IMF Working Paper

When They Go Low, We Go High?
Measuring Bank Market Power in a Low-for-Long
Environment

by Deniz Igan, Maria S. Martinez Peria, Nicola Pierri, and Andrea F. Presbitero

INTERNATIONAL MONETARY FUND

IMF Working Paper

Research Department

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May 2021

Abstract

We examine trends in bank competition since the early 2000s. The Lerner index—arguably the most commonly used measure—shows evidence of a marked increase in market power in advanced economies, especially after the global financial crisis. But other frequently used indicators of banking sector competition seem much more muted. We show that the significant drop in policy rates that occurred in the aftermath of the crisis could explain the seeming disconnect. Adjusting the Lerner index for the impact of policy rates reveals that market power has been fairly constant in advanced economies—consistent with the other signals and similar to the pattern observed in emerging markets.

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I. INTRODUCTION

Competition has become a topic of interest as one of the potential factors explaining a plethora of secular trends observed over the past few decades. Specifically, the rise in corporations' market power—as measured by markups and profitability (Diez, Leigh, and Tambunlertchai, 2018; IMF, 2019; Syverson, 2019)—has been shown to be related to the decline in the labor share (Autor et al., 2017; Aghion et al., 2019), with implications for the stagnation of wages in the lower end of the wage scale and migration patterns (De Loecker, Eeckhout, and Unger, 2020). Rising market power has also been argued to be one of the culprits behind the decline in business dynamism (Gutierrez and Philippon, 2017; Akcigit and Ates, 2019a and 2019b).

While most of the studies in the recent additions to this literature have focused on competition in the nonfinancial sector, competition in the financial sector is also of interest not only for its own sake but also because of its potential implications for competition in the nonfinancial sector. The financial—and specifically the banking—sector is special. Banks perform intermediation functions that are critical to other agents and sectors in the economy. They mobilize savings, allocate credit, and provide payment services. Through these activities, banks enable firms and households to invest in productive activities and to cope with uncertainties. Hence, changes in banking sector competition can have implications for the other sectors and the real economy. Further, since central banks rely on financial intermediaries—and in particular banks—to transmit monetary policy, changes in competition in the sector could have implications for the effectiveness of monetary policy.[1]

In contrast to other industries where more competition is typically considered to be positive, the case for competition in banking is not clear cut.[2] On the one hand, like in other sectors, competition can be beneficial as it lowers the cost of services for consumers and firms and improves efficiency and credit allocation. On the other hand, competition can pose risks to financial stability and limit access to finance. In particular, competition can erode banks' franchise value, increase their risk taking, and threaten financial stability. Also, competition can weaken banks' incentive to invest in relationship lending (because there is less room to exploit information advantages and extract rents from firms) and reduce access to finance for firms that depend on relationship lending, such as small and medium-sized enterprises.

Banking sectors in many countries experienced a great degree of changes in the aftermath of the global financial crisis (GFC) and the path of market power following the GFC is a priori

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[1] See Akcigit et al. (2021) for a discussion of the implications of rising market power for the effectiveness of macroeconomic policy.

[2] See Beck (2008) for a review of the theoretical and empirical literature on the impact of competition in banking.

unclear. In some countries the crisis led to bank consolidation—often encouraged or facilitated by resolution authorities—, which could have contributed to a decline in competition. Enhanced bank regulation and supervision may have fostered incumbents' market power, for instance, by increasing the fixed component of compliance costs and, hence, deterring entrants. But an offsetting effect may have materialized with the greater participation of (less regulated) non-banks in financial intermediation. Structural changes such as the rise of fintech providers could have also reduced banks' ability to exert market power. Hence, the behavior of market power in recent years is an interesting empirical question.

In this paper, we document the evolution of different competition measures in a diverse set of advanced economies (AEs) and emerging markets and developing economics (EMDEs) since the early 2000s. Our primary focus is on the Lerner index, arguably the most commonly used measure of market power in the banking sector. We examine the Lerner index between 2000 and 2017 in 67 countries (27 AEs and 40 EMDEs). Calculated following textbook definitions,[3] the Lerner index shows evidence of a significant rise in market power for AEs, especially after the GFC. But other frequently used indicators of competition seem much more muted. Relative to the Lerner index, indicators of market concentration and of profitability for AEs do not display such an obvious upward trend. Among EMDEs, the Lerner index has oscillated around a similar level since the mid-2000s, while market concentration has dropped, and profits and income have remained relatively flat.

One potential explanation behind the increase in the Lerner index for AEs is the significant drop in policy rates that occurred in the aftermath of the GFC. Indeed, bank interest expenses have declined along with the drop in the policy rate. Interest income on loans has also declined, explaining why net interest margins (NIMs) have remained fairly flat.[4] To more formally explore the impact of policy rates on market power, we regress the Lerner index on policy rates and GDP growth—the latter as a measure of other cyclical factors (for instance, when the economy is perceived to be strong, banks may be tempted to take more risk). For AEs, particularly after the GFC, lower policy rates are significantly correlated with a higher Lerner index. GDP growth also matters but less than the policy rate.

Adjusting the Lerner index for the impact of policy rates and other cyclical factors reveals that market power has been fairly constant in AEs. This flat pattern is consistent with the findings for profitability and margins. Expansionary monetary policy exerts a downward

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[3] The Lerner index is the difference between price and marginal cost, expressed as a share of the price. The price is captured by the share of income to assets, while the marginal cost is estimated from a trans-log cost function which includes deposits, wages, and other expenses as inputs. Section II provides details of the calculation of the Lerner index.

[4] Incidentally, this suggests that low policy rates have not yet weighed on bank profitability.

pressure both on the interest rate earned by banks on their assets and on the interest paid on their liabilities. However, different measures of margins can react differently to the same changes in costs and prices. In particular, the NIM is equal to the *difference* between interest earned and interest paid by banks. The Lerner index, instead, depends on the *ratio* between the two, and it increases when this ratio decreases. Therefore, the Lerner index and the NIM can move in different directions following a decline in interest rates. Importantly, when interest rates are close to or below zero, the Lerner index becomes uninformative as an indicator of market power because the ratio between interest paid and interest earned mechanically moves toward zero and pushes the index toward one.

The demonstration that a commonly-used measure of bank competition becomes uninformative in a low-interest-rate environment has implications for supervisors and policymakers.[5] In monitoring banking sector developments (and taking action as needed based on such monitoring), supervisors should aim to rely on a range of indicators and adopt a holistic approach.

The rest of the paper is organized as follows. Section II explains the Lerner index in detail and demonstrates how monetary policy enters the picture in the computation of the index. Section III presents the empirical findings. Section IV concludes.

