Do Net Interest Margins for Small and Large Banks Vary Differently with Interest Rates?

By Rajdeep Sengupta and Fei Xue

Bank net interest margins (NIMs) have declined since 2019, renewing concerns about the viability of traditional banking in a low-interest-rate environment. NIMs denote a bank's profitability from its core banking operations—the difference between interest income from loans, securities, and other assets and interest expenses from deposit and non-deposit funding. In practice, bank NIMs have changed with the stance of monetary policy—reductions in the effective federal funds rate have coincided with declining bank NIMs.

However, declining NIMs may pose a greater challenge for small banks than large banks. Small community banks rely more heavily on the traditional banking model and generate most of their income from interest on loans, while large banks typically have more sources of noninterest income. Understanding differences in small and large bank NIMs (as well as the forces driving them) may shed light on the effects of the recent decline. Typically, small banks provide financing to small businesses that have fewer options for external financing. Lower profits and increased distress at small banks could constrain credit to their customers, adversely affecting local economic outcomes.

In this article, we examine the relative contributions of activities that compose bank NIMs as well as their sensitivities to interest rates. We find that the recent decline in bank NIMs was largely driven by

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changes in interest rates rather than changes in their composition in bank portfolios. In particular, we find that interest income from loans and interest expenses on deposits are sensitive to changes in interest rates. However, the sensitivities are not always symmetric between large and small banks and between increases and decreases in interest rates. For example, increases in interest rates have a relatively stronger association with loan contributions to NIMs at large banks. Therefore, while lowering interest rates may be relatively disadvantageous for small banks by lowering NIMs, raising interest rates is not necessarily advantageous for them. Our results suggest that increases in loan incomes at small banks have had a relatively weaker association with increases in interest rates since 2015.

Section I describes the behavior of large and small bank NIMs since the global financial crisis (GFC) of 2008. Section II examines how changes in the composition of bank activities and their yields have changed NIMs over short and long horizons. Section III shows that interest sensitivities of contributions to bank NIMs vary with bank size and the stance of monetary policy.

I. Bank NIMs since the Global Financial Crisis of 2008

A decline in NIMs may undermine the viability of the traditional banking model, in which banks primarily take deposits and make loans, with greater consequences for small banks.[1] Small banks rely more on the traditional approach to banking: they focus on building relationships with borrowers and typically lend to small businesses, whose ability to repay is arguably harder to assess due to a lack of history or experience. In contrast, large banks rely more on a transaction-based business model and typically lend to large businesses, which are more transparent and have access to alternative sources of financing in capital markets. Moreover, large banks have increasingly supplemented their interest earnings with noninterest income, which includes fees, service charges, and revenues from trading and investment banking activities (Haubrich and Young 2019). Whereas interest income accounts for roughly 40 to 50 percent of large banks' operating income (the sum of net interest and noninterest income), it accounts for roughly 60 to 70 percent of small bank operating income. Naturally, large banks are less reliant on NIMs.

As Chart 1 shows, small banks typically record higher NIMs than large banks. This difference can be generally attributed to differences in their business models. Small banks tend to pay more on their expenses from liabilities because they lack the benefits of scale economies and "too big to fail" subsidies in funding markets that accrue to large banks (Jacewitz and Pogach 2016).[2] At the same time, small banks may be able to charge substantially higher rates on their loans because they build relationships with borrowers who arguably have fewer outside options for financing than clients of large banks.

Chart 1 also shows that large and small bank NIMs diverged after the GFC. In the five years following the GFC, large bank NIMs (blue line) fell by 70 basis points, whereas small bank NIMs (green line) declined by only 20 basis points (Covas, Rezende, and Vojtech 2015).[3] Three factors may explain this divergence. First, interest expenses declined relatively more at small banks during this period than at large banks. Large banks had already lowered their interest expenses prior to the GFC, leaving them with little room for further downward adjustment in deposit rates. Second, large banks experienced a greater decline in interest income from loans relative to securities and other assets. Third, GFC bank failures were limited almost exclusively to small banks; accordingly, their smaller decline in NIMs after the crisis may reflect a survivorship bias.

