings about tougher competition, higher efficiency and lower profits”.

Using data from seven south eastern European countries over the period 1998-2002, Athanasoglou et al. (2006) reported statistically significant relationships between profitability and such determinants as capital, inflation, operating expenses, size, ownership status, and concentration, whereas they found no evidence to support the influence of liquidity risk and GDP per capita. Finally, one of the latest studies by Tregenna (2009) analysed the high profits of American banks in the pre-crisis period (1994-2005), where the effects of market structure, bank size and operational efficiency on profitability were investigated. The main finding was that efficiency does not affect profitability strongly; rather, a positive concentration-profit relationship was found. Tregenna (2009) argued that high profits before the crisis in the US banking sector were derived through concentration and not through efficient performance, suggesting that the rising profits were at the expense of efficient economy as a whole.

Some of recent research attempts to explain the profit-efficiency relationship by introducing x-efficiency and scale-efficiency, while incorporating market power hypotheses. The methods they use to measure those efficiency indicators are the stochastic frontier analysis (SFA) and the data envelopment analysis (DEA). Claeys and Vander Vennet (2008), for example, investigated the determinants of bank interest margins in the Central and Eastern European countries. They attempted to determine empirically whether the high profit margins of banks in these transition economies are caused by a low degree of efficiency or non-competitive market conditions. By employing the SFA techniques, they find that there is evidence to support the SCP hypothesis. Higher operational efficiency is reflected in lower bank interest margins in banking sectors in these countries. Seelanatha (2010) attempted to identify the influence of bank efficiency and market structure on bank profitability in Sri Lanka. By utilizing the DEA approach, a non-parametric approach, the findings suggest that

the performances of banks in Sri Lanka depend on levels of efficiency, but not on market power, in terms of either market share or market concentration.

Finally, as Tregenna (2009) correctly points out, high profits in the banking sector cannot prevent banks themselves from bankruptcy, in the event of financial crisis, if such profits are derived from market share or market concentration, rather than through efficient performance. Although the current financial crisis has affected most Western countries and caused serious disturbances to the mature economy banking sectors, it has also constituted a useful warning to emerging banks to re-evaluate their positions. The crisis caused both banks and regulators to focus on cost reduction and efficiency improvement. In particular, a much stronger regulation of the banking sector in developing banking system is needed in order to balance returns and risks

Overall, the existing literature provides a fairly comprehensive review of the effects of market power, financial structure, and bank activity determinants on bank risk and return in an individual country or panel of countries, but some questions in relation to emerging markets banking systems still need to be answered empirically. The results of previous studies usually indicate that the impact of market power on bank performance is positive, although such relationship could be spurious. There is no empirical evidence that bank structure exerts a significant influence on increasing profitability indicators in emerging economies. Yet, existing empirical literature does not focus specifically on market structure and bank risk and returns, nor control for the influence of pricing behaviour, regulation, and financial freedom on bank performance. This paper aims at addressing the above issues, in order to gain greater insight into the factors affecting bank performance in emerging economies.

3. The model specification and variable selection

3.1 The model specification

We develop a panel data model by building upon the existing empirical models in investigating key aspects of bank performance, measured by its risk and returns. We, in particular, examine bank performance through the potential influence of market structure or market power.

Following Smirlock (1985) and Douglas and Diana (1988), the traditional hypothesis can be tested by estimating profit using the equation shown below:

$$\Pi_{it} = F(\text{Market Structure}_{it})$$

where i denotes bank i and t stands for year t , Π measures bank performance, and market structure refers to either using market share (MS) at a firm level, or using the concentration ratio (CR) at the market level. The CR reflects the degree of collusive behaviour that a firm's power to extract higher profits is due to oligopolistic behaviour. This model is based on the structure-conduct-performance (SCP) hypothesis and the relative-market-power (RMP) hypothesis. The expanded version is as follows:

$$\Pi_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 CR4_{it} + \varepsilon_{it} \quad (1)$$

where $CR4$ is a measure of the 4-firm concentration ratio. Eq. (1) differentiates the two hypotheses, the SCP versus the RMP. Each coefficient yields a marginal effect of market structure on profitability in the banking system. A coefficient combination of $\alpha_1 > 0$ and $\alpha_2 = 0$ implies that banks with a high market share are more efficient than their rivals and yield higher profit. Some empirical evidence supports the RMP theory, in which the key element of market structure is market share. Conversely, $\alpha_1 = 0$ and $\alpha_2 > 0$, suggest that the traditional SCP theory can be verified. This implies that firms' greater profitability is not affected by market share; rather, rents arise from the monopolistic operation due to market concentration.

Next, we consider the measures of X-efficiency and scale-efficiency to test the efficient-structure hypothesis (see Claeys and Vander Venet, 2008) together with other bank-specific variables. Due to a lack of data, we specify indirect measures of these efficiencies, such as the size of the bank as a proxy of scale-efficiency and overheads to total assets ratio as an overall measure of cost efficiency. Furthermore, the model is augmented with supplemented measures, which are particularly useful for providing a comprehensive understanding of the factors underlying a bank's net margins and risk and the quality of bank management.

Finally, in cross-country comparisons, it is necessary to allow for variation in country-level variables, in which we recognize that profitability determinants can vary systematically across countries. These differences are potentially important for countries in transition. Country-specific factors, such as the level of economic development, and overall financial

structure, can have a significant effect on the level of profitability. Hence, we can estimate an equation of the following form for both emerging and advanced economies.

$$\Pi_{it} = \alpha_0 + \alpha_1 MS_{it} + \alpha_2 CRA_{it} + \sum_{j=1}^J \beta_j X_{jit} + \sum_{m=1}^M \gamma_m X_{mit} + \varepsilon_{it} \text{ and } \varepsilon_{it} = \mu_{it} + \nu_{it} \quad (2)$$

where X_j is a vector of bank-specific variables and X_m is a vector of country-specific and overall financial structure factors. Also, ε_{it} is the error term with μ_{it} being the unobserved individual-specific effect and ν_{it} being the normal stochastic disturbance, where $\mu_i \approx IIN(0, \sigma_\mu^2)$ and $\nu_{it} \approx IIN(0, \sigma_\nu^2)$.

3.2. *Determinants and variable selection*

Dependent variables

We measure a bank's returns by its returns on assets and equity. The profitability measures, after-tax return on average assets (ROAA) and after-tax return on average equity (ROAE), which indicate how effectively banks' assets and equity are being managed to generate revenues, are standards in banking literature⁶. For the robustness check, we also employ an alternative measure of returns, which are the net interest margin and the Sharpe ratio. The latter is risk-adjusted returns on equity that is given by the mean value of the returns on equity divided by the standard deviation of the returns on equity. See, e.g. Kosmidou et al. (2005), Pasiouras and Kosmidou (2007), and Demirguc-Kunt and Huizinga (2010) for the use of these variables.

Our main measure of bank risk is the distance to default or Z-score, defined as the standard deviation value that a bank's rate of return on assets has to fall for the bank to become insolvent⁷. It is calculated as mean of return on assets plus capital asset ratio divided by the standard deviation of the returns on asset. A higher Z score indicates that the bank is more stable. An alternative measure of bank stability, the interest coverage ratio (or interest multiplier), is also employed. We measure the interest coverage ratio, computed as profit plus interest expenses divided by interest expenses.

⁶ In order to capture any differences that appear in assets during the fiscal year, averages are employed.

⁷ It is worth mentioning that a more appropriate measure for bank risk would be a non-performing loans ratio, however, due to data limitations, no homogeneous proxy could be constructed for all banks.

Market structure

The first measure of market structure is market share, which is a measure of relative market power, calculated as the bank's share of assets to total bank assets. It is expected that market share and bank profitability has a positive relationship. The concentration ratio, which provides estimates of the extent to which the largest firms contribute to activity in an industry, is taken as the second measure of market structure. Following Demirguc-Kunt et al. (2004), we measure bank-market concentration as the fraction of bank assets held by the four largest banks in a country. The degree of concentration of a market is expected to exert a negative influence on the degree of competition in the market.

We verify the robustness of the results by applying an alternative measure of market concentration, the Herfindahl-Hirschman index (*HHI*). The *HHI* equals the sum of the squared market shares of all the firms in the market, that is, if MS_i represents the market shares by firm i , $HHI = \sum (MS)_i^2$.⁸

Bank-specific variables

In addition to market structure, we include total of eight bank-specific control variables that have been shown to be instrumental in explaining bank profitability. Firstly, we consider interest rate spread (lending rate minus deposit rate). This gauges the extent to which interest earning capacity of an entity exceeds or falls short of its interest cost obligations. We make a priori forecast of the positive influence of this variable on risk and returns.

The second variable considered in the model is a bank size. According to Goddard et al. (2004b), a bank size can affect the profit positively through several channels due to the facts that banks with higher assets benefit from economies of scale and also larger banks may benefit from their market powers generating abnormal profits. We use total assets of the bank as a proxy for the bank size. Generally, the effect of a growing bank size on profitability has

⁸ In general, the *HHI* in a market with N equal-size firms is $\frac{1}{N}$. Because of this property, the reciprocal of *HHI* is referred to as the number-equivalent of firms. There is also a normalised Herfindahl index. Since the Herfindahl index ranges from $1/N$ to one the normalized Herfindahl index (*NHHI*) ranges from 0 to 1. It is computed as $NHHI = \frac{(HHI - \frac{1}{N})}{(1 - \frac{1}{N})}$, where again, N is the number of firms in the market, and *HHI* is the usual Herfindahl Index, as

above. We also compute the statistical variance (v) of the firm as $v = \frac{\sum_{i=1}^N (MS_i - 1/N)^2}{N}$.

been proved to be positive to a certain extent, yet, for banks that become extremely large, this could turn into negative due to bureaucratic and inflexible operations.

Thirdly, following many studies, the ratio of equity to total assets is employed as a measure of capital strength. In principle, all banks in our sample are subject to the Basel II capital adequacy regulations: banks are required to hold at least 8% of capital against their risk weighted assets. Since well-capitalized banks face lower costs of funding and lower needs of external funding, thereby lower risk of bankruptcy, it is expected there will be a negative relationship between the equity to assets ratio and bankruptcy risk and a positive association with profitability (Pasiouras and Kosmidou 2007). Note also that capitalization is important to a bank's operations in that it is the main source to cover loan losses, and also banks with more capital have more capability to develop business and deal with risks. Two positive effects of holding capital in excess of the regulatory minimum can be distinguished. First, when a bank benefits from free capital, it has the possibility of increasing its portfolio of risky assets. Second, when market conditions allow the bank to make additional loans with a beneficial return/risk profile, this will, *ceteris paribus*, increase the interest margin.