II. THE LERNER INDEX: DEFINITION AND RELATION TO MONETARY POLICY

The Lerner Index is a (very) commonly used measure of market power.[6] It is defined as:

$$Lerner = \frac{p - mc}{p} = 1 - \frac{mc}{p}$$

where p is the ratio of revenue to quantity $Q_{b,t}$ (assets) and marginal costs are:[7]

$$mc = \frac{\partial C_{b,t}}{\partial Q_{b,t}} = \varepsilon_{b,t} \frac{C_{b,t}}{Q_{b,t}}$$

where b and t are indicators for the bank and time period and $\varepsilon_{b,t}$ is the elasticity of costs to quantity.

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[5] When interest rates are low, but not close to zero, the traditional Lerner index can still be used for comparison between banks exposed to the same monetary policy.

[6] See Degryse, Morales-Acevedo, and Ongena (2014) for an overview and assessment of different methodological approaches taken to measure competition in banking.

[7] Note that while c and q are the logs of costs and quantities, C and Q are the actual values.

This elasticity is estimated from a trans-log cost function:

$$logC_{b,t} = \alpha\, logQ_{b,t} + \frac{\delta}{2}\, logQ_{b,t}{}^2 + \sum_{j=1}^{J} \beta_j\, w_{j,b,t}\, logQ_{b,t} + \sum_{j=1}^{J} \sigma_j\, w_j$$

$$+ \sum_{j=1}^{J}\sum_{k=1}^{J} \sigma_{jk}\, w_{j,b,t}\, w_{k,b,t} + \gamma X_{b,t} + \mu_b + \pi_t + \epsilon_{b,t}$$

where

- the w_j is a set of bank-specific input costs (in logs): total interest expenses over deposits, personnel expenses over assets, and other operating expenses over assets,

- $X_{b,t}$ is a set of bank-level time-varying controls to account for banks' capitalization (equity over assets), focus on lending (loans to assets) and loan quality (NPLs over loans),

- μ_b and π_t are bank and year fixed effects.

The equation is estimated by OLS separately for each country (thus all parameters are country-specific).[8] The elasticity is calculated as:

$$\varepsilon_{b,t} = \alpha + \delta\, logQ_{b,t} + \sum_{j=1}^{J} \beta_j w_{j,b,t}$$

Then, the Lerner index can be expressed as:

$$Lerner = 1 - \frac{\varepsilon_{b,t}\dfrac{C_{b,t}}{Q_{b,t}}}{\dfrac{Income_{b,t}}{Q_{b,t}}} = 1 - \varepsilon_{b,t} * \theta_{b,t}$$

where $\theta = \frac{Costs}{Income}$.

Therefore, as long as $\varepsilon_{b,t}$ is fixed (or slow moving) over time, the Lerner index increases when the cost to income ratio decreases, and vice-versa.

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[8] Imposing additional structure to the cost function, for instance homogeneity of degree one in input prices, does not significantly affect the results.

A measure of margins (on lending) commonly used by practitioners and policymakers is the net interest margin, defined as:

$$\text{Net Interest Margin (NIM)} = \frac{Net\ Interest\ Income}{Average\ Earning\ Assets}$$

which can be written as

$$NIM = R_l - R_d$$

where R_l is the interest earned on assets, that is the ratio of gross interest income over assets, while R_d is the interest paid on liabilities, that is the ratio of interest expenses over assets.

While both the NIM and the Lerner index aim to capture banks' margins, during the same period it is possible to observe the Lerner index going up but the NIM being constant or decreasing.

To see this, notice that total costs are the sum of interest expenses and operating expenses, while income is the sum of interest and non-interest income.

$$\theta = \frac{Costs}{Income} = \frac{Interest\ Expenses + Opex}{Gross\ Interest\ Income + Non - Interest\ Income}$$

Ignoring operating expenses and non-interest income, it is possible to express the cost to income ratio as:[9]

$$\theta = \frac{Costs}{Income} = \frac{R_d}{R_l}$$

and the Lerner index as:

$$Lerner = 1 - \varepsilon * \frac{R_d}{R_l}$$

This formulation shows that, when interest rates move, the Lerner index increases if the ratio of interest paid on deposits (and other liabilities) over the interest earned on assets decreases. Conversely, the NIM increases in the absolute value of the difference between these two interest rates. Hence, the Lerner index moves with the ratio of the interest paid and received by banks, while the NIM moves with the differences between the two.

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[9] Operating expenses and non-interest income are two important components of a bank's profits and losses statement. However, they are less affected by monetary policy. We ignore them for the sake of expositional brevity in order to illustrate the role of monetary expansions on the NIM and the Lerner index, but we do consider them in our estimations of the latter.

In advanced economies, the median interest paid by banks went down from approximately 2 percentage points (pp) to 0.5 pp, while the interest earned went down from 5.8 pp to 3.8 pp. Therefore, the NIM of a hypothetical bank experiencing these changes would decrease from 3.8 pp to 3.3 pp. The ratio of interest paid over interest earned would go from 0.34 to 0.13. Hence, the NIM of this bank would decrease, while the Lerner index would increase substantially.

Moreover, the ratio is more problematic than the difference when interest rates are very low. In fact, when R_d approaches 0, and as long as banks charge a positive rate to their borrowers, then the ratio $\frac{R_d}{R_l}$ approaches zero, becoming uninformative.

In what follows, we document the evolution of the Lerner index since 2000 and explore how it has been affected by the low-interest rate environment dominating the advanced-economy landscape after the GFC and how it compares to other measures of competition.

III. EMPIRICAL ANALYSIS

A. Data Construction

We use bank-level information in order to construct the Lerner index and other competition measures at the country level. The main source is Fitch Connect. We download the end-year unconsolidated statements for commercial banks where available, with the consideration that this would capture market power in a more meaningful way (for instance, a Spanish bank with operations in Latin America would face different competitive pressures in different countries). Where unconsolidated statements are not available, we use the consolidated statements.[10] We exclude banks which report missing or zero values for operating income, and missing values for the key variables and ratios used to compute the Lerner index (i.e., assets, costs, operating expense, income over assets, interest expenses over deposits, wages over assets). We then winsorize these variables at the 2.5 and 97.5 percentiles (by year) and follow the steps outlined in Section II to compute the bank-level Lerner index.

In order to construct the Lerner index at the country level, we aggregate bank-level indices using bank assets as weights; that is, the country-level index is an asset-weighted average of bank-specific Lerner indices. To ensure that the aggregated index does not paint a misleading picture due to changes in the composition of the bank-level dataset and accurately represents a country's banking system as opposed to a very small number of banks, we impose two restrictions: first, the bank sample used for a country should be balanced; second, there should be at least 10 banks in a given country in any given year.

