FEDERAL RESERVE BANK of NEW YORK

Complexity in Banking: Stock-taking and Way Forward

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Complexity in Banking

- What is it?
- What is the evidence?
- Why do we care?
- What are the drivers and implications? What are the international financial effects?

Goal: Elevate and expand the discussion in Central Banks.

Which forms of complexity create or reduce risks, and when?

Complexity in Banking

Three main points

1. Discussion of concept of Complexity can benefit from refinement and much more intensive analytical attention. A bank is more than signalled by its’ balance sheet.

2. Complexity, defined in terms of Organizational form and Globalization within Bank Holding Companies, generates benefits and costs, some realized during life and some apparent at time of resolution.

3. Particularly interesting are implications for risk-taking and liquidity management, domestically and internationally.

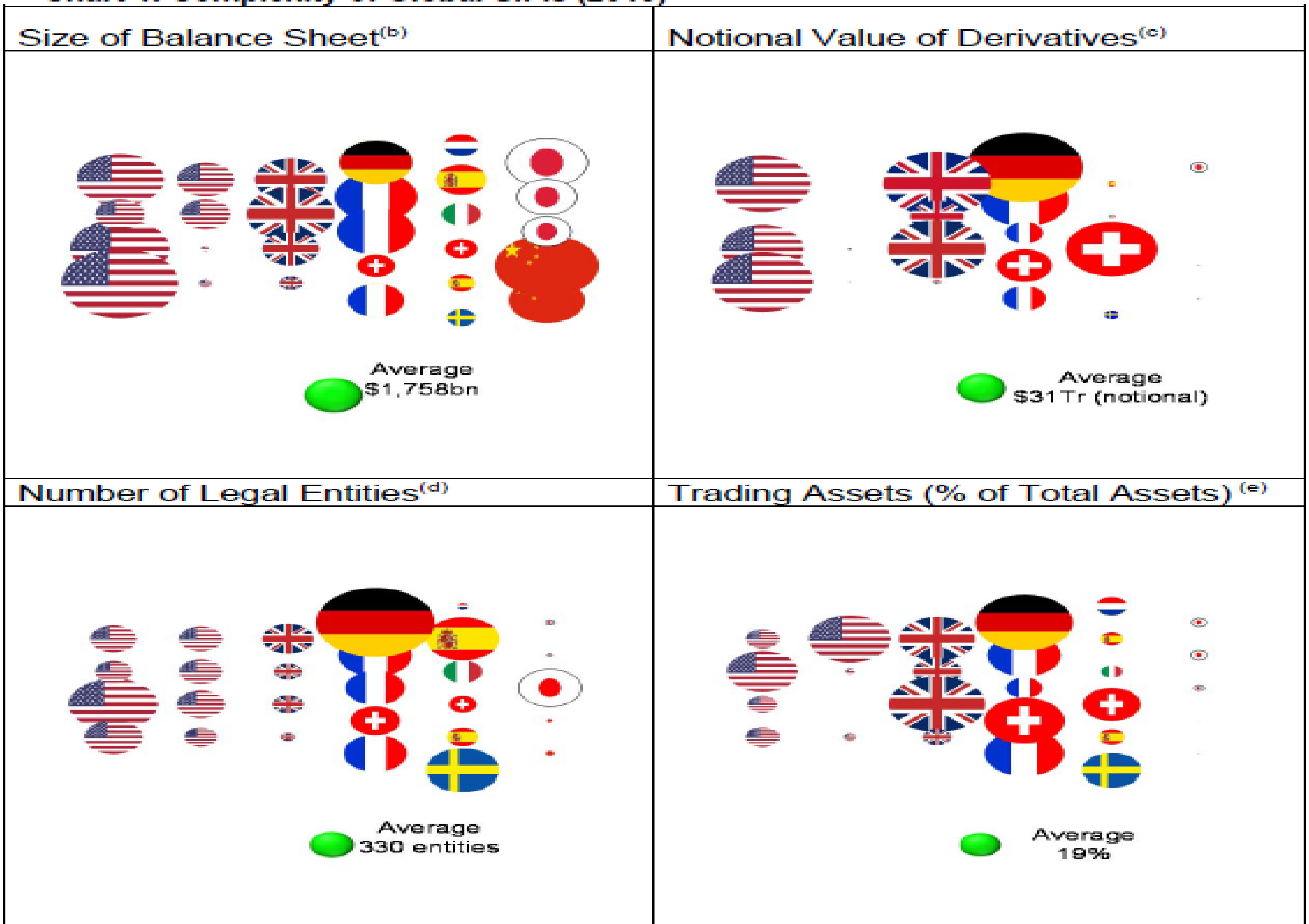
What is Complexity in Banking?