Fourthly, the ratio of overheads to total assets is considered to provide information on variation in bank costs over the banking system. A negative correlation between overhead expenses and profitability and stability is expected, provided banks are efficiently operating at lower overheads. Note, however, that Molyneux and Thornton (1992), among others, empirically observe a positive relationship, arguing that high profits earned by firms may be appropriated in the form of higher payroll expenditures paid to more productive human capital. Fifthly, off-balance-sheet activities to total assets ratio is another important variable to include in the model. Casu and Girardone (2005) point out that the European Union banking sector increasingly developed the non-traditional activities during the 1990s, and argue that the empirical study would lead to biased results without the role of off-balance sheet activities.

In addition to the abovementioned variables, the loan growth is also specified to capture the impact of yearly growth of total loans on bank performance. It is based on the argument that the rapid growth during a relatively short period is likely to yield relatively high profits. Finally, we examine the effects of bank age and foreign ownership status on bank risk and returns using dummy variables. Using 7900 bank observations from 80 countries over the period of 1988-1995, Claessens et al. (2001) report that domestic banks in

industrialized countries are more profitable than their counterparts in developing countries, but the opposite is the case for foreign banks, implying that the foreign banks are more profitable in emerging economies (see also Bush, 1997; and Bonin et al., 2005).

Financial structure and macroeconomics

Financial structure and macroeconomic factors are aggregate variables, which are also likely to influence risk and the rate of returns of individual banks. We specify three indicators of the financial structure of individual countries in the model. The first variable is domestic credit provided by the banking system (% of GDP), which includes all credit to various sectors on a gross basis, with the exception of credit to the central government. A high ratio of bank credit to GDP, for instance, may reflect higher risk of default for banks.

The second variable to capture the effect of financial structure on bank performance is the stock market turnover ratio⁹. Since the high ratio reflects more funds that come in and out of banking system and so more demand for bank services, we expect a positive relationship between turnover ratio and bank profitability. Note also that the high ratio indicates the efficiency of stock markets, and since efficient capital market discloses more information about companies, banks can benefit by reducing adverse selection and moral hazard risks, improving their profitability.

The third variable is related to regulation on deposit insurance. The dummy variable takes a value of 1, if there is deposit insurance scheme in place and 0 otherwise. The traditional argument is that more generous deposit insurance weakens the market discipline enforced by depositors, and encourages banks to take greater risk arising moral hazard in banks (For further discussion see Demirguc-Kunt and Detragiache, 2002).

Finally, in order to control the macroeconomic environment in which the banks operate, we include inflation rate and real GDP growth as proxies for business cycle fluctuations. Demirguc-Kunt et al. (2004) have shown that banks in inflationary environments have wider margin and greater returns. According to Bikker and Hu (2002) and Athanasoglou et al. (2008), GDP growth has a positive effect on banks' profitability, possibly due to increases in lending rates with less probability of default rate. However, the level of economic activity also affects the supply of funds, i.e. deposits, and if the elasticity of deposit

⁹ is the total value of shares traded during the period divided by the average market capitalization for the period

supply is small due to a rise in consumption with the GDP growth, the expected sign on the coefficient is negative.

4. Data sources and descriptive analyses

Data sources

The primary source of data on the bank's balance sheets and income statements is the BankScope database.¹⁰ The dataset in this study is supplemented by retrieving the country level data from the World Bank database.

This paper uses several criteria to filter data. Firstly, banks must be active, as indicated by the BankScope by removing banks that were bankruptcy. Secondly, in order to enhance the quality of data and comparability across countries, we selected banks that have total assets of more than a billion USD. Also, these data are only from depository and non-depository institutions involved in providing funds for industry, eliminating central banks and other non-banking financial institutions. Furthermore, any outliers are removed; particularly any values below the 1 percentage point and also above the 99 percentage point in its sample distribution were removed. This helps alleviate the problem arising from extreme outliers that affects estimation.

The above procedure yielded an unbalanced panel data set of 1929 banks, including 308 banks from emerging economies (122 banks in the Eastern Europe and 186 banks in the Middle East) and 1621 banks from Western Europe over the period 1999-2008, consisting of 3080 and 16210 observations, respectively¹¹. The data covers 10 Eastern European, 13 Middle Eastern and 17 Western European countries. The Middle East and the East Europe would appear to be a particularly appropriate choice for a study of market structure in emerging economies. The Middle Eastern banking system is fairly concentrated and, at least until the late 1990s, was tightly regulated and protected from foreign competition. Eastern Europe has recently converged with the European Union and follows the European monetary

¹⁰ The database is produced by the Bureau van Dijk, which includes more than 12,000 banks around the world, accounting for about 90% of total assets in each country.

¹¹ Banks included in the sample were eventually every bank which fell within the top 4500 banks in the world in winter 2010-2011, ranked by total assets. Furthermore, the sample covers approximately 65 % of the total assets for the whole of the EU banking system and 61 % of the total assets in all the Middle East countries.

rules. The Western banking system is also a good benchmark in which banks operate under a relatively highly competitive environment.

Table 1 shows the variables with the expected effect on profitability and stability together with sources of data and countries included in the sample.

[Table 1]

Data descriptive analyses

Table 2 demonstrates the degree of correlation amongst dependent and explanatory variables used in the multivariate regression analysis. The maximum correlation of 0.521 is found between the variables off-balance-sheet activities and equity to total asset. The matrix shows that, in general, the correlation between the explanatory determinants is not strong, suggesting that potential multicollinearity problem is very limit.

[Table 2 and 3]

The comparative study on mean values of the dependent and explanatory variables are shown in Tables 3a, 3b and 3c in terms of regional-wise, country-wise and the types of bank, respectively. Table 3a reports sample means by region, computed for bank-year observations. Comparing the statistics across regions, wider variations are observed in market structure, bank activity, overall financial structure, and macroeconomic variables. This particularly applies to the comparison between emerging banks versus advanced banks, whereas some of the mean values between Eastern Europe and Middle Eastern countries seem to be close to each other. It is remarkable to observe that the returns in emerging market banks is almost three times in ROAA (1.45) and twice in ROAE (13.27) of those in West European banks. The t-statistics for the mean equality for variables are mostly highly significant, confirming the wider degree of variations. Table 3b shows sample means by country-wise for the variables. The highest returns are found in Middle Eastern countries, e.g. Qatar, Saudi Arabia and UAE.

Table 3c compares the means and standard deviations (s.d.) of variables for the emerging and the advanced economies. Banks in emerging economies tend to exhibit higher values of s.d. than those in advanced economies, highlighting a somewhat volatile market, which is intuitively plausible. In terms of comparison between the commercial and non-

commercial banks in the last column, the mean value of the ROAA and ROAE have shown to be larger in the commercial banks, indicating a higher profitability.

[Table 4]

Table 4 ranks countries in descending order of market growth, market structure, and bank profitability and stability indicators. It is evident that Romania (36.44%), Iran (37.65%) and Finland (23.69%) have the highest market growth in the respective regions for the period 1999-2008, whereas Slovakia (11.03%), Israel (6.67%) and Germany (5.35%) have the lowest market growth. In terms of the market structure, Estonia, with a 34.48% market share and Slovakia with a 84.04% 4-firm concentration ratio and Estonia with a 0.32 Herfindahl index, seem to have the most concentrated markets in Eastern Europe. Based on the same criteria, in Qatar at 93.25% and Jordan at 0.25 in the Middle East and Cyprus at 88.69% and Finland at 0.29 in Western Europe, the markets tend to be more concentrated. Estonia and Qatar show the highest values in ROAE, at the same time, they indicate the highest Z-scores, suggesting that both countries enjoy a high profitability with stable banking systems as compared with other banks located in the same regions. Malta seems to follow the same with the highest Z-score amongst other Western European countries, though it comes to the second in ROAA and ROAE.

5. Estimation results

In order to examine cross-section variation, Eq. (2) is estimated through the fixed effects regressions. The fixed model is estimated using the Least Square Dummy Variable (LSDV) procedure, while the random effect model is estimated using the Generalized Least Squares (GLS) procedure. The potential for using the fixed effect, rather than the random effects model, can be tested with the Hausman test. The fixed/random effect approach is supported by the absence of heteroscedasticity based on the Breusch-Pagan test in the residual from our estimated model, indicating that the variance of each model's residuals is equal across banks.

Evaluation of bank returns and market structure

[Table 5]

Table 5 reports the empirical estimations of Eq. (2) for a bank's ROAA in panel A and bank's ROAE in panel B, in which profitability (Π) is regressed on market structure, bank-specific

characteristics, financial structure, and macroeconomic variables for banking systems in both emerging and advanced economies separately. The regressions include bank fixed effects and clustering of the errors at the bank level.

Note that we included the interaction terms to investigate whether interest rate spread, bank age, ownership status, and/or regulation have an independent effect on bank returns or whether their effect is channelled through the market power possessed by banks. However, since the interaction terms are highly collinear with their respective components, we run regressions without the interaction terms in models 1, 3, 5, and 7, and without the relevant individual components but with the interaction terms in models 2, 4, 6, and 8.

The explanatory power of the model is relatively high for banks in emerging economies in Panel A. The F-statistic for all models is significant at the 1% level. These results imply that additional factors may influence the profitability of banks in advanced economies.

For all regressions, the market share coefficients are positive, but statistically significant at the 5% level only for advanced markets. The coefficients of market concentration are not statistically significant for advanced economies, but we find significant negative coefficients for emerging economies. It is evident that in advanced economies market share seems to dominate market concentration, in other words, the relative-market-power (RMP), rather than the traditional structure-conduct-performance (SCP) hypothesis, is supported for advanced banking systems. The failure to support the SCP hypothesis is inconsistent with much of existing literature, which reports a positive and statistically significant market concentration coefficient for developed banking systems. Claeys and Vander Venet (2008), for instance, argue that the SCP hypothesis is adhered to Western European banks. Venet (2002) also obtained the supporting evidence for European banks in the 1990s. Moreover, Maudos and de Guevara (2004) found positive and statistically significant correlation between market concentration and bank interest margins for the period 1993–2000 for European banking systems. In a major survey, Gilbert (1984) reported that of 44 studies on the US banking industry, 32 were found to support the traditional hypothesis of the existence of collusive profits. However, in line with our results, Goldberg and Rai (1996) did not find a positive relationship between market concentration and profitability for a sample of large banks located in 11 European countries for the period 1988–1991. The insignificant relationship found in this paper may, in part, be explained in Corvoisier and Gropp (2002) that higher

market concentration may have resulted in less competitive pricing by banks located in the Euro area for the period 1993–1999.