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[10] Data from consolidated statements account for about 40% of the observations.

We complement the information at the bank level with macroeconomic indicators (real GDP growth and monetary policy rates) from the IMF's *World Economic Outlook* and *International Financial Statistics* databases.

Table A1 in the Appendix shows the number of banks per country included in the sample while Table A2 provides information on the composition of the country-level dataset. Summary statistics at both the bank and the country level are provided in Tables 1A and 1B.

B. Findings

A Glance at the Traditional Lerner

The Lerner index shows a marked increase since the early 2000s, with what appears to be a temporary decline around the late 2000s (Figure 1.A.). A steep rise is particularly observable in AEs after the GFC while, among EMDEs, the trend is less pronounced with the Lerner index oscillating around a similar level since the mid-2000s (Figure 1. B).

However, the picture looks different when we look at other indicators that could plausibly signal increased market power and that have been used as competition indicators as well. Specifically, in contrast to the Lerner index, indicators of market concentration (Figure 2)[11] and of profitability (Figure 3) do not display such an obvious upward trend. Actually, market concentration appears to be on a broadly downward trend, perhaps with the exception of the last couple of years in EMDEs. Profits declined in the initial years after the GFC and income has remained relatively flat. This is true for both country groups but it is especially striking for AEs, considering the different picture painted for market power by the Lerner index.

What could account for the upward trend in the Lerner index among AEs in the post-GFC period? One potential explanation is the notable decline in interest rates that occurred in the aftermath of the GFC as monetary policy eased significantly. This had an impact on the cost of bank deposits—a key input in the production function. Indeed, bank interest expenses declined along with the drop in the policy rate (Figure 4.A). In line with what one would expect with monetary policy transmission and reduced cost of funding, interest income on loans has also declined, almost in tandem, especially in AEs. This explains why NIMs have remained fairly flat. In the last years of our sample period, we do not detect a sharp decline of *average* profitability or NIM in AEs, consistently with Altavilla et al. (2018), Boucinha and Burlon (2020) and Lopez et al (2020), among others. This is reassuring as many have voiced the concern that bank profitability may deteriorate substantially in a low-for-long environment endangering financial stability (e.g., Bank for International Settlements 2018; IMF 2020).

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[11] Similar patterns are visible using the asset share of top 5 banks from Fitch or the World Bank GFCC dataset.

Heterogeneity across Bank Groups and Countries

One could suspect that perhaps the patterns we observe are specific to certain bank types or certain countries. The seeming increase in market power in AEs, as indicated by the unadjusted Lerner index, is common among different types of institutions: commercial versus investment banks, large versus small banks (Appendix Figure A.1). The lack of visible differences across bank groups could be interpreted to be consistent with the trends being driven by common factors at a macro scale—namely, the policy rate (and cyclical factors).

The upward pattern in the unadjusted Lerner index is also visible looking at countries with many mergers and acquisitions (M&As) versus others (Panel A of Appendix Figure A2). The fact that the increase of the Lerner index is similar between the two groups—while market concentration increased only in the high M&A countries (see Panel B of Figure A2)—is therefore another piece of evidence suggesting that this sharp increase in the Lerner index may be driven by other factors that are not adequately captured in the traditional formula rather than an actual change in the competitive structure of the banking industry.

Adjusted Lerner

To more formally explore the impact of policy rates on market power, we regress the Lerner index on countries' monetary policy rates and GDP growth while controlling for bank fixed effects. We include the latter—GDP growth rate—as a proxy of other cyclical factors that may have a bearing on risk taking and profitability. For instance, when the economy is perceived to be strong, banks may be tempted to take more risk and consequently charge higher interest rates.[12] Also, bank profitability might increase if bank revenues increase faster than costs when the demand for loans and other banking services increases during periods of strong economic growth.

Table 2 shows the regression results. In AEs, a one standard deviation (SD) decrease in the policy rate leads to a 0.05 higher Lerner index over a two-year period, while a similar change of the policy rates in EMDEs accounts for only a 0.02 higher Lerner index. The estimated impact of the monetary policy rate in AEs is economically sizable, as it represents about a fifth of the average Lerner index and more than a third of its (country-level) standard deviation. The relative importance of the policy rate in AEs becomes stronger after the GFC, as one SD lower policy rate leads to a 0.06 higher Lerner index—a larger effect than that due to a one SD increase in GDP growth, which is associated with a 0.04 increase in the Lerner index. These results confirm that, for AEs and particularly after the GFC, lower policy rates

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[12] Albertazzi and Gambacorta (2009) show that bank profits are pro-cyclical. Altunbas et al. (2010) show that a rise in GDP boosts bank lending, decreases standards and raises risk-taking behavior.

are significantly correlated with a higher Lerner index. GDP growth also matters but less than the policy rate.

We adjust the Lerner index by focusing on the residuals from this regression, which purges out the impact of policy rates and other cyclical factors. This "statistically-adjusted" index reveals that market power has been fairly constant in AEs (Figure 5.A). This is not the case in EMDEs, where we observe a closer co-movement between the traditional and adjusted Lerner indices (Figure 5.B). This is in line with the smaller coefficients obtained for this group of countries in Table 2. Turning to potential differences within advanced economies, the rise in the unadjusted Lerner index appears to be similar in the US and Europe (Panel C, Appendix Figure A2). However, the adjusted Lerner flattens more for European countries than it does for the US. This suggests that the impact of monetary policy (and cyclical factors) on the measurement of market power is more pronounced in Europe.

How can we then reconcile the behavior of the Lerner index with that of the NIM? The flat pattern displayed by the adjusted Lerner index is consistent with the findings for profitability and margins discussed before. What is happening is that expansionary monetary policy exerts a downward pressure both on the interest rate earned by banks on their assets and on the interest paid on their liabilities. However, different measures of margins can react differently to the same changes in costs and prices. In particular, the NIM is equal to the *difference* between interest earned and interest paid by banks. The Lerner index, instead, depends on the *ratio* between the two, and it increases when this ratio decreases—as explained in detail in Section II. When interest rates are very low, we can expect the two to move in different directions. Moreover, as long as banks need to charge some positive premium on the interest they pay on liabilities, for instance to recover administrative costs, the ratio between the two rates become uninformative as the funding rate approaches zero.

