**Supervisory Implications of Rising Similarity in Banking – Appendix**

A. Balance Sheet

To examine the evolution of bank balance sheets, we looked at the dispersion of balance sheet characteristics like the ratio of loans to total assets or trading assets to total assets for large firms (Figure 1). We measured dispersion by the cross-sectional standard deviation at each point in time and we generally found dispersion to be falling in the post-crisis period.[1]

This also holds for more detailed loan categories like residential real estate, commercial real estate, commercial and industrial, or consumer loans as the composition of loan balances across banks has become more similar. This contrasts with the prior two decades where the data show greater variation and more specialization in a less regulated environment. That is, there is less variation in balance sheet composition now when compare to a decade ago. And while not shown, this also holds true for funding profiles, which have largely become less dependent on wholesale funding sources and shifted towards deposits for the majority of US banks.
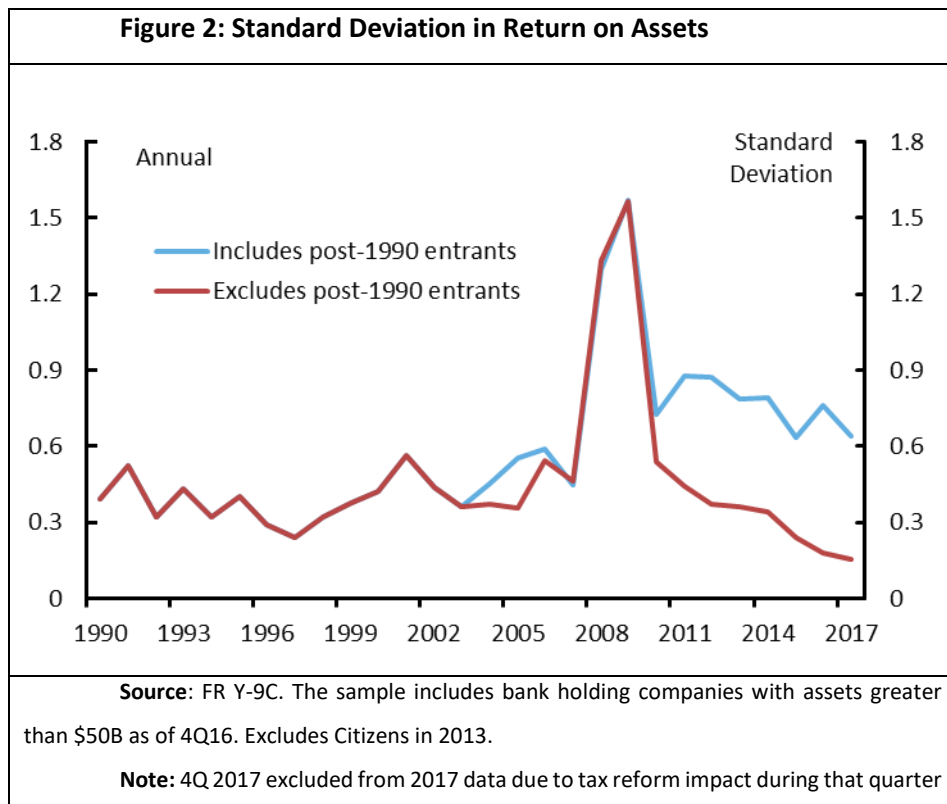