In the emerging market banking systems, given an insignificant coefficient of market share, market power does not seem to be the key factor in enabling banks to earn a relatively high rate of return. We have a significant, but a negative coefficient of market concentration. Although, it is an unexpected sign, this seems to be consistent with Fig. (1), where the profitability had an upward trend in contrast to the market concentration that had a downward trend. This may indicate that with increasing competition to reduce the market concentration the regulatory authorities lift more constraints on large banks to pursue their business, in particular, policy interest rate.

With respect to bank-specific characteristics, all of the coefficients are significant in either type of with or without interaction term models, except for the off-balance-sheet activities in emerging markets. The main finding is that the variable of interest rate spread is well-determined in the profitability indicators (ROAA and ROAE) with the correct positive sign for both emerging and advanced economies. The magnitude of the coefficients are slightly higher in banks operating in emerging economies, indicating that these banks tend to adjust more interest rates in order to raise profits. Its' interaction with market power enters with a negative coefficient, which implies that lower interest rate spreads raise bank returns, as banks gain more market power in emerging economies. Possibly, this implies that an increasing market share allows banks to lower the spreads, while increasing their profitability. The reverse situation occurs in the case of advanced economies, where the coefficients on the interaction term is positive, indicating that as banks expand their market share, an opportunities to raise the spreads arises to increase their profit.

The assets variable enters with a negative and significant coefficient for emerging economies, but with a positive coefficient for advanced economies. This contrasting result suggests that larger banks have lower rates of return for developing economies but have higher rates of return for advanced economies. The result for emerging economies may reflect the scale inefficiencies in large banks, and explain the negative impact on profitability of the market concentration constituted by four largest banks. These results support the studies that reported either economies of scale and scope for smaller banks, or diseconomies for larger financial institutions, although the theory provides conflicting predictions about optimal bank asset structures.

The relatively high and significant coefficients of equity to total assets and overheads to total assets with the expected positive and negative signs, respectively, demonstrate that capital strength and overhead expenses appear to be the robust determinants of bank profitability. The finding that a high capital adequacy increases ROAA and ROAE is consistent with previous studies (see e.g. Kosmidou, 2007 and Athanasoglou et al., 2008), in support of the argument that well capitalized banks face lower costs of external funding, resulting in the higher profitability.

Furthermore, controlling for all other relevant factors, the coefficient on the off-balance-sheet activities is statistically significant only for the advanced markets banking systems. With a negative sign, it is associated with lower returns. This conflicts with Demircuc-Kunt and Huizinga (2010): using data for 1,334 banks in 101 countries over the 1995-2007 periods, who found that expansion into fee income (non-interest income) increases the rate of return on assets, and it could offer some risk diversification benefits. The insignificant coefficient for emerging markets may reflect too little operation of the off-balance activities in banks to determine its effect.

Market growth, measured as real growth of total loans in the bank's markets, appears to be another important determinant for both economies; the fast-growing banking market tends to have a market environment that is in favour of every bank to gain higher returns. The effect of bank age is highly significant, but the signs are opposite for emerging economies and advanced economies. Older banks in emerging countries are more profitable, compared to their counterparts in advanced economies. It is, however, noteworthy; that when bank age interacts with market share in ROAE, Model 6 and 8 show that older banks have higher returns, irrespective of their economies.

We also find that foreign banks in emerging economies seem to earn greater profits, whereas their counterparts in advanced economies earn fewer profits. Yet, the real impact of bank ownership status on returns still depends on its market power in advanced markets; in Model 8, the variable of the interaction between ownership and market share yields a positive coefficient suggesting that foreign banks with a substantial market power are more profitable. Our finding implies that foreign banks enter to the emerging market do not enhance competition, but new technology and services that helps them increase spread in favour of raising more profits. In contrast, foreign banks does intensify competition in developed markets, which reduce profitability overall.

Turning to financial structure and macroeconomic variables, we again tend to find different results between emerging and advanced economies. While there is a highly significant relationship between domestic credit provided by the banking sector and profitability, the coefficients have the opposite sign of negative and positive. This indicates that in the emerging markets, scarcity of fund supply becomes a key constraint on competition growth. The more funds available on market, the high competition will be, and so to increase competitive pressure on banks to provide competitive services.

Stock market turnover ratio is positively related to bank profitability based on the 5% significance level. Since increasing efficiency in stock markets should contribute to revealing more information, making the process of selection and monitoring of borrowers easier for banks, this should improve a bank's interest margin and profitability. Hence, other things being equal, the complementary relationship is formulated between the development of banking systems and the stock markets.

The variable of regulation is statistically significant only for banks in emerging markets with a negative sign, implying that the regulation through the deposit insurance scheme exert a detrimental impact on returns. The generous deposit regulation in combination with market power also reduces bank profitability for banks located in advanced economies. Furthermore, the effects of inflation and GDP growth on bank profitability are negative and positive respectively for advanced economies; lower rate of inflation and high GDP growth are associated with higher returns in matured banks.

The dummy variables are used for the different types of banks, where all bank types are in comparison with the counterpart of commercial banks, except for Middle East that is compared with Eastern Europe. It is observed that investment banks generate higher returns on assets than do commercial banks, being applicable to both economies. Islamic banks tend to be more profitable than commercial banks when the profitability is gauged by ROAE. Real estate and savings banks in advanced banking systems are less profitable, while the reverse is true in emerging economies. Banking systems operating in Middle East appear to perform better than those in the Eastern Europe.

Evaluation of bank stability and market structure

We consider how a bank's Z-score and interest coverage ratio are related to the market structure and other determinants of bank performance. Table 6 presents the regressions of the

Z-score in panel A and the interest coverage ratio in panel B, for both emerging and advanced markets banking systems. All explanatory variables in both panel regressions are fully analogous to the rate of return regressions in Table 5, except for the fact that one period lag of equity to total assets is specified in order to avoid direct accounting relationship between capital and the Z-score. The estimation is by ordinary least squares (OLS) by taking fixed effect with a clustering of the errors at the bank level.

[Table 6]

Both the Z-score and the interest coverage ratio are positively and significantly related to market share, suggesting that a greater market share increases bank stability. By contrast, the effect of market concentration on the Z-score is significantly negative only in advanced economies, meaning that concentrated markets pose some risk in matured banks.

Given many significant coefficients, it is evident that the variables of the Z-score and the interest coverage ratio are closely related to bank-specific factors. With a positive sign on the coefficient of interest rate spread, banks operating in both types of economies seem to become more stable as the spread widens. Bank size, proxies by the total assets; however, does not appear to improve bank stability. As expected, a high capital ratio is found to contribute to bank stability, being consistent with theory. Higher overheads are positively related to the Z-score, yet negatively related to the interest coverage for both economies. It is interesting to find that the former implies that banks with higher overheads are more stable when the stability is measured by the Z-score. Banks, which focus on generating profits through off-balance-sheet activities, tend to have less risk in both emerging and advanced economies, *albeit* the coefficients in the Z-score are insignificant in emerging banks. Note that in Table 5, we find a negative impact of off-balance-sheet business on the returns in advanced banks, but this new finding in Table 6 indicates that the variable appears to present banks with a trade-off between risk and returns.

The positive sign on the coefficients of the market growth indicates that the variable serves to provide a preferable effect on the banks' stability. The bank age appears to matter in emerging economies, where older banks are more stable compared to younger banks, which is intuitively plausible for the less developed markets. Notably, the bank age effect seems to be channelled through the market share in Model 2. By contrast, given the insignificant coefficients the bank age does not seem to alter the degree of stability in advanced countries' banks. The increasing presence of foreign banks in the economy exerts a positive impact on

bank stability for both economies, which would be strengthened with their increasing market power (see the interaction terms in Model 2, 4, 6 and 7).

In terms of the effect of financial structure, the sign on the significant coefficients is the same as in the case of profitability regressions in Table 5. An increase in releasing domestic credit causes to lower profitability and stability in emerging economies, but the reverse is the case in advanced economies. Again, this is perhaps due to the fact that un-matured banks tend to invest in risky investment projects or release funds to lower quality borrowers with a lack of adequate screening and monitoring systems in place. The stock turnover ratio enters with the positive coefficients, indicating that stock market efficiency is one of the factors for the bank stability. Bank stability is positively associated with the index of bank regulatory power for advanced economies, whereas it is negatively for emerging economies. Given the fact that the negative coefficient is also found for bank profitability in Table 5, the deposit insurance regulation has little contribution for the sound operations in emerging banks. However, note that when it is interacted with market power in Model 2 and 6, at least it will reveal a desirable impact on emerging banks. This could indicate that bank regulations in reducing bank risk depend on market power of banks and perhaps the economic environment, where the banking systems are operated. It manifests itself that ignoring such interactions as the one between regulation and market power leads to erroneous inference about the impact of regulations on bank risk.

The macroeconomics variables seem to significantly impact on the bank risk, which was not found for the returns for emerging banks. The stability improves when the country experience high GDP growth in a deflationary period. Finally, the dummy variables for different types of banks are, in general, insignificant. It appears that there is little difference in terms of bank stability between commercial banks versus other types of banks. The exception is for the Middle East versus Eastern Europe banks. It reveals that the Middle Eastern banking systems are more stable than their counterparts in the Eastern Europe.

Robustness tests

The findings from these regressions remained to some extent robust, *albeit* with minor variation, to a number of alternative ways we ran the regressions. Specifically, we tried i) including normal Herfindahl index (*NHHI*) instead of 4-firm concentration ii) adding more explanatory variables than previous studies, namely, personnel expenses to size, square of bank size, cost to income ratio, and stock market capitalization, iii) decomposing non-

commercial banks to investment, co-operative, savings and Islamic banks, iv) including a one-period lag of explanatory variables, such as a capital adequacy lag, and interest rate spread lag, v) using net interest margin and the Shape ratio instead of ROAA and ROAE, and vi) removing investment, Islamic, and real estate banks one by one from the sample, which may have different objectives amongst themselves. None of these alternative approach yielded significant different results. For brevity, the results are not presented here, but are available from the authors upon request.

Discussion of the key findings

The empirical results found in this section support the view that greater market power leads to higher bank profit rates in advanced economies, however, it cannot explain the high bank returns among emerging markets, at least during the period under consideration, failing to address our key question of why bank profitability indicators in emerging economies are high in relation to market structure. There are some possible reasons we should emphasize based on the data and empirical results in other variables. Firstly, we can argue that as the number of banks in a market increases, the profitability indicators decrease significantly, irrespective of the efficiency of the banking system. High entry barriers and restrictions on foreign banks facilitate market collusion, with the consequence that even markets with low concentration may exhibit collusive behaviour, raising the profits of existing banks. In other words, market competitiveness depends on the number of participants. For example, in Eastern Europe countries such as Poland and the Czech Republic that have a relatively large number of banks in their respective markets, the profitability ratio is low. Similarly, in mature economies, the German banking system has the largest number of banks, while the profitability indicators are the lowest.