Multiple concepts used!!!

- Non-traditional banking activity
- Business models and business activities
- Organizational
  - ➢ *Numbers and types of entities within the banking conglomerate*
- Geographic
  - ➢ *Branch and subsidiary structures internationally*
- Designation of G-SIBS
  - ➢ *Size of balance sheets, notional value of derivatives, number of legal entities, trading assets*

No off-the-shelf measure of organizational complexity for individual firms. Haldane 2015: number satisfying G-SIFI criteria did not decline post-crisis, through the end of 2013.

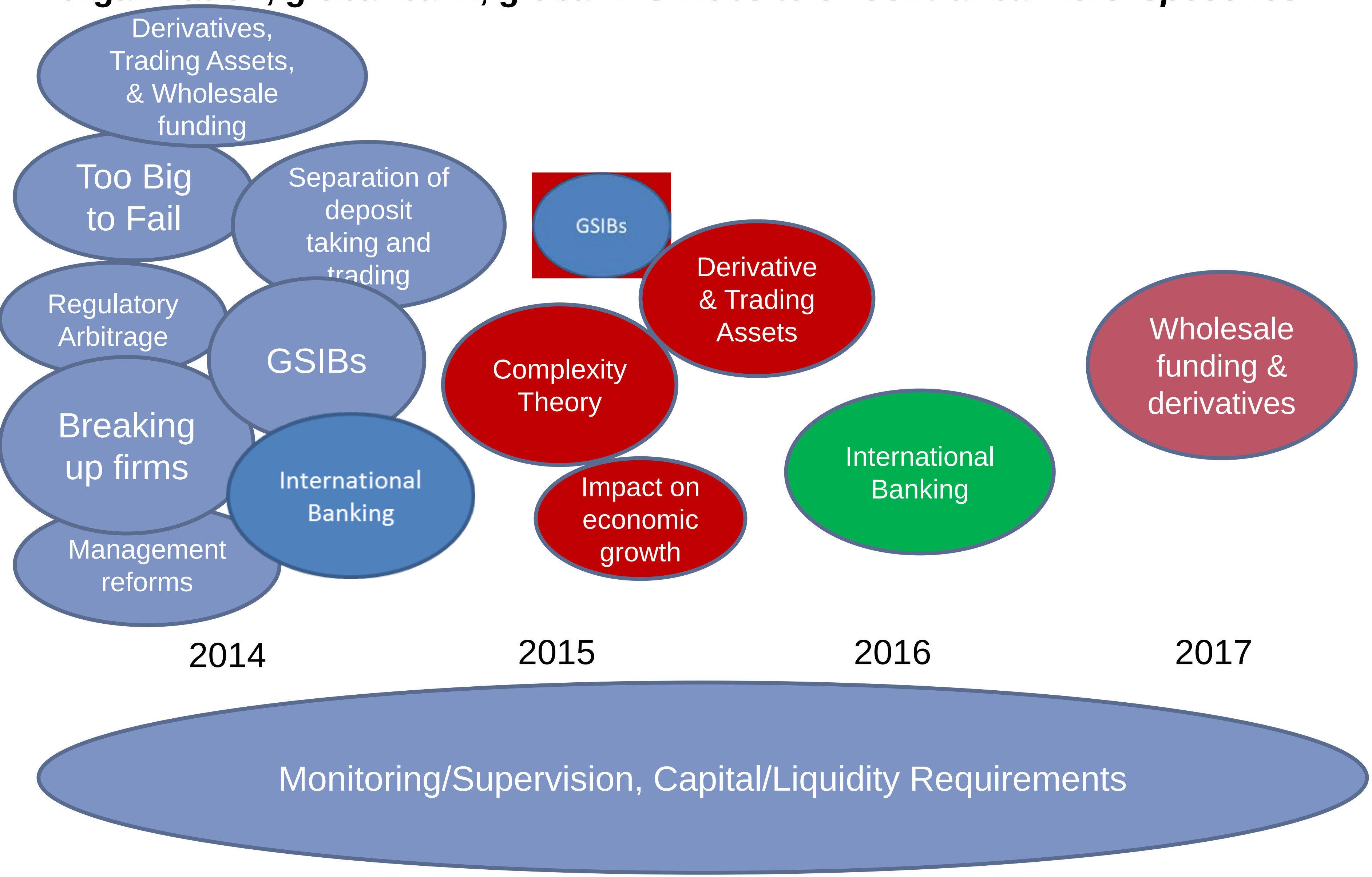
Chart 4: Complexity of Global SIFIs (2013)[(a)]