To shed further light on the impact of this "denominator effect", we consider an alternative adjustment procedure. Rather than including the interest expenses in the denominator (by including them in the total cost of banks), we subtract such expenses from both the numerator and the denominator (that is, from both the revenues and the costs). In practice, the estimation procedure is identical to the one described in Section II, except for two differences: (a) the price $p_{b,t}$ is computed as the ratio of revenues minus interest expenses over assets (rather than revenues over assets) and (b) the costs $C_{b,t}$ are computed as total expenses minus interest expenses (rather than total expenses). Therefore, interest expenses are subtracted rather than divided over. The evolution over time of this alternative Lerner index, together with the classical unadjusted Lerner, is illustrated by Figure 6. This alternative Lerner does not grow over time, confirming that the sharp rise of the unadjusted Lerner index is caused by the "denominator effect". However, this alternative Lerner index appears to be impacted by business cycle fluctuations, while the statistical adjustment

procedure does not (e.g., Figure 5) as it explicitly controls for economic growth (see Table 2). The statistical adjustment is therefore to be preferred in most settings.
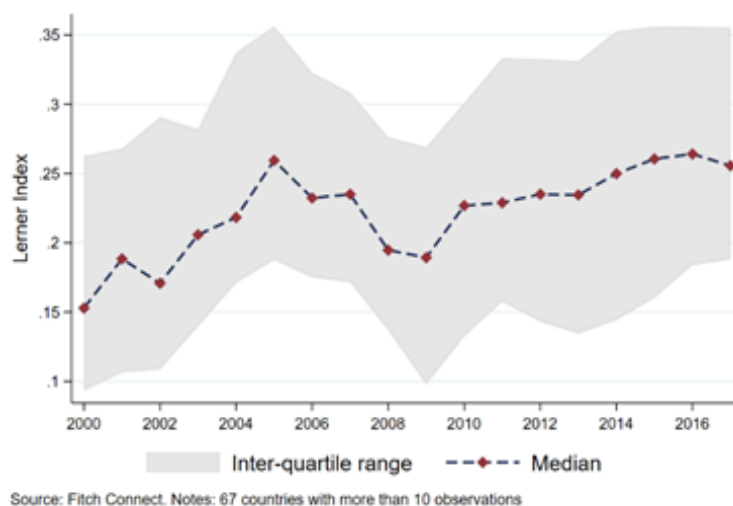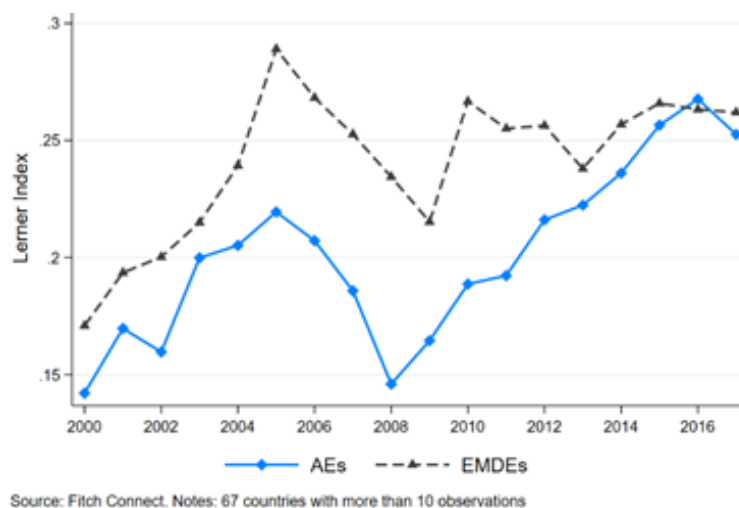
IV. CONCLUDING REMARKS

While the recent literature on competition has focused on nonfinancial firms, we examine market power among banks. The Lerner index—a commonly used measure of competition in the banking sector—shows evidence of a marked increase in market power in advanced economies, especially after the global financial crisis. But other frequently used indicators of banking sector competition and market power seem much more muted. We show that the significant drop in policy rates that occurred in the aftermath of the crisis could explain the seeming disconnect and adjusting the Lerner index for the impact of policy rates and other cyclical factors reveals that market power has been fairly constant in advanced economies. This is consistent with the other indicators and similar to the pattern observed in emerging markets.

Going forward, policymakers need to continue to pay attention to the behavior of the Lerner index at the zero lower bound (ZLB). Our analysis demonstrates that, since the GFC, traditional measures of mark-ups in banking appear to have increased largely as a result of the significant drop in policy rates. But once the decline in rates is accounted for, the Lerner index for advanced economies shows no significant upward trend. This finding is reassuring: the policy response to the GFC does not seem to have resulted in a structural increase in market power. Further, at least so far, there is little indication that banks' profitability has been adversely affected in a low interest rate environment. Whether the Lerner index continues to be stable will likely depend on how long rates stay at the ZLB (as the pressure on profits may intensify and possibly trigger consolidation in the banking sector) and the extent to which banks can overcome structural challenges, such as the rise of fintech, which could affect their ability to exert any market power.

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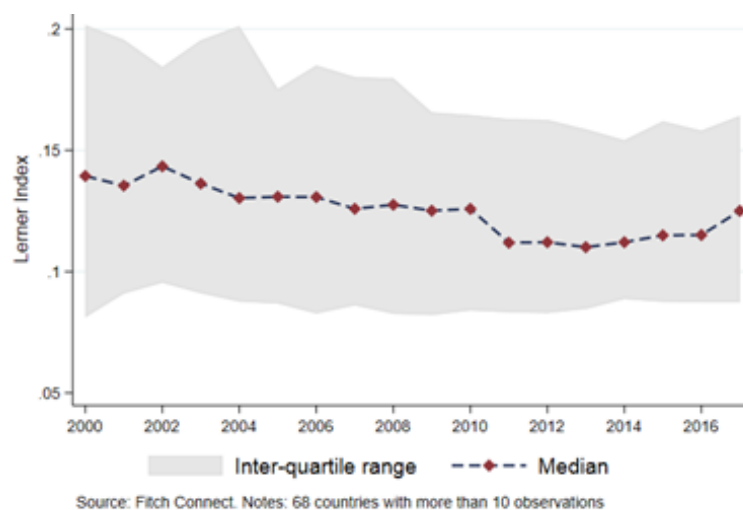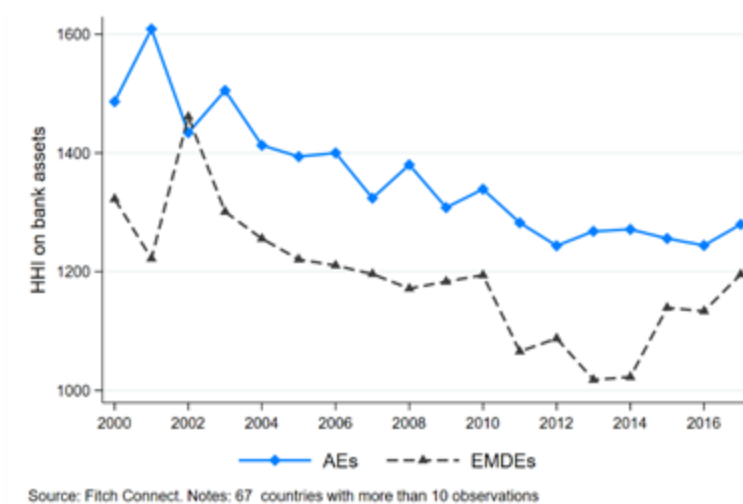
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Figure 1. Lerner Index