Another possible answer would be the high interest rate margins – the spread between bank interest earnings and expenses as a percentage of interest-earning assets – which vary widely across markets, and remain substantially high as compared with those in advanced economies. The average interest rate spread (average lending rate minus deposit rate) among emerging economies is also significantly high: on average, financial institutions in emerging economies have a mean interest rate spread of 6.09 percent, compared to 3.55 percent for advanced economies. The spread is widely regarded as an indicator of the efficiency of financial intermediation. Hence the high interest rate spreads are an impediment to financial intermediation, as they discourage potential savers due to low returns, and increase financing

costs for borrowers, reducing investment and growth opportunities. This is of particular concern for countries in transition, where financial systems are largely bank-based. Our finding of the positive significant coefficient on the interest rate spread in emerging banking systems implies that the price of bank products is not favourable for customers, but for banks, so that banks can earn more profits through increasing interest margin revenues in a non-competitive financial market.

6. Conclusions and policy implications

This paper empirically investigates the effects of market structure, bank-specific characteristics, overall financial structure and macroeconomic environment on profitability and stability of 308 banks in emerging economies and 1621 banks in advanced economies during the period of the ‘fat’ years, 1999-2008 when banks enjoyed very high profits. In particular, we assessed the extent to which the relatively high profitability in emerging banking systems can be attributed to non-competitive market conditions and/or pricing behaviour.

Our results show clearly that there are large differences in profitability among the banks in our sample, and that a significant amount of this variation can be explained by the factors included in our analysis. We find that market share has no significant impact on bank profitability in emerging markets, providing no evidence in support of the RMP hypothesis, whereas we find evidence to support the hypothesis in advanced economy banking systems. More importantly, it is found that market power not only influences bank performance directly, but also indirectly by interacting with other key determinants. Through substantial market power, bank age, bank ownership status and regulation (deposit insurance) are associated with more stable banking system in emerging countries. We also find that market concentration negatively affect profitability in emerging banks. The support of the SCP hypothesis is also failed in this respect. However, given that, being specific to emerging economies, smaller banks are found to earn higher profits, whereas larger banks are found to earn lower profits, our result is not implausible.

The main findings for other determinants of bank performance can be summarized as follows. Both a bank’s rate of return and its stability increase with its interest rate spreads, and are promoted with a high capital ratio. Trade-offs between risk and return are observed in

relation to the off-balance-sheet activities in advanced economies. We also find the scale efficiencies in smaller banks and its inefficiencies among large banks in emerging economies. Finally, bank's profitability and stability appear to move in line with stock market developments.

These findings have several implications for policy makers in emerging economies. Given the small number of banks and high interest rate spread in emerging economies, profits are derived from the fact that higher prices are imposed on borrowers and lenders in a less competitive environment, i.e. the profitability is the product of social inefficiency at a cost to the remainder of the economy. Thus, policy makers should remove unnecessary restrictions and entry barriers in establishing new private banks, and also provide conditions in which foreign banks are encouraged to enter the market. It is noteworthy that mostly the coefficients' magnitude of bank-specific variables is larger in emerging economy banks than those in counterpart. This re-emphasises the important role of policy makers in ensuring that profits are consistent in the face of economic fluctuations. Also, bank managers in emerging economies should undertake the necessary measures to enhance the role of capitalization, and to create efficient cost control and liquidity, in order to further increase bank's profitability and stability.

Another implication of this study is that both banks and regulatory agencies should focus more on how to improve efficiency and less on market share or market concentration. Although, during the period under study, there was a significant decrease in the market concentration of emerging banks (recall Fig. 3), further reduction is still needed. During the period 1999 to 2008, the composition of businesses in banking industries in emerging economies changed radically, but still maintained relatively high concentration ratios compared to the Western countries. Clearly, an important policy implication is that antitrust or regulatory action may indeed be stressed. Changes in banking concentration ratios should occur for a variety of ways, including merger activity, deregulation, globalisation, nationalisation, privatisation, new products and technologies, production efficiency, restructuring and so on. In short, since the SCP hypothesis dominates in the advanced market banking system, antitrust enforcement would be socially beneficial, and since the RMP hypothesis dominates in the emerging market banking systems, policies that penalize or impair mergers would be socially costly.

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Table 1 Variables, units, expected effect, source of data and sample countries

Variables	Units	Expected effect on returns	Expected effect on risk	Source
Profitability Indicators				
Return on average assets before tax (ROAA)	Ratio	--	--	BankScope
Return on average equity before taxes (ROAE)	Ratio	--	--	BankScope
Z-score	Ratio	--	--	BankScope
Interest Coverage Ratio [(profit + interest expenses)/interest expenses]	Ratio	--	--	BankScope
Market Structure				
Market share	Ratio	Positive	Positive	BankScope
4-firm concentration ratio	Ratio	Positive	Positive	BankScope
Bank-specific Characteristics				
Interest rate spread	Percentage	Positive	Positive	BankScope
Size of bank	Logarithm	?	?	BankScope
Equity to total assets	Ratio	Positive	Positive	BankScope
Overheads to total assets	Ratio	Negative	Negative	BankScope
Off-balance-sheet activity to total assets	Ratio	?	?	BankScope
Market growth (total assets)	Ratio	?	?	BankScope
Bank age	Dummy	?	?	BankScope
Ownership	Dummy	?	?	BankScope
Financial Structure				
Domestic credit provided by banking system (% of GDP)	Ratio	?	?	World Bank
Stock market turnover ratio	Ratio	Positive	Positive	World Bank
Regulation	Dummy	?	?	Demircuc-Kunt, Karacaovali and Laeven (2005)
Macroeconomics				
Inflation	Percentage	?	?	World Bank
GDP growth	Percentage	?	?	World Bank
Countries Included				
<i>Emerging economies:</i>				
Eastern Europe: Bulgaria, Czech –Rep, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia				
Middle East: Bahrain, Egypt, Iran, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi, Syria, Turkey, UAE				
<i>Advanced economies:</i>				
Western Europe: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden, UK				

- ROAA is return on average assets, which is defined as profit before tax as a percentage of total assets of a bank.
- ROAE is return on average equity, which is defined as profit before tax as a percentage of equity of a bank.
- Z-score is defined as [(ROAA+CAR)/SROAA], where ROAA is return on average assets, CAR represents capital assets ratio, and SROAA stands for standard deviation of return on assets.
- Interest coverage ratio (or interest multiplier) is defined as profit plus interest expenses divided by interest expenses.
- Market share is the share of a bank's assets to total assets in the market. 4-firm market concentration is the share of 4 largest bank assets to total assets in the market. Interest rate spread is the difference between lending and deposit rates.
- Log (total assets) is the natural logarithm of total assets in US dollars. Equity to total asset is the capital to asset ratio, which is defined as equity as a percentage of total assets.
- Overheads is defined as total overhead costs as a share of total assets.
- Off-balance-sheet activities are assets or debts that do not appear on a company's balance sheet as a percentage of total assets.
- Market growth is the inflation-adjusted growth rate of bank total loans.
- Bank age is the established year of a bank.
- Domestic credit is domestic credit provided by banking sector as a percentage of GDP.
- Stock market turnover ratio is the total value of shares traded during the period divided by the average market capitalization for the period. It is a measure of stock market efficiency.
- Financial Regulation measures deposit insurance from Demircuc-Kunt and Detragiache (2002) that takes a value of 1 if the country has an explicit deposit insurance scheme and 0 otherwise.
- Inflation is the inflation rate based on consumer prices. GDP growth is the inflation-adjusted growth rate of gross domestic product of the country.

Table 2 Correlation matrix for variables

Correlation Probability	ROAA	ROAE	Z-score	Interest Cov. Ratio	Market share	4_firm concentration	Interest rate spread	Log(total assets)	Equity to total assets	Overheads to total assets	Off-balance-sheet activity to total assets	Market growth (loans)	Bank age	Foreign banks	Domestic credit	Stock market turnover ratio	Regulation	Inflation	
ROAE	0.816***																		
Z-score	0.416***	0.303***																	
Interest Cov. Ratio	0.725***	0.731***	0.328***																
Market share	0.283***	0.244***	0.215***	0.298***															
4_firm concentration	0.343***	0.209***	0.342***	0.326***	0.274***														
Interest rate spread	0.117***	0.090***	-0.015	-0.095***	-0.008	-0.014													
Log(total assets)	0.110***	0.105***	0.049***	0.338***	0.235***	0.071***	-0.261***												
Equity to total assets	0.645***	0.234***	0.271***	0.373***	0.073***	0.309***	0.086***	0.033*											
Overheads to total assets	0.132***	-0.043**	0.025	-0.347***	-0.141***	-0.048***	0.446***	-0.526***	0.302***										
Off-balance-sheet activities	0.538***	0.291***	0.380***	0.378***	0.147***	0.362***	-0.060***	0.116***	0.521***	0.093***									
Growth of total loans	0.335***	0.302***	0.264***	0.351***	0.160***	0.236***	-0.122***	0.165***	0.186***	-0.112***	0.299***								
Bank age	0.057***	0.027	0.067***	0.092***	0.035*	0.144***	-0.118***	0.265***	0.044**	-0.082***	0.077***	0.051***							
Foreign banks	0.059***	0.105***	0.029	0.185***	0.204***	0.039**	-0.145***	0.345***	-0.106***	-0.235***	0.039**	0.092***	0.111***						
Domestic credit	-0.109***	-0.023	0.092***	0.027	-0.203***	-0.072***	-0.065***	-0.081***	-0.166***	-0.067***	-0.019	0.083***	0.058***	0.010					
Stock market turnover ratio	0.028	0.002	0.034*	0.090***	0.005	0.026	-0.003	0.302***	0.060***	-0.168***	0.038**	0.016	0.072***	0.079***	-0.019				
Regulation	-0.053***	-0.043**	-0.048***	-0.090***	-0.390***	-0.111***	-0.036*	-0.042**	-0.023	0.044**	-0.002	-0.055***	0.014	0.005	0.062***	0.007			
Inflation	0.261***	0.130***	-0.114***	0.274***	0.138***	0.351***	-0.077***	0.328***	0.269***	-0.123***	0.211***	0.170***	0.105***	0.135***	-0.137***	0.210***	-0.057***		
GDP growth	0.212***	0.205***	0.304***	0.232***	0.117***	0.335***	-0.013	0.083***	0.118***	-0.075***	0.168***	0.199***	0.011	0.076***	-0.065***	0.041**	0.029	0.157***	