Figure 1: Portfolio Variation

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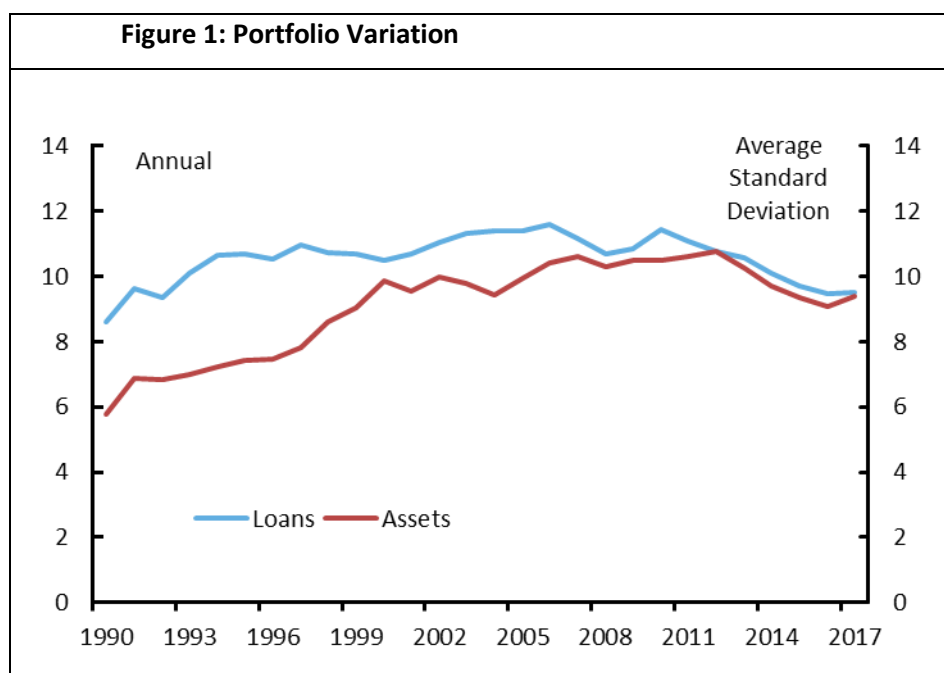
[1] The sample includes a balanced sample of 19 bank holding companies with assets greater $50B as of 4Q16 which have filed Y-9C data since 1990.
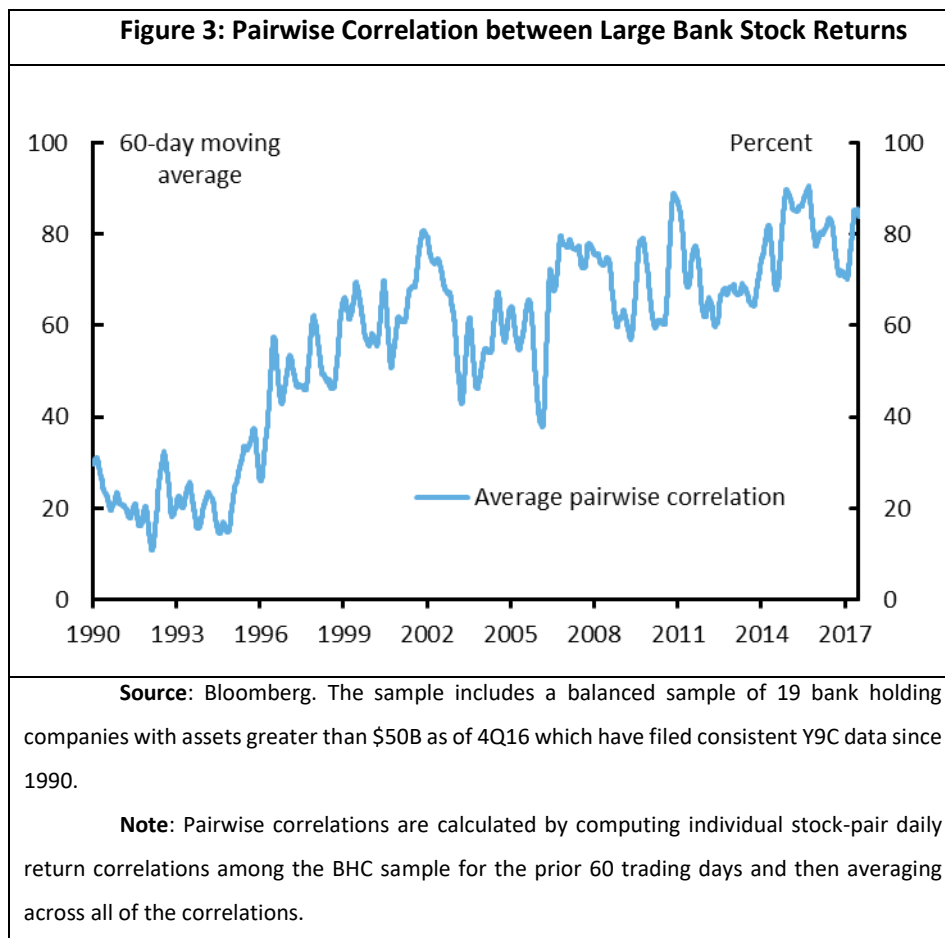
B. Income Statements

We performed a similar analysis for various income statement items such as the return on assets (RoA). Here again, we see a general downward trend in the cross-sectional variation since the financial crisis, which is consistent with the idea of greater similarity of earnings streams. We also looked at the composition of revenue like the share of net interest income in total net revenue which similarly exhibits less dispersion in recent years.