A. Aggregate Lerner

Source: Fitch Connect. Notes: 67 countries with more than 10 observations

B. Lerner by income group

Source: Fitch Connect. Notes: 67 countries with more than 10 observations

Sources: Fitch Connect; IMF staff calculations.
Note: The top chart plots the median across countries of the country-specific Lerner index, together with the interquartile range. The bottom chart plots the median across countries of the country-specific Lerner index, separately for advanced economies (AEs) and emerging markets and developing economies (EMDEs). The sample covers 67 countries (27 AEs and 40 EMDEs) with more than 10 observations. The country-level Lerner index is computed as the weighted average of the bank-level Lerner index taking bank assets as weights. For details on Lerner index estimation, see Section II.

Figure 2. Market Concentration

A. **Aggregate Market Concentration**

Source: Fitch Connect. Notes: 68 countries with more than 10 observations

B. **Concentration by income group**

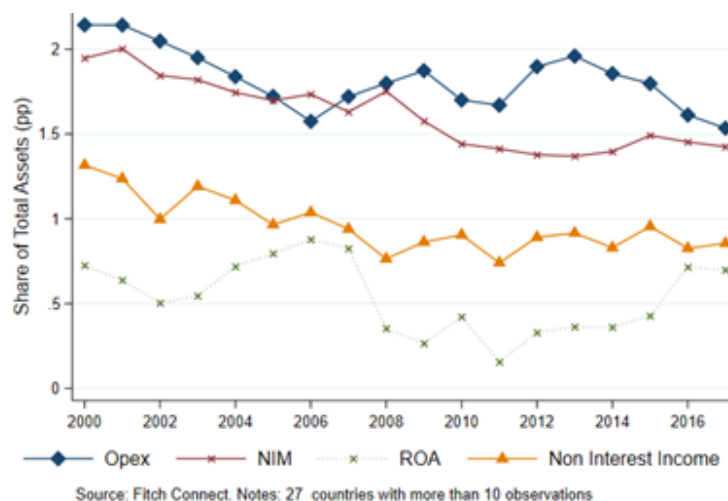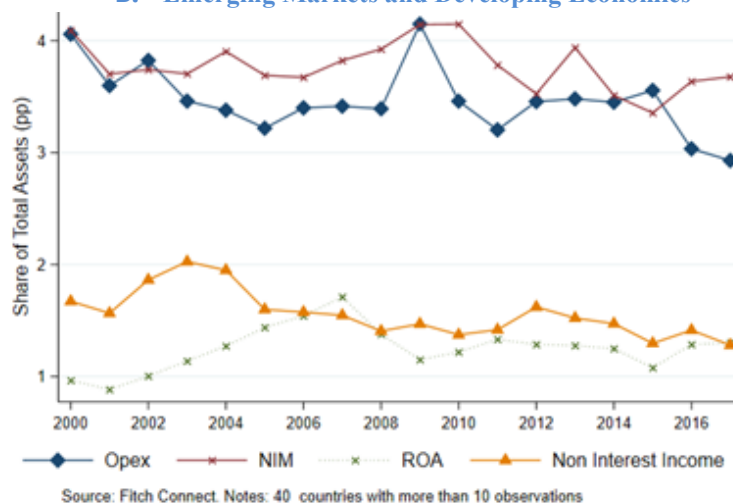Source: Fitch Connect. Notes: 67 countries with more than 10 observations

Sources: Fitch Connect; IMF staff calculations.
Note: The top chart plots the median across countries of the country-specific Herfindahl–Hirschman Index (HHI), together with the interquartile range. The bottom chart plots the median across countries of the country-specific HHI, separately for advanced economies (AEs) and emerging markets and developing economies (EMDEs). The sample covers 67 countries (27 AEs and 40 EMDEs) with more than 10 observations.

Figure 3. Profitability, Income, and Costs

A. Advanced Economies

Source: Fitch Connect. Notes: 27 countries with more than 10 observations

B. Emerging Markets and Developing Economies

Source: Fitch Connect. Notes: 40 countries with more than 10 observations

Sources: Fitch Connect; IMF staff calculations.

Note: The charts plot the median across countries of the country-specific values of operating expenses (Opex), net interest margin (NIM), return on assets (ROA), and non-interest income (NII) as a share of bank assets, separately for advanced economies (AEs) and emerging markets and developing economies (EMDEs). The bank-level variables are expressed as percentage of total assets and are aggregated at the country level as asset-weighted averages. The sample covers 67 countries (27 AEs and 40 EMDEs) with more than 10 observations.