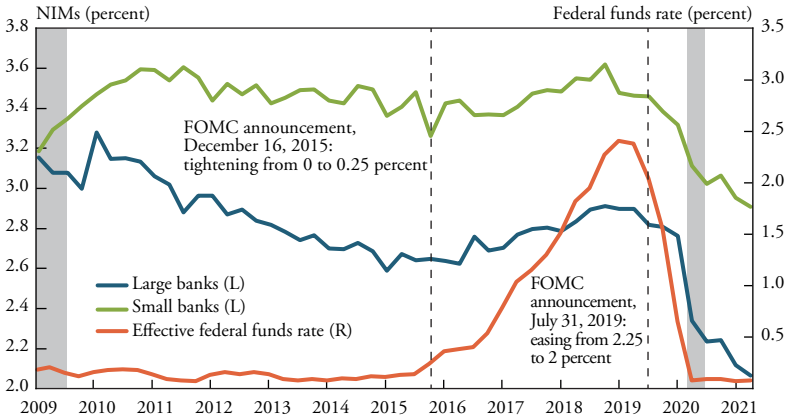
Barring the period from 2016 to mid-2019 during which monetary policy tightened, NIMs have gradually declined with interest rates since the GFC. This decline is part of a much broader historical trend of declining bank NIMs attributed to declining long-term interest rates (term premiums) since the early 1990s (Di Lucido, Kovner, and Zeller 2017).

More recently, however, the decline in NIMs has been both sharper and relatively comparable across large and small banks. Since 2019:Q2, large bank NIMs have declined by around 70 basis points, while small bank NIMs have declined by roughly 55 basis points. This decline in NIMs has coincided with the easing of monetary policy that started in August 2019. The further easing of monetary policy since the onset of the pandemic in early 2020 was accompanied by an even steeper decline in NIMs.[4]

Although the gap between small and large bank NIMs widened after the GFC, the difference in levels has remained nearly unchanged

Chart 1

NIMs at Small and Large Banks, 2009:Q1 to 2021:Q2



Note: Gray areas represent National Bureau of Economic Research (NBER)-defined recessions.
Sources: Board of Governors of the Federal Reserve System, NBER, and authors' calculations.

in recent years. This recent pattern would suggest that factors that affect NIMs, such as interest rates, do so in the same way for large and small banks. However, as prior research has shown, NIMs and interest rates do not always move in tandem (Ennis, Fessenden, and Walter 2016). Moreover, considering the widening of large and small bank NIMs after the GFC, NIMs and interest rates do not necessarily move in the same way for large and small banks either. Investigating the interest sensitivities of NIM components may shed light on differences in large and small bank NIMs over the credit cycle—the expansion and contraction of credit over time.

II. Changes in the Contributions of NIM Components over Short and Long Horizons

Bank NIMs comprise five components that tend to vary with interest rates. The three asset-side components—loans, securities, and other interest-bearing assets—generate income for the bank. The two liability-side components—expenses from interest-bearing deposit and nondeposit liabilities—reduce that income. Changes in contributions from these five components together yield the overall changes in NIMs. In general, the asset-side components generate positive contributions when interest rates rise, whereas the liability-side components generate a negative contribution. The converse is true when interest rates decline.

A change in the contribution from any one of these components can be further decomposed into changes in the yield of that component and changes in the share of that component in banks' portfolios. For example, the total contribution from loans comprises changes in loan yields (changes in returns on loans) and changes in the loan share of earning assets (changes in the volume of loans in the banks' asset portfolio). Accordingly, we account for changes in both yields and shares of each NIM component when assessing potential differences in the relative contributions of NIM components across small and large banks.