Figure 2: Standard Deviation in Return on Assets

Source: FR Y-9C. The sample includes bank holding companies with assets greater than $50B as of 4Q16. Excludes Citizens in 2013.

Note: 4Q 2017 excluded from 2017 data due to tax reform impact during that quarter

C. Market Indicators

We also looked at the question of bank similarity using various measures of correlation and dispersion of equity market returns and valuations. If bank business models are becoming more similar,
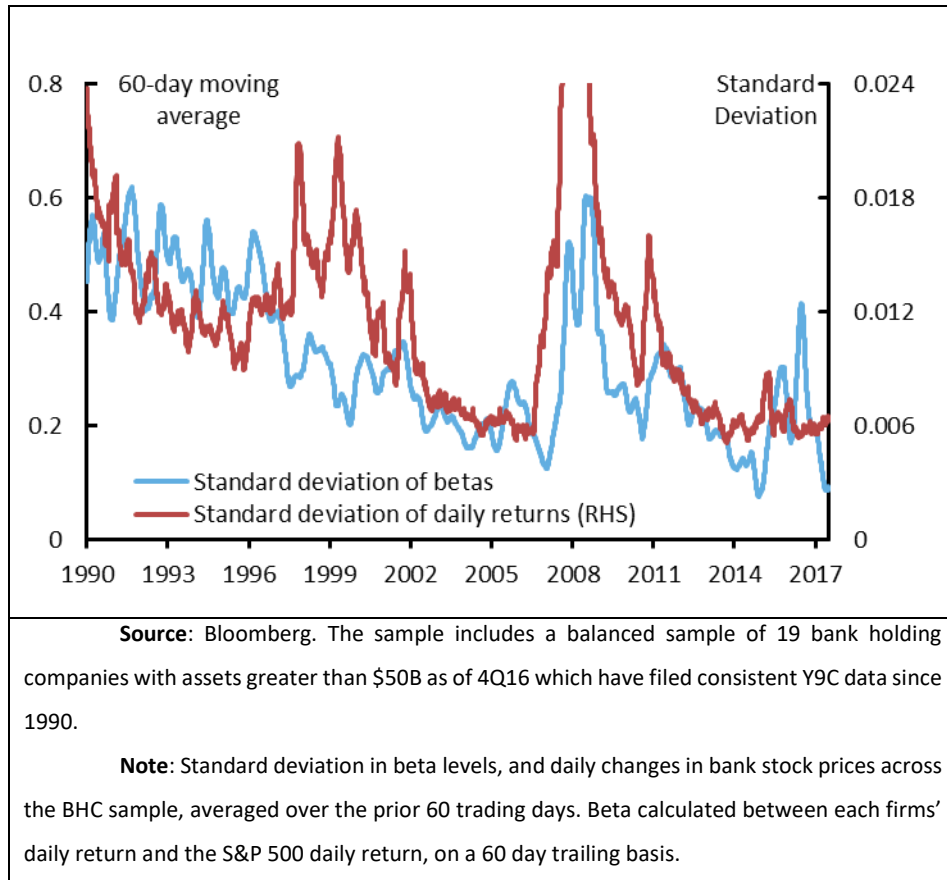
for example, one would expect returns to show greater correlation over time. First, we examined the average pair-wise correlation of equity returns for large banks and the data show a general upward trend since the financial crisis as returns become more correlated.[2] This could reflect greater similarity across banks as returns respond to the same factors or greater diversification within each individual firm, which leaves them relatively more linked to the common systematic factors.

Figure 3: Pairwise Correlation between Large Bank Stock Returns

Source: Bloomberg. The sample includes a balanced sample of 19 bank holding companies with assets greater than $50B as of 4Q16 which have filed consistent Y9C data since 1990.

Note: Pairwise correlations are calculated by computing individual stock-pair daily return correlations among the BHC sample for the prior 60 trading days and then averaging across all of the correlations.

Similarly, we observe declining dispersion in returns as the standard deviation of daily returns is trending down. Finally, we looked at the cross-sectional variation in equity market betas (a measure of correlation with the broader market) and saw a decline since the financial crisis, although it has been punctuated by some spikes recently that seem to be linked to sentiment about deregulation.