Figure 4. Interest Margin Components and Policy Rate

A. Advanced Economies

Source: Fitch Connect. Notes: 27 countries with more than 10 observations

B. Emerging Markets and Developing Economies
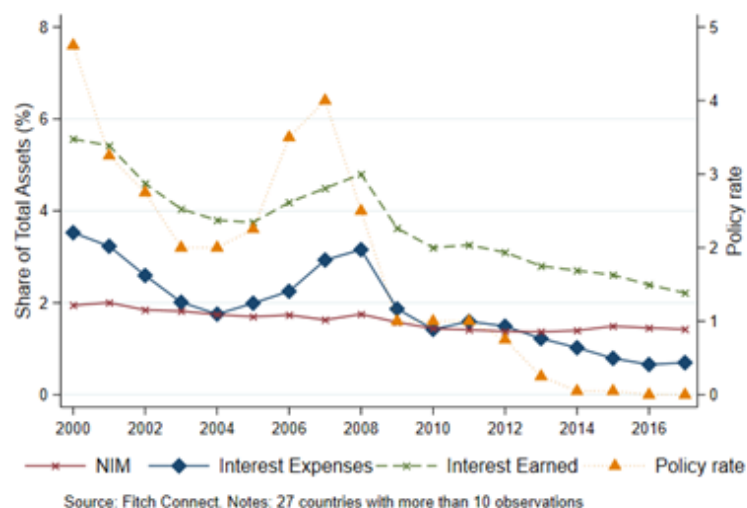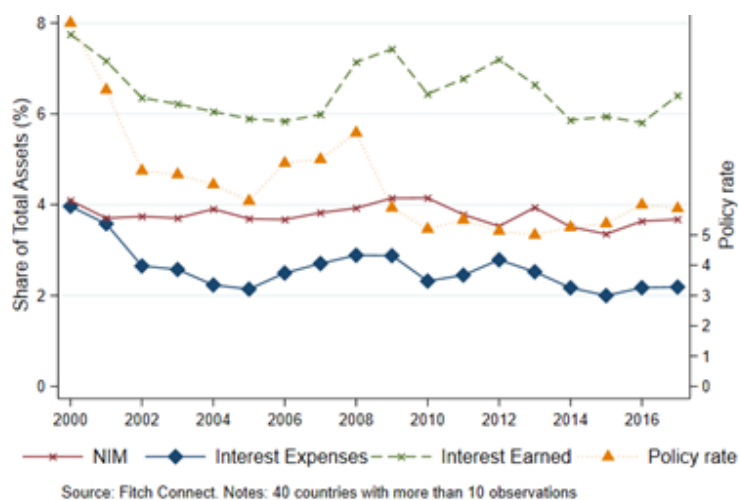

Source: Fitch Connect. Notes: 40 countries with more than 10 observations
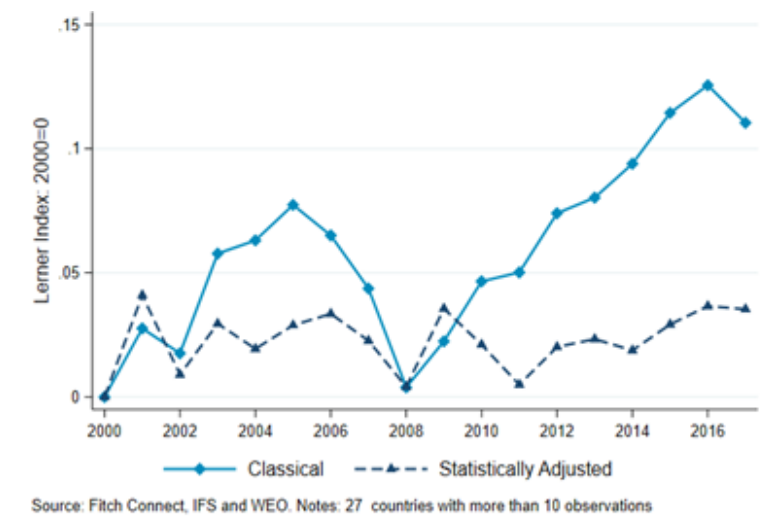
Sources: Fitch Connect; IMF staff calculations.
Note: The charts plot the median across countries of the country-specific values of net interest margin (NIM), interest expenses, and interest earned (or gross interest income) as a share of bank assets, separately for advanced economies (AEs) and emerging markets and developing economies (EMDEs). The bank-level variables are expressed as percentage of total assets and are aggregated at the country level as asset-weighted averages. The sample covers 67 countries (27 AEs and 40 EMDEs) with more than 10 observations.

Figure 5. Adjusted Lerner Index

A. Advanced Economies

Source: Fitch Connect, IFS and WEO. Notes: 27 countries with more than 10 observations

B. Emerging Markets and Developing Economies

Source: Fitch Connect, IFS and WEO. Notes: 40 countries with more than 10 observations
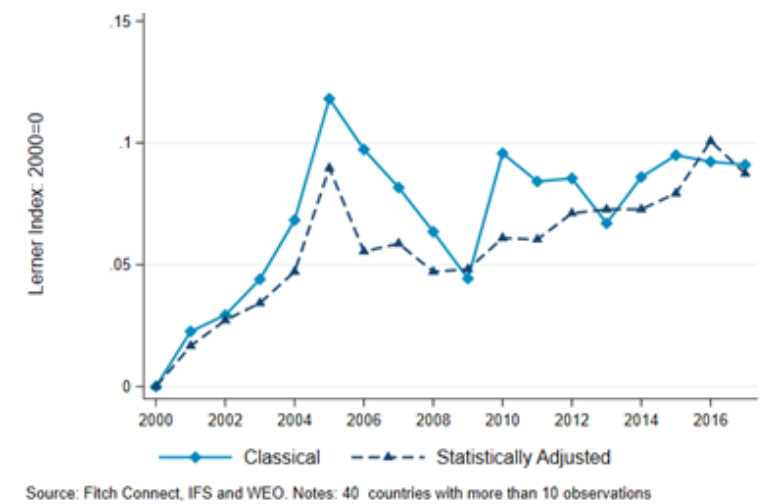
Sources: Fitch Connect; IMF staff calculations.
Note: The charts plot the median across countries of the traditional Lerner index, together with the statistically adjusted Lerner index, separately for advanced economies (AEs) in the top chart and emerging markets and developing economies (EMDEs) in the bottom chart. The value for both series is set to 0 for 2000. The country-level traditional Lerner index is computed as the weighted average of the bank-level Lerner index taking bank assets as weights. The statistically adjusted Lerner index is computed as the residual of a regression of the traditional Lerner index on policy rates and GDP growth. For further details, see Table 2. The sample covers 67 countries (27 AEs and 40 EMDEs) with more than 10 observations.

Figure 6. Alternative Adjustment Procedure (AEs)

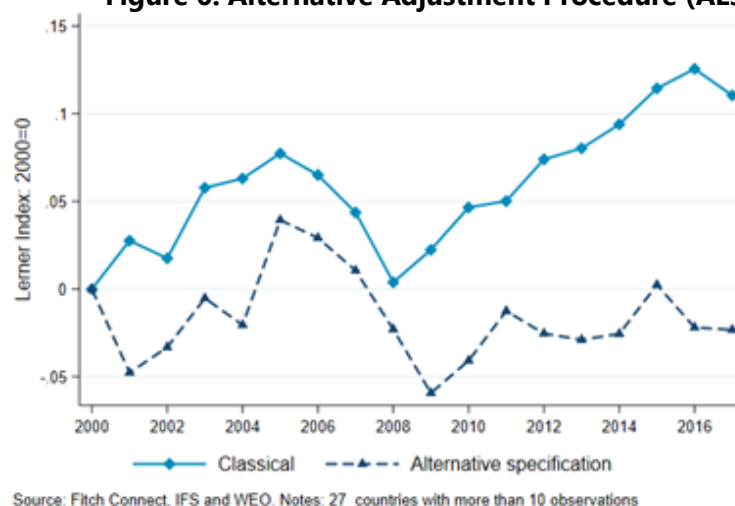Source: Fitch Connect, IFS and WEO. Notes: 27 countries with more than 10 observations

Sources: Fitch Connect; IMF staff calculations.
Note: The charts plot the median across countries of the traditional Lerner index, together with a Lerner index computed with an alternative procedure, for advanced economies (AEs). The value for both series is set to 0 for 2000. The country-level Lerner indexes is computed as the weighted average of the bank-level indexes taking bank assets as weights. The alternative procedure subtracts interest expenses from both numerator (price=revenues over assets) and denominator (total costs) of the Lerner. The sample covers 27 AEs with more than 10 observations.