NIM components and the 2019:Q2–2021:Q2 decline in bank NIMs

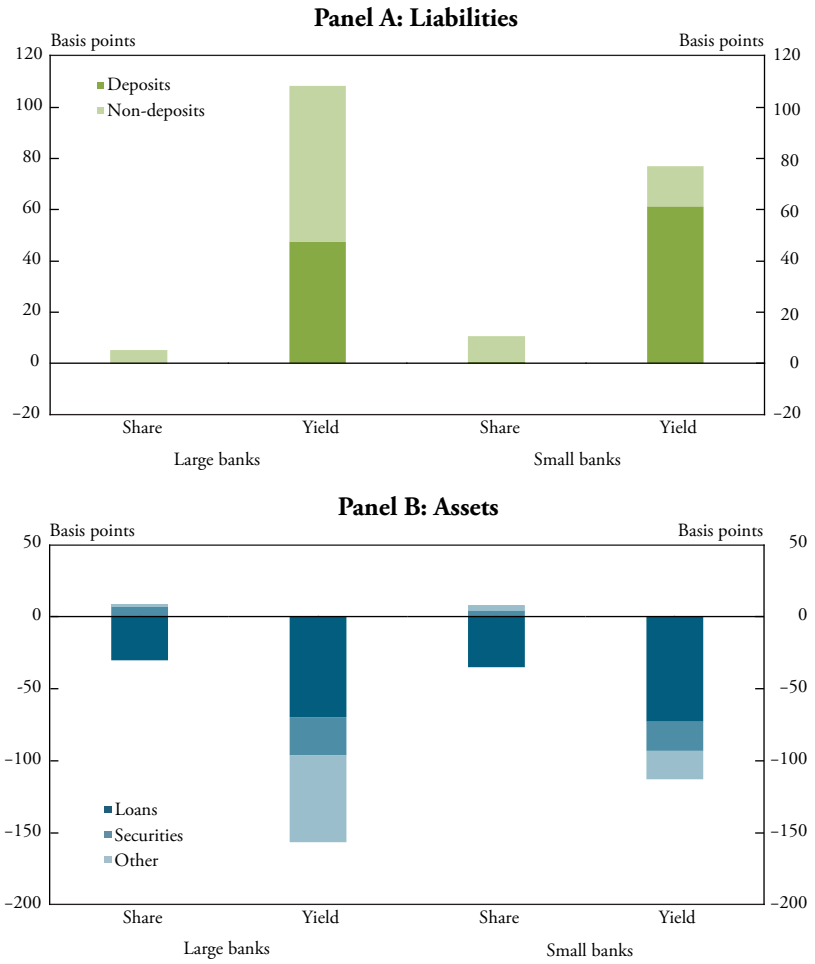
As a first step, we decompose the recent decline in NIMs since 2019:Q2 into changes in the yields and shares of both liabilities and assets. Together, Panels A and B of Chart 2 indicate that the bulk of changes in contributions to NIMs in the past two years have been driven by changes in the yields of both asset-side and liability-side components. Changes in the portfolio composition of assets and liabilities have been relatively small.

Panel A of Chart 2 shows that reduced expenses from interest-bearing deposit and non-deposit liabilities have contributed positively to NIMs at both small and large banks over the past two years. In comparison, the contribution from changes in portfolio composition have been minimal and can be attributed mostly to a marginal increase in non-deposit financing.[5] Deposits make up a relatively larger share of total liabilities in small banks (about 70–80 percent compared with 50–60 percent for large banks) and consequently contributed relatively more to changes in yields at small banks. Moreover, small banks tend to gain relatively more from reduced expenses from deposits when interest rates are cut (Covas, Rezende, and Vojtech 2015). In contrast, non-deposits make up a relatively larger share of total liabilities in large banks and consequently a relatively larger share of contributions from changes in yields.

Panel B of Chart 2 shows that reduced interest income from loans, securities, and other interest-bearing assets contributed negatively to NIMs at both large and small banks over the past two years, more than offsetting the positive contribution from reduced expenses.[6] The negative contribution from changes in yields from loans and securities (dark blue and medium blue bars, respectively) has been comparable

Chart 2

NIM Contributions from Changes in Yields and Shares, 2019:Q2 to 2021:Q2



Sources: Board of Governors of the Federal Reserve System and authors' calculations.

across large and small banks. However, the negative contribution from changes in other interest-bearing assets (light blue bars)—which include leases, trading assets, repurchase agreements, and interest-bearing balances due from other depository institutions—is much greater at large banks than small banks. Other interest-bearing assets make up a relatively larger share of interest-earning assets in large banks and consequently a relatively larger share of contributions from changes in yields.

Importantly, changes in the share of loans in bank portfolios have also contributed negatively to NIMs in the last two years. The dark blue bars in Panel B show that declining loan shares at both small and large banks made a significant negative contribution to NIMs. This result stands in contrast with the marginally positive contribution of changes in loan shares to NIMs following the GFC (Covas, Rezende, and Vojtech 2015). The decline in loan shares over the past two years has been driven in part by the decline in loan demand due to government stimulus and transfers during the pandemic.[7] Still, the lack of significant increases in bank lending when interest rates drop to low levels has led recent research to question the efficacy of the bank lending channel at low rates (Borio and Gambacorta 2017).

Together, Panels A and B of Chart 2 suggest that despite a sizeable contribution from declining loan shares, most of the decline in bank NIMs over the past two years can be attributed to reduced yields from loans, securities, and other interest-bearing assets. Because changes in interest rates are among the most significant drivers of changes in yields, we next examine how contributions from NIM components vary with changes in interest rates.