This table shows the correlations between the main variables.
 *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table3a Descriptive statistics and tests of means of dataset – by region averages over 1999-2008

	ROAA	ROAE	Z-score	Interest Coverage Ratio	Market share	4 Firms concentration	Interest rate spread	Log(size)	Equity to total assets	Overhead s to size	Off-balance-sheet activities	Market growth (loans)	Domestic Credit	Stock Turnover Ratio	Regulation	Inflation	GDP growth
Eastern European banks																	
Mean	1.29	13.13	1.64	82.31	11.20	77.79	6.22	14.54	0.09	0.03	0.18	21.75	51.16	104.71	1.0	4.42	4.60
No. of observation	880	823	880	734	893	1076	754	892	861	856	687	626	1017	1139	1220	1032	1178
Middle Eastern banks																	
Mean	1.55	13.36	2.13	123.42	8.66	74.40	5.96	15.09	0.10	0.02	0.27	14.88	77.54	49.44	0.39	3.08	4.91
No. of observation	1350	1305	1350	678	1690	1792	1056	1448	1241	1424	1302	1118	1662	1536	1860	865	1226
Total Emerging market banks																	
Mean	1.45	13.27	1.94	102.05	9.63	75.67	6.22	14.88	0.09	0.02	0.24	17.35	67.53	72.97	0.63	3.81	4.76
No. of observation	2230	2128	2230	1412	2336	2868	1813	2340	2102	2260	1989	1744	2679	2675	3080	1897	2404
West European banks																	
Mean	0.43	6.65	1.03	53.49	1.32	51.64	3.55	15.07	0.06	0.02	0.10	6.74	129.88	105.47	0.99	2.10	2.13
No. of observation	11540	11251	11540	10061	11648	14133	10397	11502	11427	11440	9998	9530	15762	15344	16210	16206	16070
Tests of means (t-statistics)																	
Western vs. Eastern Europe	-36.59***	-27.32***	-25.95***	-12.16***	-45.35***	-56.78***	-17.72***	11.35***	-28.03***	-31.11***	-16.96***	-32.88***	108.01***	0.50	-3.49***	-69.98***	-48.23***
Western vs. Middle East Europe	-53.22***	-34.52***	-51.69***	-27.81***	-42.28***	-62.36***	-11.99***	-0.51	-39.00***	-3.90***	-42.56***	-22.97***	79.66***	40.28***	133.75***	-27.30***	-54.62***
Eastern Europe vs. Middle East	-4.81***	-0.61	-10.43***	-10.12***	4.89***	6.83***	16.36***	-9.48***	-3.78***	18.83***	9.53***	9.34***	-19.22***	28.88***	43.44***	11.56***	-3.35***
Advanced vs. Emerging economies	-57.48***	-41.45***	-3.35***	-26.70***	-52.69***	-81.26***	-10.78***	6.20***	-45.27***	-20.31***	-41.44***	-35.31***	117.26***	29.41***	85.33***	-50.85***	-68.62***

This table shows summary statistics of the main variables in different economies. It also reports the tests of means.

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

Table3b Descriptive statistics of dataset by country averages over 1999–2008

Country	No. of Banks	Bank Performance				Bank Concentration		Bank-specific Variables					Financial Structure			Macroeconomics		
		ROAA	ROAE	Z-score	Interest Cov. Ratio	Market Share	4 Firms Concentration	Interest Spread	Log(size)	Equity to Total Assets	Overheads to Total Assets	Off-balance-sheet activities	Market Growth (Loans)	Domestic Credit	Stock Turnover Ratio	Regulation	Inflation	GDP Growth
East European Countries																		
Bulgaria	11	1.87	15.63	1.97	113.65	11.63	80.08	6.49	13.53	0.12	0.04	0.127	27.99	49.38	63.09	1.00	5.62	5.31
Czech-Rep	20	1.00	13.02	1.40	85.47	6.49	80.80	4.77	14.84	0.07	0.02	0.178	17.81	48.83	63.53	1.00	2.91	3.91
Estonia	3	1.61	16.78	3.77	127.87	34.48	-	5.21	14.79	0.09	0.03	0.176	24.23	60.49	82.51	1.00	4.01	7.39
Hungary	14	1.16	13.59	1.59	70.89	9.52	74.27	4.41	15.09	0.08	0.03	0.330	23.09	60.92	107.64	1.00	6.35	3.59
Latvia	8	1.57	15.11	2.12	113.47	16.39	83.01	6.27	13.92	0.09	0.03	0.116	27.80	67.83	99.37	1.00	3.98	7.22
Lithuania	4	1.00	11.65	2.72	62.63	25.64	-	6.66	13.94	1.00	0.03	0.118	26.74	49.39	70.14	1.00	2.09	5.71
Poland	25	1.33	12.91	1.42	75.36	7.63	70.65	7.23	15.03	0.09	0.03	0.170	20.96	40.69	114.18	1.00	3.22	4.20
Romania	13	1.65	11.66	1.68	77.62	10.20	82.13	10.36	14.24	0.12	0.04	0.171	26.43	38.31	87.53	1.00	7.06	5.09
Slovakia	11	0.95	13.80	1.45	62.08	11.90	84.04	6.07	14.65	0.08	0.03	0.183	14.21	51.50	92.66	1.00	5.16	4.54
Slovenia	13	1.09	10.59	1.25	77.63	9.43	74.09	4.69	14.44	0.09	0.03	0.235	21.39	58.37	92.41	1.00	5.43	4.43
Middle Eastern Countries																		
Bahrain	15	1.63	14.52	1.92	179.37	8.47	82.75	6.83	15.06	0.11	0.02	0.169	15.46	60.27	29.82	1.00	1.81	5.99
Egypt	24	0.86	9.37	0.83	39.67	4.52	66.29	7.75	14.53	0.08	0.02	0.178	9.35	99.94	131.30	0.00	4.64	4.88
Iran	15	1.57	13.79	1.27	122.05	8.77	77.68	8.73	15.20	0.07	0.02	0.315	25.46	47.33	55.27	0.00	-	5.78
Israel	11	0.47	8.37	2.15	50.70	9.52	85.17	5.13	16.04	0.05	0.02	0.310	6.26	80.28	31.76	0.00	2.19	3.79
Jordan	9	1.22	11.34	2.09	116.73	11.11	91.56	6.36	14.88	0.10	0.02	0.274	12.88	97.29	35.88	0.00	2.78	6.02
Kuwait	14	2.28	16.12	3.47	159.23	11.11	80.00	7.42	15.43	0.12	0.02	0.181	16.82	78.03	26.48	0.00	2.51	2.62
Lebanon	18	0.83	12.55	2.71	120.29	7.41	59.35	5.93	14.91	0.07	0.01	0.078	11.02	180.57	27.65	1.00	-	-
Oman	8	2.24	14.90	3.38	164.04	14.08	83.52	4.47	14.21	0.13	0.02	0.346	13.76	39.02	18.59	1.00	1.55	3.72
Qatar	7	2.38	19.51	4.20	163.42	16.95	93.25	6.97	14.86	0.13	0.01	0.411	18.97	41.48	29.64	0.00	3.35	5.60
Saudi Arabia	11	2.33	18.61	3.57	179.10	10.10	66.00	4.08	16.38	0.11	0.02	0.231	15.73	58.15	23.31	0.00	2.58	3.42
Syria	5	0.38	7.51	0.16	159.17	20.83	99.38	7.09	14.50	0.07	0.01	0.350	20.52	33.98	38.07	0.00	4.04	3.89
Turkey	23	1.79	16.16	1.29	92.85	8.69	79.48	3.23	15.66	0.11	0.04	0.352	27.39	45.94	106.51	1.00	8.78	6.05
UAE	26	2.43	14.49	2.39	176.04	4.95	61.97	3.55	14.76	0.14	0.02	0.461	18.72	51.13	29.28	0.00	-	-
West European Countries																		
Austria	78	0.42	7.92	0.99	72.97	1.79	65.82	2.57	15.00	0.05	0.01	0.096	8.74	124.52	100.69	1.00	2.00	21.87
Belgium	35	0.57	7.96	0.74	69.40	4.33	65.90	3.22	15.04	0.06	0.01	0.148	10.62	114.79	111.99	1.00	2.23	2.21
Cyprus	8	0.63	7.08	1.34	76.36	13.70	88.69	3.32	15.13	0.06	0.01	0.115	15.31	-	97.64	1.00	2.91	3.82
Denmark	42	1.01	9.52	1.42	97.64	3.61	82.19	3.03	14.91	0.10	0.02	0.268	16.70	148.88	86.79	1.00	2.22	1.69
Finland	8	0.60	7.91	0.94	89.40	14.71	-	3.36	16.53	0.07	0.01	0.162	12.72	70.65	100.27	1.00	1.87	3.16
France	217	0.60	8.68	0.93	71.67	0.72	41.62	3.73	15.42	0.07	0.02	0.153	9.76	109.77	114.01	1.00	1.78	2.20
Germany	627	0.23	4.45	0.92	29.81	0.17	45.22	3.52	14.65	0.05	0.02	0.059	3.32	141.36	99.06	1.00	1.62	6.03
Greece	16	0.42	6.62	0.13	48.19	8.64	73.18	3.49	16.03	0.08	0.03	0.164	23.52	98.14	93.05	1.00	3.30	3.92
Ireland	37	0.47	9.60	1.25	141.43	5.49	71.58	3.11	16.58	0.05	0.00	0.129	10.59	141.36	99.06	1.00	3.77	6.03
Italy	168	0.72	8.65	1.21	73.46	0.97	54.75	3.46	15.69	0.08	0.02	0.112	12.97	107.36	88.06	1.00	2.36	1.23
Luxembourg	64	0.58	11.84	1.09	132.79	2.04	39.23	7.93	15.32	0.05	0.01	0.183	8.11	125.17	105.36	1.00	2.40	4.12
Malta	6	0.99	11.77	6.66	146.96	28.57	88.54	4.08	14.96	0.08	0.01	0.151	4.23	134.39	115.42	1.00	2.50	2.44
Netherlands	33	0.69	9.78	1.29	104.74	5.52	79.37	2.99	15.58	0.06	0.01	0.128	13.35	164.03	101.76	1.00	2.22	2.42
Portugal	24	0.71	11.07	1.00	77.60	5.88	-	4.94	15.74	0.07	0.02	0.258	13.58	148.85	103.53	1.00	2.91	2.03
Spain	109	0.76	9.73	1.41	108.07	1.99	59.50	2.10	16.03	0.07	0.01	0.205	17.40	141.11	122.72	1.00	3.22	3.77
Sweden	22	0.81	10.42	1.26	97.05	6.80	82.80	1.95	15.74	0.07	0.02	0.199	12.92	108.22	97.15	1.00	1.60	2.95
UK	127	0.57	8.13	0.81	84.56	1.25	60.35	3.47	15.73	0.06	0.02	0.154	9.95	152.35	109.82	1.00	2.81	2.60