Table 1A. Summary Statistics at the Bank Level

	# obs	Mean (pp)	Std. Dev.	Min	Max
Lerner Index	312,566	19.9	13	0	67.96
NIM	312,566	3.69	2.1	-0.24	19.64
ROE	312,566	6.5	12.4	-160.37	41.48
ROA	312,566	0.71	1.3	-8.37	7.8
Cost to income	312,566	82.9	17.3	0	169.8

Sources: Fitch Connect, IMF staff calculation

Table 1B. Summary Statistics at the Country Level

	# obs	Mean	Std. Dev.	Min	Max
Lerner, traditional	1,108	0.24	0.13	0.00	0.66
Lerner, adjusted	1,108	0.00	0.06	-0.23	0.26
HHI	1,107	1427	906	141	7564
Real GDP growth	1,108	0.03	0.03	-0.06	0.10
Policy rate	1,108	0.05	0.04	-0.01	0.16

Sources: Fitch Connect, IMF International Financial Statistics; IMF staff calculations.

Note: The traditional Lerner is computed as the weighted average of the bank-level Lerner index taking bank assets as weights. The adjusted Lerner is obtained as the residuals from regressing the traditional Lerner on contemporaneous and lagged policy rate and real GDP growth in the country-year panel dataset, see Table 2 for more detail. HHI is the Herfindahl–Hirschman Index based on total bank assets considering each country as a market.

Table 2. Cyclical Drivers of the Lerner Index

	(1)	(2)	(3)	(4)
	Whole period		pre-GFC	post-GFC
Policy rate	-0.87***			
	(0.00)			
GDP growth	0.92***			
	(0.00)			
Policy rate - AEs		-2.75***	-2.78***	-3.60
		(0.00)	(0.00)	(0.00)
Growth rate - AEs		1.50***	1.14***	1.66***
		(0.00)	(0.00)	(0.00)
Policy rate - EMDEs		-0.44**	-0.72***	0.44*
		(0.00)	(0.00)	(0.10)
Growth rate - EMDEs		0.97***	1.12***	0.52**
		(0.00)	(0.00)	(0.02)
Observations	1,108	1,108	582	525
R-squared	0.77	0.79	0.86	0.88
# countries	67	67	67	66
Country FEs	Yes	Yes	Yes	Yes
Within R-squared	0.17	0.24	0.30	0.19

Sources: Fitch Connect, World Economic Outlook, IMF *International Financial Statistics*, national central banks, and IMF staff calculations.

Note: The table reports the results from regressing the Lerner index on contemporaneous and lagged policy rate and real GDP growth in the country-year panel dataset. The regressions are estimated with ordinary least squares with robust standard errors and include country fixed effects (FEs). For each variable, each row reports the sum of the coefficients of the contemporaneous and lagged terms, and below that, in parentheses, the p-value of a joint F-test for the null hypothesis that the sum of the coefficients is different from 0. Columns (2) to (4) allow the effects of policy rate and GDP growth to differ across advanced economies (AEs) and emerging market and developing economies (EMDEs). Columns (3) and (4) report separate regressions for the pre- and post-global financial crisis (GFC), using 2010 as the first post-GFC year. Residuals from the regression in column (2) are used to compute the statistically adjusted Lerner index. ***, **, and * denote statistical significance at the 1,5, and 10 percent level, respectively.

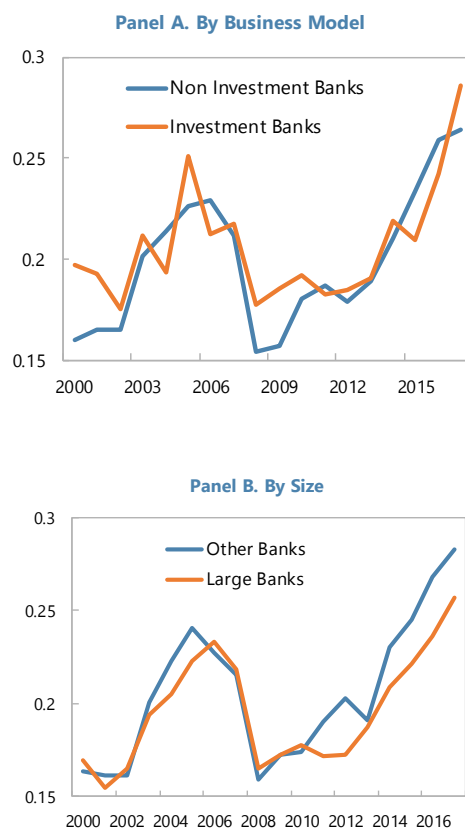**Appendix Table A1. Sample Composition at the Bank Level**

Advanced economies

Country	# banks	Country	# banks
Australia	124	Latvia	26
Austria	708	Luxembourg	159
Belgium	87	Netherlands	67
Canada	167	Norway	168
Cyprus	29	Portugal	137
Czech Republic	41	Singapore	17
Denmark	136	Slovak Republic	23
France	153	Slovenia	27
Germany	2,501	Spain	261
Greece	27	Sweden	141
Hong Kong, SAR	59	Switzerland	582
Italy	934	United Kingdom	259
Japan	823	United States	13,281
Korea	106		
		Total	21,043

Emerging markets and developing economies

Country	# banks	Country	# banks
Argentina	104	Mexico	61
Azerbaijan	39	Morocco	26
Bahamas	26	Peru	31
Bangladesh	68	Philippines	67
Belarus	29	Poland	192
Brazil	200	Romania	38
Bulgaria	30	Russian Federation	1,136
Chile	40	Saudi Arbia	12
Colombia	75	South Africa	36
Croatia	53	Sri Lanka	76
Dominican Republic	73	Tanzania	42
Ghana	46	Thailand	40
Guatemala	30	Tunisia	24
Honduras	31	Turkey	60
Hungary	166	Uganda	27
India	315	Ukraine	155
Jordan	16	Uruguay	52
Kazakhstan	42	Vietnam	51
Kenya	58	Zambia	26
Lebanon	66		
Malaysia	75		
		Total	3,734