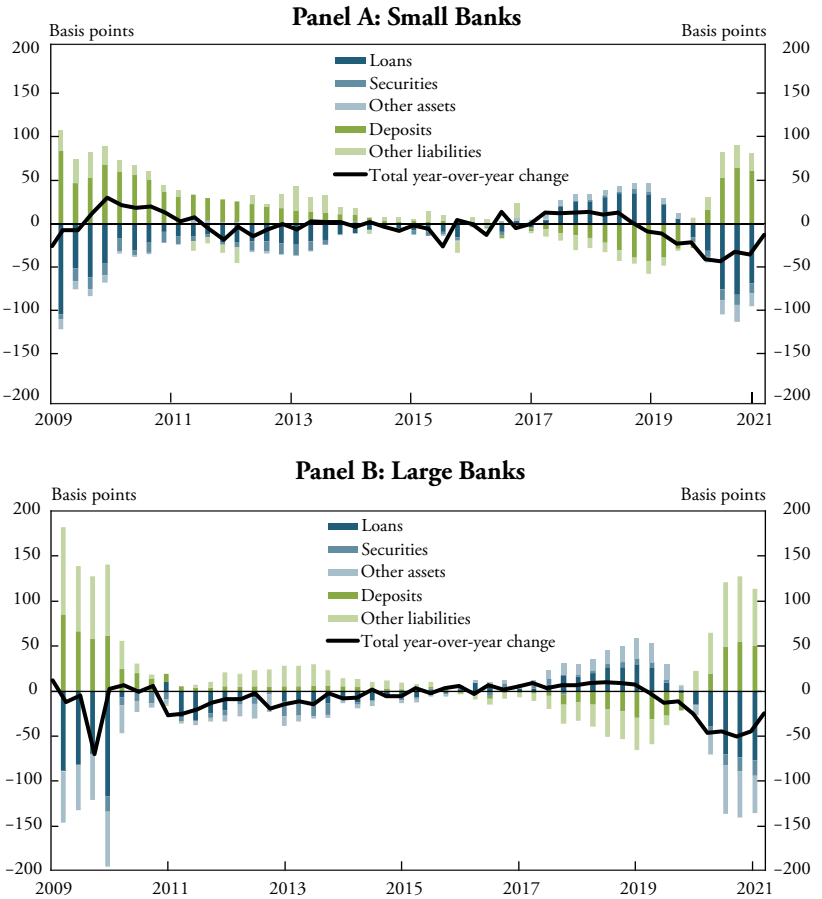
Changing NIM contributions over the post-GFC credit cycle

Understanding how contributions to NIMs change through different phases of the credit cycle is likely to become increasingly important as the economy improves and monetary policy begins to normalize. To assess how the contribution of different NIM components changes with both increases and decreases in interest rates, we extend our period of analysis to 2009:Q1–2021:Q2. We use this post-crisis period because the conduct of monetary policy and the operating environment for banks have changed significantly since the GFC.[8]

NIM components vary based on whether the monetary policy stance is restrictive or accommodative. For example, interest rate cuts during the GFC not only reduced interest expenses from both deposit and non-deposit liabilities but also reduced interest income from assets. Panels A and B of Chart 3 show that after these cuts, liability-side components at both large and small banks contributed positively to bank NIMs, while asset-side components contributed negatively—the same pattern exhibited during the recent decline in NIMs since mid-2019.

Chart 3

Changes in Contributions of NIM Components, 2009:Q1 to 2021:Q2



Sources: Board of Governors of the Federal Reserve System and authors' calculations.

When monetary policy became more restrictive after 2015, this pattern reversed: interest expenses increased (contributing negatively to NIMs) as did interest income (contributing positively to NIMs). Because rate cuts were drastic at the onset of the GFC and the COVID-19 pandemic, the changes in NIM contributions have been consequently greater at the beginning and end of the period shown in Chart 3 than in the middle.

Changes in NIM contributions at smaller banks tend to be smaller in magnitude than those at large banks. Comparing Panels A and B of Chart 3 shows that changes in NIM contributions at small banks come

mostly from loans and deposits, which comprise a relatively larger portion of their balance sheet. In contrast, changes in NIM contributions at large banks tend to be larger and come from other interest-bearing assets and non-deposit liabilities. The heterogeneity in the pattern of small and large bank NIM contributions reflects the relative share of each component in the bank's balance sheet.

Despite these differences, NIM contributions from small and large banks have varied similarly with changes in interest rates, albeit with different magnitudes. In other words, differences in the contributions of NIM components across large and small banks can be traced largely to the magnitude of these components' response to changes in rates. In the next section, we measure the responsiveness of these contributions using statistical methods. In doing so, we account for changes in macroeconomic and financial conditions that can also influence NIM contributions.