How do central bankers discuss COMPLEXITY?

- Usually as a word pair: “large and complex banks” …..

… and mainly in monitoring context. Otherwise, frequency of use seems to have declined post-crisis. Keyword search: complex(ity), bank, financial institution, organization, global bank, global *BIS website of Central bankers' speeches*



Types of complexity map to broad policy issues

- Systemic stability and interconnectedness
- Scope of regulation
  - *banks, financial conglomerates, activity-based*
  - *local versus global*
- Criteria for designation on systemic importance
- Approaches and evidence based on BHC size
  - *too big to fail or too complex to fail?*
  - *when does "size" versus "complexity" bring advantages?*
- Approaches to systemic importance of hosted foreign firms
  - *geographic diversification of parents, funding sources*
- Liquidity regulation and guidance
- Recovery and resolution frameworks

Andy Haldane: On Microscopes and Telescopes (3/2015)

- Most extensive speech with a focus on complexity!
- On the architecture of financial regulation given complex financial systems.
- Conceptual framework – lessons from complex networks and topology
- Generates Tinbergen Rule set of principles, by complex system layer
  - ✓ *on individual entities – the microscopic or micro-prudential layer;*
  - ✓ *on national financial systems and economies the macroscopic or macro-pru / monetary policy layer,*
  - ✓ *on the global, the telescopic or global financial architecture layer (which remains perhaps the most deficient).*

✓ Nice way to characterize the efforts of the policy communities, and most of the efforts of researchers

Related research, Gai, Haldane, and Kapadia (JME 2011), *Complexity, concentration and contagion,* shows networks

Interplay between complexity, concentration and stability explored using a simple network model of the banking system. Individual banks are randomly linked together by their interbank claims on each other. Tipping points may be embedded in the financial network and depend on the level of liquid asset holdings, the amount of interbank activity, and the size of haircuts on banks' assets…. Cool insights and pictures!

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One direction of work: policy and analytical attention focused on Bank Business models

One type of classification system, for example for US large banks

- **Universal Banks**: Largest banks with a high degree of geographic and business diversification that includes retail, wholesale, and investment banking and asset management services (US examples: JPMorgan, Bank of America, Citigroup, Wells Fargo)