This table shows summary statistics of the main variables in different countries.
 *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table 3c Descriptive statistics of dataset by bank types and region averages

Variable	Banks in Emerging Economies (No. of Obs. 3080)				Banks in Advanced Economies (No. of Obs. 16210)				Total Banks (No. of Obs. 19290)			
	Commercial Banks (No. of Obs. 2460)		Non-commercial Banks (No. of Obs. 620)		Commercial Banks (No. of Obs. 6350)		Non-commercial Banks (No. of Obs. 9860)		Commercial Banks (No. of Obs. 8810)		Non-commercial Banks (No. of Obs. 10480)	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Bank Performance												
ROAA	1.43	1.25	1.52	1.37	0.60	0.87	0.34	0.42	0.87	1.08	0.39	0.56
ROAE	13.38	8.17	12.78	8.78	9.16	8.62	5.43	4.57	10.52	8.71	5.78	5.10
Z-score	1.91	1.28	2.06	1.32	1.09	1.19	0.99	0.29	1.32	1.27	1.06	0.49
Interest Cov.Ratio	99.17	77.94	119.74	83.10	77.82	81.30	43.26	47.57	84.00	80.91	45.34	50.43
Banking Concentration												
Market share	10.33	12.89	6.46	8.01	2.78	7.83	0.58	3.06	5.25	10.40	0.89	3.73
4 Firms Concentra.	75.55	13.13	76.09	12.36	55.53	17.22	49.36	12.49	61.59	18.53	51.05	14.08
Bank-Specific Variables												
Interest rate spread	7.94	5.17	4.24	8.73	4.50	5.85	2.60	2.49	6.22	5.64	3.42	2.94
Log(size)	14.92	1.42	14.70	1.35	15.37	1.61	14.93	1.20	15.22	1.56	14.92	1.21
Equity to total assets	0.09	0.04	0.10	0.05	0.06	0.04	0.06	0.03	0.07	0.04	0.06	0.03
Overheads to size	0.02	0.01	0.03	0.02	0.02	0.01	0.02	0.01	0.02	0.01	0.02	0.01
Off-balance-sheet activities	0.245	0.190	0.210	0.222	0.161	0.169	0.076	0.080	0.191	0.180	0.082	0.096
Market growth (loans)	16.92	15.15	19.65	14.68	10.82	13.78	5.15	8.81	13.00	14.58	5.70	9.51
Financial Structure												
Domestic Credit	69.32	39.60	60.24	20.15	127.6	28.26	131.3	18.79	112.35	40.69	127.64	24.56
Stock Turnover Ratio	75.41	55.99	62.89	55.22	100.08	47.59	109.02	54.65	93.63	51.08	106.57	55.65
Regulation	0.63	0.48	0.63	0.48	1.00	0.00	1.00	0.00	0.93	0.25	0.93	0.25
Macroeconomics												
Inflation	3.81	2.59	3.81	2.59	2.10	0.87	2.10	0.87	2.28	1.28	2.28	1.28
GDP Growth	4.75	2.34	4.81	2.32	2.47	1.87	1.90	1.45	3.01	2.21	2.03	1.62

This table reports summary statistics of the main variables in different economies for different bank types.

*, **, *** denote significance at 10%, 5%, and 1%, respectively. Emerging economies included East European and Middle Eastern countries. Advanced economies included West European countries.

Table4 Mean values and ranks of market structure and bank performance for emerging and advanced countries over 1999–2008

Rank	Market Growth – Total Assets (%)	Market Share (%)	4-Firm Concentration (%)	Normal Herfindahl Index	ROAA	ROAE	Z-score	Interest Coverage Ratio
Rank of Eastern Europe								
1	Romania (36.44)	Estonia (34.48)	Slovakia (84.04)	Estonia (0.32)	Bulgaria (1.87)	Estonia (16.79)	Estonia (3.77)	Bulgaria (127.67)
2	Latvia (33.26)	Lithuania (25.64)	Latvia (83.01)	Lithuania (0.23)	Romania (1.65)	Bulgaria (15.63)	Czech–Rep (113.65)	Czech–Rep (113.65)
3	Bulgaria (30.48)	Latvia (16.39)	Romania (82.13)	Romania (0.18)	Estonia (1.61)	Latvia (15.11)	Latvia (2.12)	Estonia (113.47)
4	Lithuania (28.59)	Slovakia (11.90)	Czech (80.80)	Poland (0.17)	Latvia (1.57)	Slovakia (13.80)	Bulgaria (1.97)	Hungary (85.47)
5	Estonia (27.84)	Bulgaria (11.63)	Bulgaria (80.08)	Slovenia (0.17)	Poland (1.33)	Hungary (13.59)	Romania (1.68)	Latvia (77.63)
6	Poland (22.18)	Romania (10.20)	Hungary (74.27)	Czech (0.15)	Hungary (1.16)	Czech (13.02)	Hungary (1.59)	Lithuania (77.62)
7	Hungary (21.38)	Hungary (9.52)	Slovenia (74.09)	Slovakia (0.14)	Slovenia (1.09)	Poland (12.91)	Slovakia (1.45)	Poland (75.36)
8	Slovakia (20.19)	Slovenia (9.43)	Poland (70.65)	Hungary (0.13)	Czech (1.00)	Romania (11.66)	Poland (1.42)	Romania (70.89)
9	Czech (18.4)	Poland (7.63)	-	Latvia (0.13)	Lithuania (1.00)	Lithuania (11.65)	Czech (1.40)	Slovakia (62.63)
10	Slovakia (11.02)	Czech (6.49)	-	Bulgaria(0.12)	Slovakia (0.95)	Slovakia (10.59)	Slovenia (1.25)	Slovenia (62.08)
Rank of Middle East								
1	Iran (37.65)	Syria (20.83)	Qatar (93.25)	Jordan (0.25)	UAE (2.43)	Qatar (19.51)	Qatar (4.20)	Bahrain (179.57)
2	Qatar (28.26)	Qatar (16.95)	Jordan (91.56)	Qatar (0.23)	Qatar (2.38)	Saudi (18.61)	Saudi (3.57)	Saudi (179.10)
3	UAE (25.25)	Oman (14.08)	Israel (85.17)	Turkey (0.21)	Saudi (2.33)	Turkey (16.16)	Kuwait (3.47)	UAE (176.04)
4	Syria (24.76)	Jordan (11.11)	Oman (83.52)	Bahrain (0.16)	Kuwait (2.28)	Kuwait (16.12)	Oman (3.38)	Oman (164.04)
5	Bahrain (23.82)	Kuwait (11.11)	Bahrain (82.75)	Kuwait (0.15)	Oman (2.24)	Oman (14.90)	Lebanon (2.71)	Qatar (163.42)
6	Turkey (21.28)	Saudi (10.10)	Kuwait (80.00)	Iran (0.14)	Turkey (1.79)	Bahrain (14.52)	UAE (2.39)	Kuwait (159.23)
7	Kuwait (17.71)	Israel (9.52)	Turkey (79.48)	Israel (0.13)	Bahrain (1.63)	UAE (14.49)	Israel (2.15)	Syria (159.17)
8	Oman (16.68)	Iran (8.77)	Iran (77.68)	Oman (0.12)	Iran (1.57)	Iran (13.79)	Jordan (2.09)	Iran (122.05)
9	Egypt (15.16)	Turkey (8.69)	Egypt (66.29)	Jordan (0.1)	Jordan (1.22)	Lebanon (12.55)	Bahrain (1.92)	Lebanon (120.29)
10	Saudi (15.06)	Bahrain (8.47)	Saudi (66.00)	UAE (0.08)	Egypt (0.86)	Jordan (11.34)	Turkey (1.29)	Jordan (116.73)
11	Jordan (12.35)	Lebanon (7.41)	Lebanon (61.97)	Lebanon (0.06)	Lebanon (0.83)	Egypt (9.37)	Iran (1.27)	Turkey (92.85)
12	Lebanon (11.77)	UAE (4.95)	Lebanon (59.35)	Saudi (0.05)	Israel (0.47)	Israel (8.37)	Egypt (0.83)	Israel (50.70)
13	Israel (6.67)	Egypt (4.52)	-	-	Syria (0.38)	Syria (7.51)	Syria (0.16)	Egypt (39.67)
Rank of Western Europe								
1	Finland (23.69)	Malta (28.57)	Cyprus (88.69)	Finland (0.29)	Denmark (1.01)	Luxembourg (11.84)	Malta (6.66)	Malta (146.96)
2	Greece (20.62)	Finland (14.71)	Malta (88.54)	Denmark (0.21)	Malta (0.99)	Malta (11.79)	Denmark (1.42)	Ireland (141.43)
3	Cyprus (19.59)	Cyprus (13.70)	Sweden (82.50)	Cyprus (0.18)	Sweden (0.81)	Portugal (11.07)	Spain (1.41)	Luxembourg (132.79)
4	Denmark (17.74)	Greece (8.64)	Denmark (82.19)	Netherlands (0.16)	Spain (0.76)	Sweden (10.42)	Cyprus (1.34)	Spain (108.07)
5	Spain (16.67)	Sweden (6.8)	Netherlands (79.37)	Belgium (0.14)	Italy (0.72)	Netherlands (9.78)	Netherlands (1.29)	Netherlands (104.74)
6	Sweden (14.83)	Portugal (5.88)	Greece (73.18)	Ireland (0.13)	Portugal (0.71)	Spain (9.73)	Sweden (1.26)	Denmark (97.64)
7	Netherlands (14.76)	Netherlands (5.52)	Ireland (71.58)	Malta (0.13)	Netherlands (0.69)	Ireland (9.60)	Ireland (1.25)	Sweden (97.05)
8	Portugal (13.91)	Ireland (5.49)	Belgium (65.90)	Austria (0.12)	Cyprus (0.63)	Denmark (9.52)	Italy (1.21)	Finland (89.40)
9	UK (13.63)	Belgium (4.33)	Austria (65.82)	France (0.08)	Finland (0.60)	France (8.68)	Luxembourg (1.09)	UK (84.56)
10	Ireland (13.56)	Denmark (3.61)	UK (60.35)	Sweden (0.08)	France (0.60)	Italy (8.65)	Portugal (1.00)	Portugal (77.60)
11	Malta (13.37)	Luxembourg (2.04)	Spain (59.50)	Germany (0.07)	Luxembourg (0.58)	UK (8.13)	Austria (0.99)	Cyprus (76.36)
12	Italy (13.01)	Italy (1.99)	Italy (54.75)	Italy (0.05)	Belgium (0.57)	Belgium (7.96)	Finland (0.94)	Italy (73.46)
13	Austria (11.32)	Austria (1.79)	Germany (45.22)	Spain (0.05)	UK (0.57)	Austria (7.92)	France (0.93)	Austria (72.97)
14	France (10.09)	UK (1.25)	France (41.62)	Luxembourg (0.04)	Ireland (0.47)	Finland (7.91)	Germany (0.92)	France (71.67)
15	Luxembourg (10.08)	Italy (0.97)	Luxembourg (39.23)	UK (0.03)	Austria (0.42)	Cyprus (7.08)	UK (0.81)	Belgium (69.40)
16	Belgium (7.85)	France (0.72)	-	Greece (0.01)	Greece (0.42)	Greece (6.82)	Belgium (0.74)	Greece (48.19)
17	Germany (5.35)	Germany (0.17)	-	-	Germany (0.23)	Germany (4.45)	Greece (0.13)	Germany (29.81)

- Not available; Ratios are calculated for each bank in each country and then averaged over the country's sample period.