III. How Do NIM Contributions Vary with Interest Rates?

Although both interest income and interest expenses exhibit a positive relationship with interest rates, this relationship is not necessarily symmetric. For example, an increase in the effective federal funds rate might generate a greater increase in interest income from loans than in interest expenses on deposits, thereby raising NIMs. In fact, the pass-through from policy rates to loan rates and deposit rates often differs. Driscoll and Judson (2013) find that the pass-through from monetary policy to deposit rates tends to be sluggish in episodes of tightening. The pass-through to deposit rates may also be weaker because deposit rates lack a term premium—additional compensation investors receive for longer-maturity assets such as loans. Research has often attributed the historical decline in bank NIMs since the early 1990s to a decline in term premiums (Paul and Zhu 2020). Because NIMs constitute the margin of longer-maturity loans over shorter-term deposits, both short-term and long-term interest rates are relevant to any analysis of the interest sensitivity of NIM components.

We use interest rates on U.S. Treasury securities as our measures of short-term and long-term interest rates. The market for U.S. Treasuries is the largest and most liquid financial market in the world, and Treasuries are widely accepted as the benchmark low-risk assets against which all interest-bearing assets are priced. The plot of yields on Treasury securities of

different maturities is known as the yield curve. An upward *shift* of the yield curve denotes an overall increase in interest rates regardless of maturity. An upward *slope* of the yield curve, on the other hand, denotes a positive term premium and therefore a relative increase in interest rates for longer-maturity Treasuries over shorter-maturity Treasuries. We use changes in the three-month Treasury yield to denote a shift in the yield curve and use the difference between the 10-year and the three-month Treasury yields to denote changes in the slope of the yield curve. The level and slope of the yield curve are summary measures for overall interest rates.

To determine the sensitivity of different NIM components to changes in interest rates, we estimate a linear model that controls for variations in macroeconomic and financial conditions.[9] In particular, we control for overall macroeconomic conditions using (annualized) quarterly changes in real GDP, the civilian unemployment rate, and commercial and residential house price indexes. In addition, we control for financial market conditions using quarterly growth in stock returns and a risk premium measured as the difference between the BBB bond index and the 10-year Treasury yield.

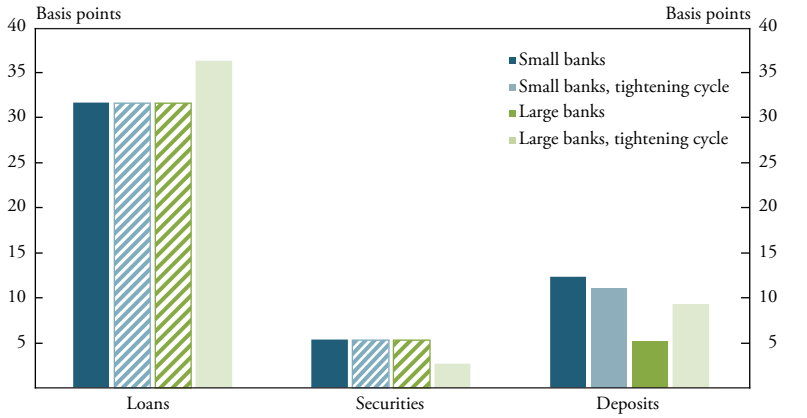
We interact explanatory variables in our model with an indicator variable for large banks and an indicator variable for the monetary policy tightening cycle. Fully interacting explanatory variables with an indicator variable for large banks allows us to determine whether the observed associations differ between large and small banks. Moreover, fully interacting explanatory variables with an indicator variable for the quarters that belong to a tightening cycle helps us determine whether the observed associations differ based on the stance of monetary policy.[10]

We find significant associations between interest rates and NIM contributions from deposits, loans, and securities. However, we find no significant association between interest rates and NIM contributions from other assets and non-deposit liabilities. These results are consistent across small banks and large banks and hold irrespective of the stance of monetary policy. Appendix Table A-1 includes the complete regression results.