Sources: Fitch Connect, World Economic Outlook,
and IMF staff calculations

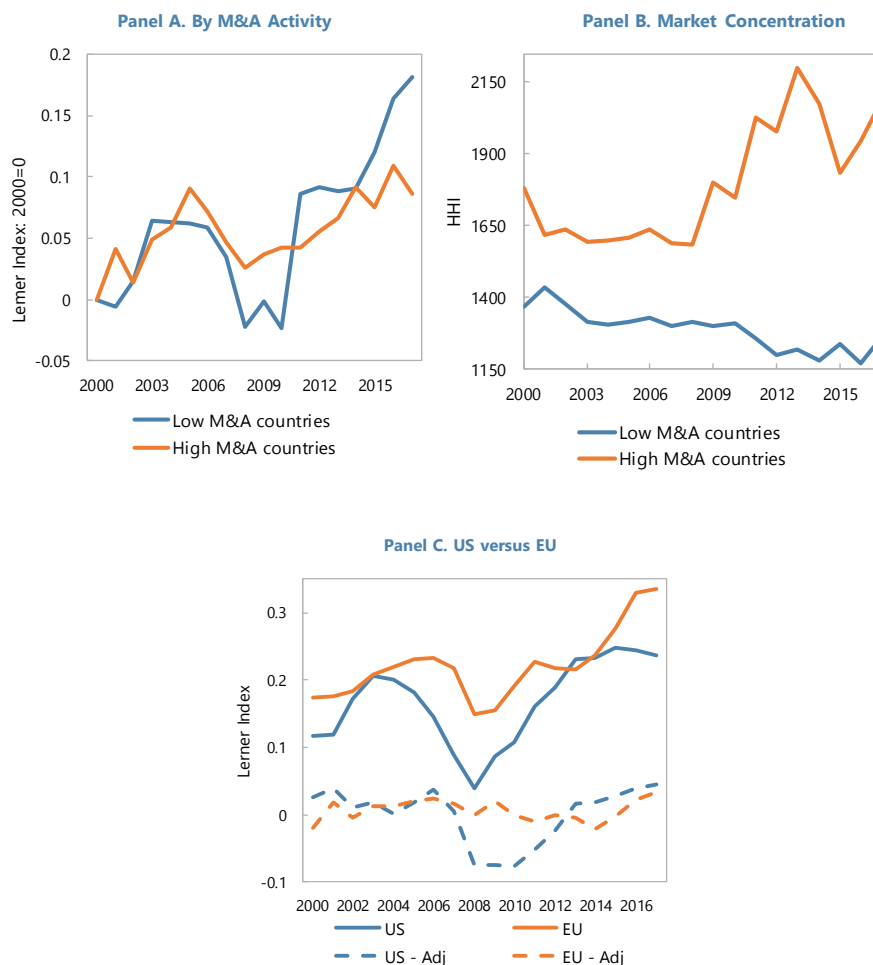**Appendix Table A2. Sample Composition at the Country Level**

Advanced economies

Country	# obs	Country	# obs
Australia	18	Latvia	18
Austria	18	Luxembourg	18
Belgium	18	Netherlands	18
Canada	18	Norway	18
Cyprus	18	Portugal	18
Czech Republic	18	Singapore	11
Denmark	18	Slovak Republic	18
France	18	Slovenia	18
Germany	18	Spain	18
Greece	18	Sweden	18
Hong Kong, SAR	15	Switzerland	18
Italy	18	United Kingdom	18
Japan	18	United States	18
Korea	18		
		Total	**249**

Emerging markets and developing economies

Country	# obs	Country	# obs
Argentina	18	Mexico	18
Azerbaijan	16	Morocco	17
Bahamas	18	Peru	18
Bangladesh	18	Philippines	18
Belarus	15	Poland	18
Brazil	18	Romania	18
Bulgaria	16	Russian Federation	18
Chile	18	Saudi Arabia	18
Colombia	18	South Africa	18
Croatia	18	Sri Lanka	18
Dominican Republic	18	Tanzania	13
Ghana	17	Thailand	18
Guatemala	15	Tunisia	18
Honduras	16	Turkey	18
Hungary	18	Uganda	11
India	18	Ukraine	18
Jordan	18	Uruguay	18
Kazakhstan	18	Vietnam	18
Kenya	18	Zambia	17
Lebanon	18		
Malaysia	18		
		Total	**693**

Sources: Fitch Connect, World Economic Outlook, IMF International Financial Statistics, national central banks, and IMF staff calculations.

Appendix Figure A1. Lerner Index: Heterogeneity across Bank Groups

Panel A. By Business Model

Panel B. By Size

Sources: Fitch Connect; IMF staff calculations.

Note: The sample covers 27 advanced economies with more than 10 observations. The charts plot the median across advanced economies of the country-specific Lerner index calculated separately for banks with different characteristics. In Panel A, investment bank is defined as banks in the lowest decile of in terms of loan to assets (because of data availability only 26 countries are present). In Panel B, large banks are defined as banks in the top decile in terms of assets In all panels, bank groups are defined according to the average value of bank characteristics in the years 2000 to 2002. For each group, the country-level traditional Lerner is computed as the weighted average of the bank-level Lerner index taking bank assets as weights.

Appendix Figure A2. Heterogeneity across Countries within Advanced Economies

Panel A. By M&A Activity

Panel B. Market Concentration

Panel C. US versus EU

Sources: Fitch Connect; IMF staff calculations.

Note: The sample covers 27 advanced economies with more than 10 observations. Panel A plots the median of country-specific Lerner index among banks, separately for countries in the low or high group in terms of post-GFC M&A. The high M&A group is defined as the top 10 advanced economies in terms of number of mergers and acquisitions involving a bank as one of the parties involved, normalized by the number of banks in that country (average across the sample period). The low M&A group includes all other advanced economies. Panel B plots the median of the Herfindahl–Hirschman Index (HHI) calculated using bank assets as a measure of market share and considering each country as a market, separately for countries in the low or high group in terms of merger and acquisition (M&A) activity following the global financial crisis (GFC). Panel C plots the median across countries of the country-specific Lerner index among banks, together with the statistically adjusted Lerner Index, separately for the United States and EU countries. The country-level traditional Lerner index is computed as the weighted average of the bank-level Lerner index taking bank assets as weights. The statistically adjusted Lerner index is computed as the residual of a regression of the traditional Lerner index on policy rates and GDP growth. For further details, see Table 2.