- Market growth is the inflation-adjusted growth rate of bank assets.
- Market share is the share of a bank's assets to total assets in the national market. 4-firm market concentration is the fraction of assets held by the four largest banks in each country.
- ROAA is return on average assets, which is defined as profit before tax as a percentage of total assets of a bank.
- Normal Herfindahl index is a concentration ratio measured as sum of square of market share.
- ROAE is return on average equity, which is defined as profit before tax as a percentage of equity a bank.
- Z-score is defined as [(ROAA+CAR)/SROAA], where ROAA is return on average assets, CAR represents capital assets ratio, and SROAA stands for standard deviation of return on assets. Interest coverage is defined as profit plus interest expenses divided by interest expenses.

Source: Authors' calculations based on data from the BankScope database of the IBCA.

Table 5 Determinants of the returns (ROAA and ROAE): emerging economies vs. advanced economies

Variable	Panel A: ROAA				Panel B: ROAE			
	Banks in emerging economies		Banks in advanced economies		Banks in emerging economies		Banks in advanced economies	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure								
Market share	0.0068 (0.37)		0.0148** (2.04)		0.1253 (0.74)		0.2059** (2.23)	
4-firms concentration	-0.0293*** (-3.51)	-0.0293*** (-3.30)	0.0010 (1.23)	0.0005 (0.54)	-0.1417* (-1.81)	-0.1453* (-1.76)	0.0083 (0.76)	0.0017 (0.15)
Bank-Specific Variables								
Interest rate spread	0.0979*** (5.89)		0.0660*** (14.77)		0.7639*** (4.72)		0.5049*** (7.75)	
Log(total assets) (t-1)	-0.3488* (-1.87)	-0.2326 (-1.44)	0.2309*** (8.04)	0.0438** (2.17)	-6.0079*** (-3.42)	-3.7804** (-2.51)	1.5681*** (4.19)	0.3084 (1.23)
Equity to total assets	1.0125*** (4.86)	1.2702*** (6.22)	0.7297*** (19.15)	0.6809*** (17.60)	3.3359 (1.64)	6.6954*** (3.42)	3.6481*** (6.94)	3.0023*** (5.87)
Overheads to total assets(t-1)	-0.4604* (-1.85)	-0.3590 (-1.33)	-0.2234*** (-5.43)	-0.2411*** (-5.68)	-4.8612** (-2.00)	-3.0891 (-1.18)	-0.9763* (-1.80)	-0.8309 (-1.53)
Off-balance-sheet activities to total assets	0.0894 (0.27)	0.3716 (1.07)	-0.3100** (-2.52)	-0.6359*** (-5.01)	0.5945 (0.19)	3.1297 (0.97)	-7.6776*** (-4.76)	-9.4448*** (-5.85)
Loan growth	0.0068** (2.49)	0.0061** (2.06)	0.0020*** (3.20)	0.0013** (2.05)	0.0506* (1.90)	0.0455 (1.59)	0.0132* (1.68)	0.0095 (1.19)
Bank age	0.0624** (2.33)		-0.0411*** (-9.01)		0.8101*** (3.22)		-0.2769*** (-4.65)	
Ownership (foreign banks)	0.0479*** (3.23)		-0.1521*** (-3.95)		0.0485** (2.04)		-0.1286*** (-4.37)	
Overall Financial Structure								
Domestic credit provide by banking	-0.0136*** (-4.53)	-0.0125*** (-3.71)	0.0011** (1.97)	0.0023*** (4.12)	-0.0942*** (-3.23)	-0.0879*** (-2.72)	0.0445*** (5.98)	0.0516*** (7.13)
Stock turnover ratio	0.0024 (1.35)	0.0041** (2.30)	0.0006** (2.24)	-0.0004* (-1.68)	0.0344** (2.08)	0.0559*** (3.41)	0.0007 (0.20)	-0.0054* (-1.72)
Regulation	-0.2611* (-1.81)		0.1414 (0.77)		-0.3015 (-1.43)		0.1211 1.76	
Macroeconomics								
Inflation	0.0007 (0.04)	0.0178 (1.03)	-0.0459*** (-3.72)	-0.0668*** (-5.25)	0.0055 (0.04)	0.1948 (1.21)	-0.6123*** (-3.89)	-0.7473*** (-4.79)
GDP growth	0.0042 (0.31)	0.0076 (0.52)	0.0139*** (3.33)	0.0188*** (4.34)	0.1463 (1.13)	0.1727 (1.25)	0.3068*** (5.75)	0.3290*** (6.14)
Vector Products								
Market share* Interest rate spread		-0.0012*** (-3.95)		0.0137*** (6.51)		-0.0008* (-1.72)		0.1288*** (4.58)
Market share*bank age		0.0007 (1.20)		0.0000 (0.34)		0.0095* (1.78)		0.0027* (1.71)
Market share*ownership		-0.0305 (-0.99)		-0.0007 (-0.033)		-0.0278 (-0.10)		0.5693** (2.22)
Market share*regulation		0.0069 (0.25)		-0.0211 (-1.49)		0.0294 (0.11)		-0.4978*** (-2.79)
Bank Type and Regional Dummies								
Dummy investment	1.0429** (2.45)	1.0365** (2.22)	0.3089*** (3.26)	0.3236*** (3.33)	1.9427 (0.42)	0.0101 (0.00)	0.6610 (0.53)	0.9938 (0.79)
Dummy Islamic	0.3631 (1.30)	0.2638 (0.86)			3.8242* (1.73)	3.2373 (1.35)		
Dummy real estate	1.2973* (1.72)	0.5860 (0.73)	-0.0855 (-1.58)	-0.1506*** (-2.74)	9.4551 (1.52)	4.5504 (0.69)	-3.0842*** (-4.52)	-3.4622*** (-5.06)
Dummy savings	1.2929** (2.21)	1.1935* (1.85)	-0.2048*** (-6.56)	-0.2600*** (-8.22)	11.0146*** (2.20)	10.4600*** (1.91)	-3.8423*** (-9.72)	-4.1703*** (-10.55)
Dummy cooperative	-0.7500 (-1.41)	-0.8482 (-1.45)	-0.1532*** (-4.77)	-0.2264*** (-7.06)	-4.5876 (-0.99)	-5.1311 (-1.02)	-2.9335*** (-7.23)	-3.4655*** (-8.66)
Dummy Middle East	0.2815* (1.87)	0.3079* (1.78)			1.2535 (0.94)	1.3655 (0.91)		
AR(1)	p=0.0589 (t-value=0.88)	p=0.0419 (t-value=0.64)	p=0.0262 (t-value=-1.20)	p=0.0023 (t-value=0.10)	p=0.0664 (t-value=-0.94)	p=0.3722** (t-value=-5.37)	p=0.0084 (t-value=0.41)	p=0.0093 (t-value=0.46)
Correlated Random Effects - Hausman test	$\chi^2 = 67.70^{***}$	$\chi^2 = 51.21^{***}$	$\chi^2 = 213.89^{***}$	$\chi^2 = 123.10^{***}$	$\chi^2 = 58.83^{***}$	$\chi^2 = 48.46^{***}$	$\chi^2 = 18.19^{***}$	$\chi^2 = 183.59^{***}$
Redundant Fixed Effects - Likelihood Ratio	$\chi^2 = 475.24^{***}$	$\chi^2 = 464.95^{***}$	$\chi^2 = 3350.63^{***}$	$\chi^2 = 3346.10^{***}$	$\chi^2 = 431.46^{***}$	$\chi^2 = 423.98^{***}$	$\chi^2 = 3312.15^{***}$	$\chi^2 = 3449.72^{***}$
F-statistic	15.38	12.94	13.20	11.87	7.34	6.24	9.71	9.55
R ² -adjusted	0.83	0.81	0.72	0.69	0.69	0.65	0.65	0.64
Standard error of regression	0.43	0.46	0.26	0.27	3.99	4.25	3.28	3.30
No. of countries	23	23	17	17	23	23	17	17
No. of banks	123	123	687	687	119	119	683	683
No. of observations	387	387	3356	3356	367	367	3316	3316
Bank dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank

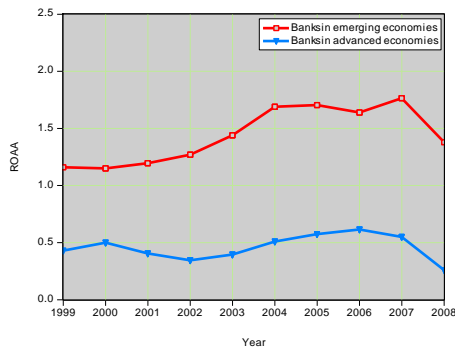
- The dependent variable in panel A is return on average assets, which is defined as profit before tax as a percentage of total assets of a bank.
- The dependent variable in panel B is return on average equity, which is defined as profit before tax as a percentage of equity of a bank.
- Market share*interest rate spread is an interaction term of market share and interest rate spread.
- Market share*age is an interaction term of market share and bank age. Market share*ownership is an interaction term of market share and foreign ownership. Market share*regulation is an interaction term of market share and regulation.
- We estimate all regressions using country and time fixed effects and clustering at bank level. t-values are in parentheses. *, ** *** denote significance at 10%, 5%, and 1%, respectively. AR (1): Arellano-Bond test that average auto-covariance in residuals of order 1 is 0 (H0: no autocorrelation).