Chart 4 shows that changes in interest rates have the strongest positive association with changes in NIM contributions from loans and a relatively weaker positive association with deposits and securities. Specifically, a 1 percentage point change in the three-month Treasury yield is associated with a 32 basis point change in NIM contributions from loans

Chart 4

Association with a 1 Percentage Point Change in the Three-Month Treasury Yield



Notes: Solid bars indicate associations are statistically significant at the 5 percent level. Hashed bars indicate no statistically significant change (at the 10 percent level) from the baseline estimate. "Tightening cycle" indicates quarters in which the Federal Reserve increased the target federal funds rate or left the target federal funds rate unchanged following an increase in previous quarters.
Sources: Board of Governors of the Federal Reserve System and authors' calculations.

at small banks (dark blue bar) compared with a 12 and 5 basis point change in the NIM contributions from deposits and securities, respectively.[11] The association for loans is stronger because most bank loans are variable-rate loans that are indexed to benchmark rates (Kumbhat, Palomino, and Perez-Orive 2017). Monetary policy drives benchmark rates, yielding a higher pass-through to loan yields and loan contributions.[12]

However, the estimated associations do not always change with bank size or with the stance of monetary policy. For example, at small banks, the association between interest rates and NIM contributions from loans and securities does not significantly change during a tightening cycle (comparing the dark blue and hashed light blue bars in Chart 4). Put differently, the positive contributions to small bank NIMs from loans and securities when rates are rising are of similar magnitude to the negative contributions from loans and securities when rates are falling. In addition, when policy is accommodative and rates are falling, the association between interest rates and NIM contributions from loans and securities does not significantly change with bank size (comparing the dark blue and hashed dark green bars). In other words, large and small banks see a similar decrease in NIM contributions from loans and securities when rates are declining.

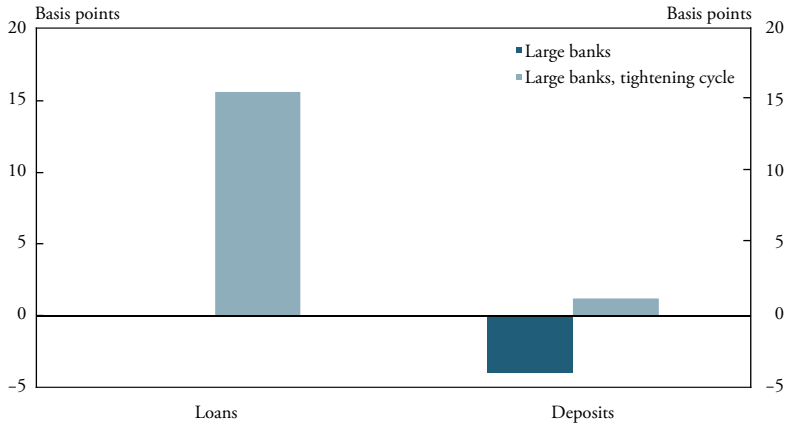
In contrast, during a tightening cycle, when interest rates are *increasing*, the associations between interest rates and NIM contributions from loans and securities differ by bank size. The solid light green bars in Cha*f* rt 4 show that the association at large banks is relatively stronger and more substantial for loans but weaker and negligible for securities.

The stronger association between rising rates and higher loan income at large banks could be the result of increasing loan shares, increasing yields, or both. First, contrary to conventional wisdom, raising rates in an ultra-low-rate environment may actually boost lending, raising the loan share of earning assets. Indeed, this article has already demonstrated that the recent decline in interest rates shrank bank loan portfolios (see Panel B of Chart 2). Rising interest rates increase banks' interest income from lending, thereby increasing their willingness to lend (Borio and Gambacorta 2017). Our results would suggest that this incentive is relatively stronger at large banks given their access to alternative sources of income. Second, increasing yields on large bank loans can be attributed to differences in the types of loans (that is, more leveraged loans at large banks) and loan contract terms between small and large banks. Because the stronger association between rising rates and higher loan income at large banks is relative to small banks, it could also be attributed to a lower degree of pass-through on loan rates for small-bank customers who may be unwilling or unable to withstand a higher interest burden. Another important factor is the increased concentration of loans at large banks in the syndicated loan market—the largest market for bank loans—allowing them to charge higher spreads on comparable loans (Lian 2018). By contrast, small banks possess relatively less market power in the loan markets in which they operate. Therefore, differences in market power could also account for the relatively higher loan incomes at large banks following rate increases.

The association between interest rates and NIM contributions from deposits changes with bank size and the stance of policy. Because deposits are an expense item, they generate a positive contribution to NIMs when interest rates decline and a negative contribution when interest rates increase. However, the magnitude of these contributions differs between small and large banks. When monetary policy is accommodative, reduced expenses from lower deposit rates are higher at small banks than at large banks (comparing the solid dark blue bar

Chart 5

Association with a 1 Percentage Point Increase in the Slope of the Yield Curve



Notes: All associations shown in the chart are statistically significant at the 5 percent level. "Tightening cycle" indicates quarters in which the Federal Reserve increased the target federal funds rate or left the target federal funds rate unchanged following an increase in previous quarters.
Sources: Board of Governors of the Federal Reserve System and authors' calculations.