Figure 4: Average Standard Deviation of Large Bank Equities

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[2] Pairwise correlations are calculated by computing individual stock-pair daily return correlations among the BHC sample for the prior 60 trading days and then averaging across all of the correlations.

Source: Bloomberg. The sample includes a balanced sample of 19 bank holding companies with assets greater than $50B as of 4Q16 which have filed consistent Y9C data since 1990.

Note: Standard deviation in beta levels, and daily changes in bank stock prices across the BHC sample, averaged over the prior 60 trading days. Beta calculated between each firms' daily return and the S&P 500 daily return, on a 60 day trailing basis.

Taken together, these results are consistent with the premise that large banks returns are becoming more similar. These trends are part of a larger trend since the mid-1990s, however, so it is not clear how much of this can be directly attributed to the recent factors discussed earlier.

D. Organizational Structure

Finally, we utilized a database[3] providing comprehensive information on the entities controlled by each U.S. BHC over time, so that we can observe the industries in which a BHC operates (according to the North American Industrial Classification System (NAICS)). Observing the extent to which BHCs operate in the same industries would provide an indication of how similar they are to one another. We constructed an index of "similarity" for a sample of the largest banks. This index shows a substantial upward trend since 2004 and continuing after the crisis, albeit with a flattening in more recent years.

Figure 5: Similarity in NAICS of BHCs with > $50Bn

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[3] Cetorelli, N., and S. Stern. 2015. "Same Name, New Businesses: Evolution in the Bank Holding Company." Liberty Street Economics (September).

Annual   Index

(chart showing "Similarity in NAICS of BHCs with >$50Bn", x-axis 1990–2017, y-axis 0.2–0.41)
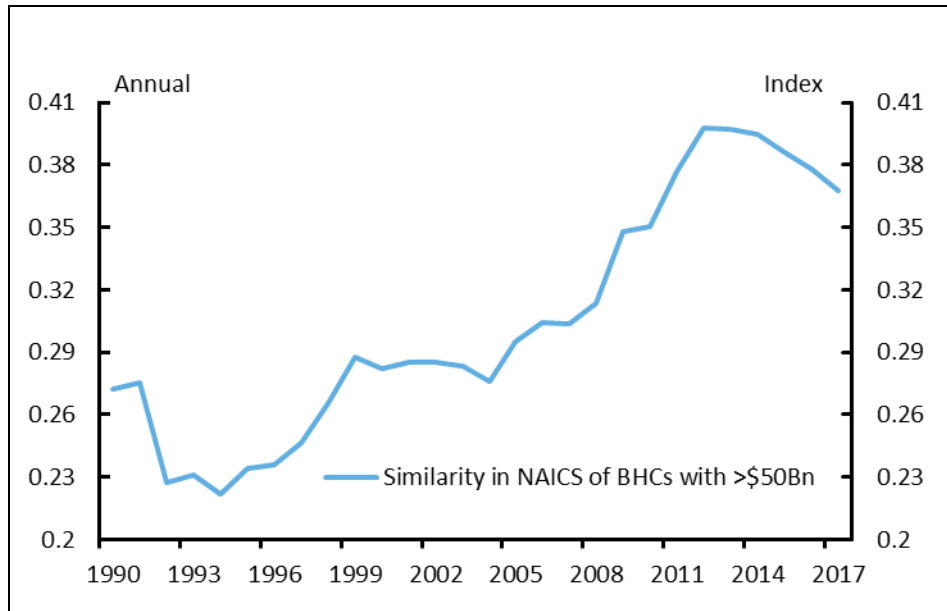
Source: FRBNY Calculation. The sample includes a balanced sample of 19 bank holding companies with assets greater than $50B as of 4Q16 which have filed consistent Y9C data since 1990.

Note: Note: Contains entities with > $50Bn as of 2016, not including post-1990 entrants

Similarity index= $\dfrac{1}{M}\sum\limits_{j=1}^{M}\dfrac{1}{N}\sum\limits_{i=1}^{N} NAICS_{ij}$

If BHCs have a full overlap of 5-digit NAICS, the similarity index is equal to 1. If their business scope is completely disjointed, the index is equal to 1/N, where N is the number of BHCs used in the computation.