Table 6 Determinants of risk (Z-score and Interest Coverage Ratio): Emerging economies vs. advanced economies

Variable	Panel A: Z-score				Panel B: Interest Coverage Ratio (Interest Multiplier)			
	Banks in emerging economies		Banks in advanced economies		Banks in emerging economies		Banks in advanced economies	
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Structure								
Market share	0.0396* (2.07)		0.0063** (2.07)		0.0225 (1.28)		0.0556*** (5.08)	
4-firms concentration	-0.0176 (-1.58)	-0.0013 (-0.11)	-0.0029*** (-5.65)	-0.0028*** (-5.52)	-0.0131 (-1.33)	-0.0135 (-1.31)	0.0008 (0.43)	0.0009 (0.48)
Bank-Specific Variables								
Interest rate spread	0.0427** (1.98)		0.0006*** (1.97)		0.0926*** (4.54)		0.0298*** (3.36)	
Log(total assets) (t-1)	-0.5314 (-0.33)	-0.0021 (-0.01)	0.0039 (0.22)	0.0015 (0.13)	-0.1951 (-0.87)	-0.0205 (-0.11)	0.0896 (1.30)	0.0632 (1.39)
Equity to total assets (t-1)	0.5207** (2.15)	0.4100** (2.25)	0.2551** (2.15)	0.1778* (1.89)	1.1495*** (4.24)	1.4226*** (5.38)	0.8539*** (9.65)	0.8236*** (9.80)
Overheads to total assets(t-1)	1.2460*** (3.92)	1.4169*** (4.56)	0.0815*** (3.84)	0.0726*** (3.62)	-0.5177 (-1.71)	-0.3659* (-1.72)	-0.3912*** (-4.76)	-0.3645*** (-4.47)
Off-balance-sheet activities to total assets	0.1345 (0.28)	0.4788 (1.08)	0.2207*** (3.15)	0.2061*** (3.05)	0.7435* (1.75)	1.0780** (2.46)	0.5730** (2.01)	0.6167*** (2.16)
Market growth (total loans)	0.0069* (1.81)	0.0082** (2.14)	0.0009** (2.37)	0.0010*** (2.72)	0.0059* (1.72)	0.0057 (1.58)	0.0029** (2.12)	0.0021 (1.59)
Bank age	0.2335*** (6.79)		-0.0023 (-0.85)		0.0930*** (2.71)		-0.0058 (-0.53)	
Ownership (foreign banks)	0.2762** (2.05)		0.0303** (1.97)		0.0953** (2.23)		0.3205*** (3.72)	
Overall Financial Structure								
Domestic credit provide by banking	-0.0203*** (-4.72)	-0.0253*** (-5.75)	0.0012*** (3.71)	0.0016*** (5.28)	-0.0027 (-0.69)	-0.0025 (-0.59)	0.0073*** (6.17)	0.0073*** (6.19)
Stock turnover ratio	0.0008 (0.31)	0.0061*** (2.61)	0.0003 (1.51)	0.0003* (1.65)	0.0030 (1.28)	0.0058** (2.49)	-0.0004 (-0.68)	-0.0005 (-0.88)
Regulation	-1.1503*** (-7.57)		0.9381*** (15.71)		-0.2297** (-2.53)		0.0673 (0.20)	
Macroeconomics								
Inflation	-0.0304 (-1.47)	-0.0591*** (-2.88)	-0.1292*** (-16.90)	-0.1293*** (-17.39)	-0.0455** (-2.32)	-0.0211 (-1.01)	-0.1070*** (-3.79)	-0.1111*** (-3.98)
GDP growth	0.0623*** (3.10)	0.0812*** (4.09)	0.0400*** (15.20)	0.0411*** (16.14)	0.0460*** (2.54)	0.0474** (2.49)	0.0667*** (6.94)	0.0669*** (6.95)
Vector products								
Market share* Interest rate spread		0.0021 (1.32)		0.0023** (2.39)		0.0008 (0.56)		-0.0001 (-0.03)
Market share*bank age		0.0021*** (2.91)		-0.0001 (-0.16)		0.0007 (1.01)		-0.0004 (-1.41)
Market share*ownership		0.0896*** (2.90)		0.0049*** (3.47)		0.0121*** (4.42)		0.0073*** (3.19)
Market share*regulation		0.0319** (2.50)		-0.0005* (-1.90)		0.0107*** (3.38)		-0.0744*** (-3.96)
Bank Type and Regional Dummies								
Dummy investment	0.2437 (0.43)	0.3040 (0.56)	0.0087 (0.18)	0.5649 (1.00)	0.5587 (1.48)	0.5180 (1.32)	0.6243 (1.46)	0.5951 (1.50)
Dummy Islamic	-0.0301* (-1.85)	-0.0454 (-0.14)			0.1873 (0.81)	0.0917 (0.39)		
Dummy real estate	0.1822 (0.25)	0.0155 (0.02)	0.0523 (0.82)	0.0663 (0.09)	0.3086 (0.44)	-0.2512 (-0.35)	0.2604 (0.37)	-0.3237 (-0.44)
Dummy savings	0.3957 (0.50)	0.4714 (0.61)	0.0079 (0.53)	0.7288 (0.92)	0.6066* (1.66)	0.6220 (1.14)	0.6407 (1.22)	0.6979 (1.26)
Dummy cooperative	0.2002 (0.29)	-0.0030 (-0.01)	-0.0151 (-0.99)	-0.1621 (-0.23)	-0.3517 (-0.77)	-0.4716 (-0.99)	-0.3924 (-0.85)	-0.5443 (-1.12)
Dummy Middle East	0.8163*** (4.28)	0.7549*** (3.87)			0.2221** (2.14)	0.3069** (2.05)		
AR(1)	p=-0.0570 (t-value=-0.94)	p=0.0709 (t-value=-0.96)	p=0.0285 (t-value=1.28)	p=0.0110 (t-value=0.49)	p=0.0513 (t-value=0.92)	p=0.0280 (t-value=0.50)	p=0.1373 (t-value=6.89)	p=0.1382 (t-value=6.92)
Correlated Random Effects -Hausman test	$\chi^2 = 120.95^{***}$	$\chi^2 = 97.53^{***}$	$\chi^2 = 132.30^{***}$	$\chi^2 = 165.27^{***}$	$\chi^2 = 50.72^{***}$	$\chi^2 = 39.71^{***}$	$\chi^2 = 161.01^{***}$	$\chi^2 = 171.79^{***}$
Redundant Fixed Effects – Likelihood Ratio	$\chi^2 = 349.03^{***}$	$\chi^2 = 302.69^{***}$	$\chi^2 = 2205.08^{***}$	$\chi^2 = 2198.88^{***}$	$\chi^2 = 301.19^{***}$	$\chi^2 = 288.93^{***}$	$\chi^2 = 3503.64^{***}$	$\chi^2 = 3521.97^{***}$
F-statistic	3.68	3.28	5.90	5.93	8.77	7.74	14.40	14.31
R ² -adjusted	0.46	0.42	0.49	0.49	0.72	0.69	0.73	0.73
Standard error of regression	0.90	0.93	0.18	0.18	0.58	0.61	0.64	0.64
No. of countries	23	23	17	17	23	23	17	17
No. of banks	132	132	728	728	130	130	717	717
No. of observations	454	454	3711	3711	427	427	3614	3614
Bank dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank

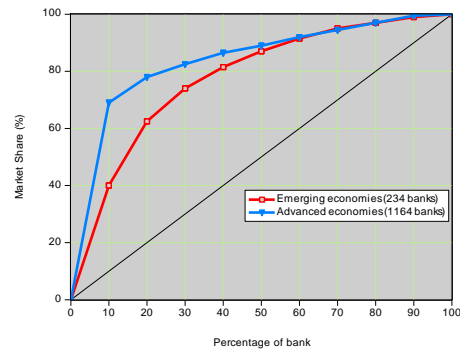
- The dependent variable in panel A is the Z-score, which is defined as $[(ROAA+CAR)/SROAA]$, where ROAA is return on average assets, CAR represents capital assets ratio, and SROAA stands for standard deviation of return on assets.
- The dependent variable in panel B is the Interest coverage ratio (interest multiplier) is defined as profit plus interest expenses divided by interest expenses.
- Market share*interest rate spread is an interaction term of market share and interest rate spread.
- Market share*age is an interaction term of market share and bank age. Market share*ownership is an interaction term of market share and foreign ownership.
- Market share*regulation is an interaction term of market share and regulation.
- We estimate all regressions with mean data for every year and clustering at bank level. t-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively. AR (1): Arellano-Bond test that average auto-covariance in residuals of order 1 is 0 (H0: no autocorrelation).

Figure 1. Trend of return on average assets by categories of market type.



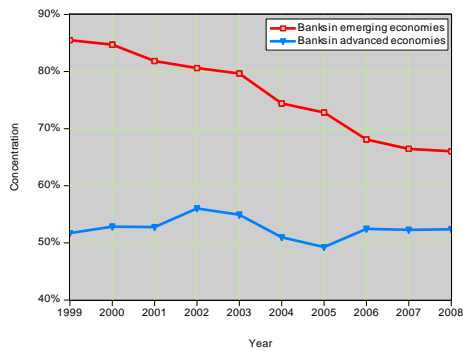
This plot shows the trend of return on average assets by market types from 1999 to 2008.

Figure 2. Lorenz Curve by categories of market type.



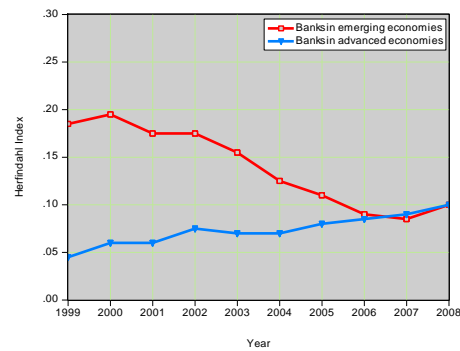
This figure displays the Lorenz Curve of average total assets during the period 1999-2008.

Figure 3. Trend of 4-firm concentration by categories of market type.



This plot shows the trend of market concentration (total assets) by market types from 1999 to 2008.

Figure 4. Trend of normalized Herfindahl index by categories of market type.



This plot shows the trend of concentration by market types from 1999 to 2008.

- ROAA (return on average assets) measured as net income as a percentage of total assets, market share measured as a percentage of a bank's assets to total assets of banks in the country in question, concentration measured as a percentage of four-bank assets to total assets in the country operated, and a Herfindahl index measured as a square of total market shares of all banks operated in each country. For more detail, see Section 3 of this article.
- Market categories are emerging and advanced economies. Banks included are commercial, investment, Islamic, real estate, savings, and corporate banks. The data are from BankScope.

Source: Authors' calculations based on data from the BankScope database of the IBCA.