with the solid dark green bar in Chart 4). This result is unsurprising, as large banks pay less on deposits than small banks and accordingly can reduce expenses to a lesser extent than small banks when the Federal Reserve cuts rates. Thus, small banks gain relatively more from reduced interest expenses when the stance of policy is accommodative. During a tightening cycle, however, the estimated associations between interest rates and deposit contributions are comparable (comparing the solid light blue bar with the solid light green bar in Chart 4).[13] Despite large banks' funding advantage, increased expenses on deposits from rising rates at large banks are comparable to those at small banks. Yet, as mentioned above, rising rates did increase NIM contributions from loans at large banks to a significantly greater degree than at small banks. With a comparable increase in expenses and a relatively greater increase in incomes, a tightening cycle does appear to favor large banks.

Our analysis yields significant associations between the slope of the yield curve and NIM contributions from deposits and loans, but only for large banks.[14] Chart 5 shows that though the association with deposits is marginal, the association with loans is substantial. During a tightening cycle, a steepening of the yield curve can significantly

increase loan incomes at large banks. Bank loans typically have maturities over longer horizons. Although some loans are indexed to shorter-term benchmarks, the loan spread is known to increase with the steepening of the yield curve.[15] This result also implies that yield curve inversion during a tightening cycle would substantially reduce income from loans at large banks.

Conclusion

The sharp drop in bank NIMs since 2019 has once again focused attention on the viability of the traditional banking model. Understanding the implications of this decline, however, requires an understanding of how the components of NIMs have changed, both in bank portfolios and in their sensitivity to interest rates. We analyze changes in five components that drive NIMs at small and large banks over the post-GFC period. We find that the recent decline in bank NIMs since mid-2019 was largely driven by changes in yields on these components rather than changes in their composition in bank portfolios. In particular, we find that changes in yields on loans and deposits drove changes in NIMs at small banks while changes in yields of other assets and non-deposit liabilities drove changes in NIMs at large banks. This pattern has largely held since the GFC, though small banks have seen a relatively greater decline in NIMs in recent years.

We conduct a statistical analysis of the sensitivities of NIM contributions to changes in interest rates over the post-GFC period. After controlling for financial and economic conditions that also affect bank NIMs, we find significant associations between interest rates and NIM contributions from deposits and loans at both large and small banks. Despite their funding advantage, increased expenses on deposits from rising rates at large banks are comparable to those at small banks. However, rising rates did increase the NIM contribution from loans at large banks to a significantly greater degree than at small banks. Moreover, this contribution increases further with a steepening of the yield curve. With a comparable increase in expenses and a relatively greater increase in incomes, the statistical analysis suggests that a tightening cycle of monetary policy has favored large banks relatively more over the post-GFC period.

Our results highlight that while lowering rates is relatively disadvantageous for small banks because of the accompanying decline in NIMs, raising rates is not necessarily advantageous for them. Although recent experience would suggest that a tightening cycle may mitigate the disadvantage from low NIMs faced by small banks, it would also help large banks in terms of relatively higher loan incomes. More research is needed to determine the source of large banks' advantage in loan incomes during tightening cycles. Differences in loan types and contractual terms between small and large banks could yield this advantage, as could relatively higher market power in setting loan rates.

Appendix

Regression Results

Table A-1

Interest Rate Sensitivities of NIM Components

	Dependent variable				
	Assets			Liabilities	
Independent variables	Loans	Securities	Other assets	Deposits	Non-deposits
Level (short-term rate)	0.316**	0.053*	0.035	0.123**	0.090
	(0.020)	(0.006)	(0.039)	(0.004)	(0.157)
Level * Large bank	–0.031	0.015	0.018	–0.071**	0.114
	(0.007)	(0.004)	(0.014)	(0.002)	(0.056)
Level * Tighten	0.028	–0.086	0.002	–0.012**	0.030
	(0.018)	(0.058)	(0.030)	(0.000)	(0.060)
Level * Large bank * Tighten	0.050**	–0.026**	0.025	0.053**	–0.031
	(0.001)	(0.002)	(0.011)	(0.002)	(0.028)
Slope	0.133	0.070	–0.010	0.025	0.036
	(0.063)	(0.023)	(0.010)	(0.004)	(0.016)
Slope * Large bank	–0.042	–0.014	0.014	–0.040**	0.036
	(0.007)	(0.005)	(0.006)	(0.002)	(0.006)
Slope * Tighten	–0.117	–0.092	0.016	–0.040	–0.001
	(0.032)	(0.072)	(0.028)	(0.007)	(0.006)
Slope * Large bank * Tighten	0.156**	–0.019	–0.037	0.052**	–0.005
	(0.011)	(0.008)	(0.012)	(0.002)	(0.024)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	98	98	98	98	98
R^2	0.996	0.975	0.993	0.996	0.974

* Significant at the 10 percent level
** Significant at the 5 percent level
*** Significant at the 1 percent level

Notes: Robust standard errors are in parentheses. We use changes in the three-month Treasury yield to denote a shift in the level of the yield curve and use the difference between the 10-year and the three-month Treasury yields to denote changes in the slope of the yield curve. "Large bank" is an indicator variable for the group of banks with $50 billion of assets in end-of-year 2009 U.S. dollars. "Tighten" is an indicator variable for observations that belong to a quarter during the tightening cycle from 2015:Q4 to 2019:Q2.

Endnotes

[1]We use a $50 billion threshold in end-of-year 2009 U.S. dollars to distinguish between large and small banks. We use public data from regulatory filings of domestic banking organizations. Our primary data source is Form Y-9C, which collects basic financial data from domestic bank holding companies (BHCs). We refer to banks, banking organizations, and BHCs interchangeably.

[2]In addition to scale economies, large banks have benefitted from increased concentration and market power in some markets, as well as any implicit too-big-to-fail subsidy.

[3]Covas, Rezende, and Vojtech (2015) present the trends for small and large bank NIMs prior to the GFC.

[4]Research has pointed to the fact that the already severe decline in NIMs could have been worse without the extraordinary policy interventions undertaken during the pandemic. Marsh and Sharma (2021) find that the Paycheck Protection Program (PPP) supported margins of participating banks. More broadly, Beck, Carletti, and Bruno (2021) argue that these interventions created a virtuous circle that reduced risk premiums for all economic agents, including large banks. We abstract from examining the effects of such extraordinary measures except for their effect on interest rates.

[5]This may come as a surprise to readers who are aware of the record increases in bank deposits since the March 2020 turmoil in financial markets. However, most of the increase in deposits is attributed to noninterest-bearing deposits and therefore not included in NIMs. In addition, banks have significantly reduced expenses on any increases in interest-bearing deposits.

[6]In part, the reduced income has been attributed to low rates on PPP loans (Marsh and Sharma 2021).

[7]Although loan shares have decreased, bank lending increased sharply at the onset of the pandemic and then slowed significantly. Much of the increase in lending comes from participation in the PPP. However, non-PPP bank lending has declined since 2019 (Ennis and Jarque 2021).

[8]The expansion of the Federal Reserve's balance sheet has substantially increased the reserves currently held at banks, whereas changes in liquidity and capital regulation following the GFC have changed banks' operating environment.

[9]We follow the regression specification in Claessens, Coleman, and Donnelly (2018) and Altavilla, Boucinha, and Peydró (2018). Specifically, we regress quarterly contributions to NIMs on a lagged dependent variable and the level and slope of the yield curve. We use year fixed effects and control for quarterly changes in macroeconomic and financial conditions. Alternative specifications yield qualitatively similar results.

[10]We classify a quarter as belonging to a tightening cycle if the Federal Reserve increased the target federal funds rate in that quarter or left the target

federal funds rate unchanged following an increase in previous quarters. Using this definition, we determine that the only tightening cycle in our period of analysis lasted from 2015:Q4 to 2019:Q2.

[11]Because loans and securities are income items, a 1 percentage point increase in the three-month Treasury yield is associated with a 32 basis point increase in the NIM contribution from loans and a 5 basis point increase in the NIM contribution from securities. However, deposits are expense items, and therefore, a 1 percentage point increase in the three-month Treasury yield is associated with a 12 basis point decrease in the NIM contribution from deposits.

[12]Most bank loans are indexed to some benchmark rates. Borrowers submitting loan applications typically get quotes of the contractual benchmark rate plus some number of basis points. Until recently, most banks used as their benchmark the London Interbank Offer Rate (LIBOR), which is highly correlated with Treasury yields of similar maturity. However, with the LIBOR set to expire by the end of 2021, banks are currently using alternative benchmarks.

[13]The estimated associations show that changes in contributions from deposits are only 2 basis points lower than those for small banks.

[14]We cannot make any useful comparison with small banks as our results suggest no statistically significant associations between the slope of the yield curve and NIM contributions for small banks.

[15]The median maturity on large bank syndicated loans is 48 months. And while most loans have been indexed to a three-month LIBOR rate, the spread on the loan would likely increase with the term premium.

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