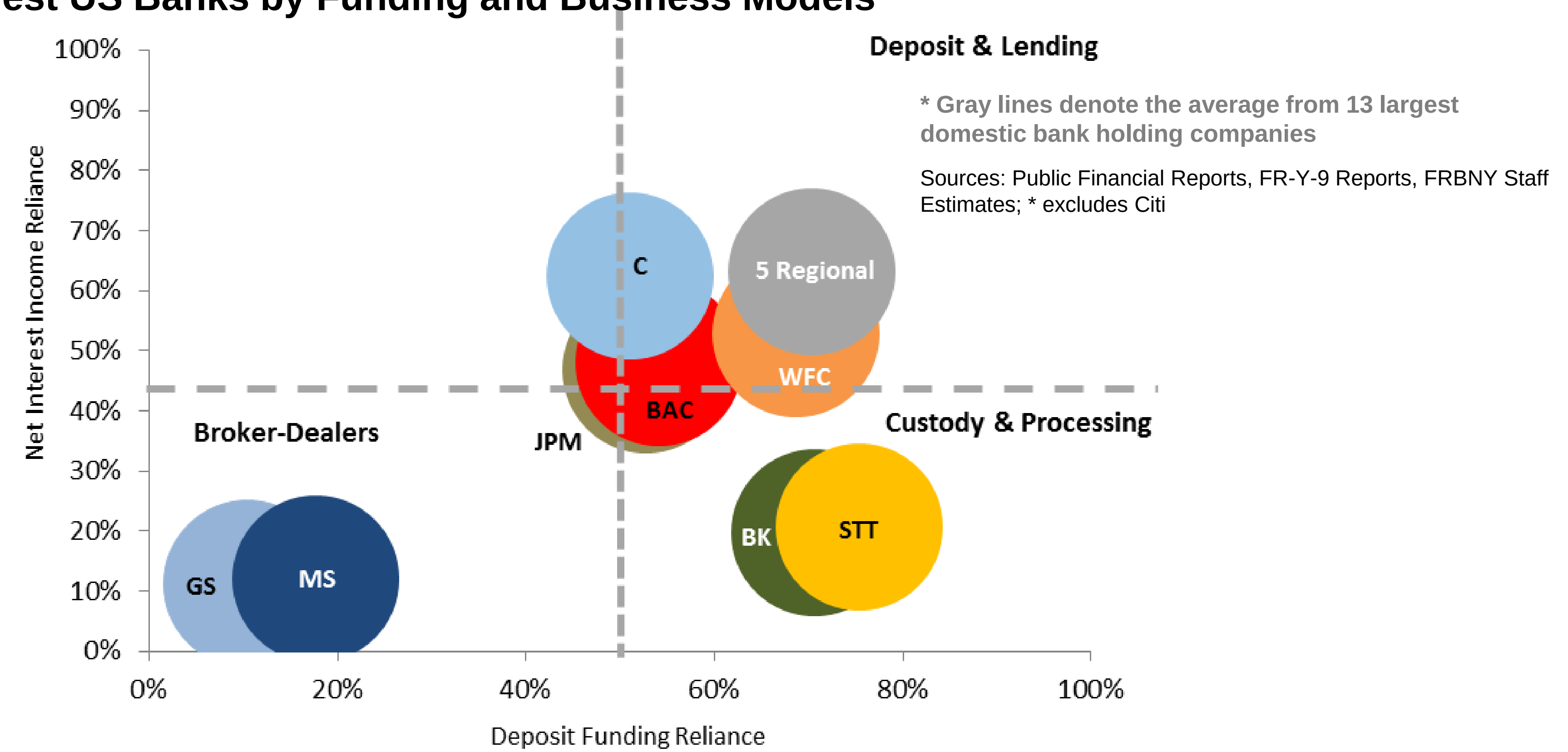
- **Custody Banks**: Specialized banks that safeguard and service client assets without engaging in traditional lending, instead hold a more liquid and high quality asset portfolio (US examples: Bank of New York, State Street)

- **Broker-Dealers**: Firms that focus on servicing capital market activities with extension into asset management (US examples: Goldman Sachs, Morgan Stanley)

- **Regional Banks**: Banks with greater business concentration in retail and commercial banking with domestic geographic concentration

Business Model differences link to distinct Risk-taking and Exposures

Largest US Banks by Funding and Business Models



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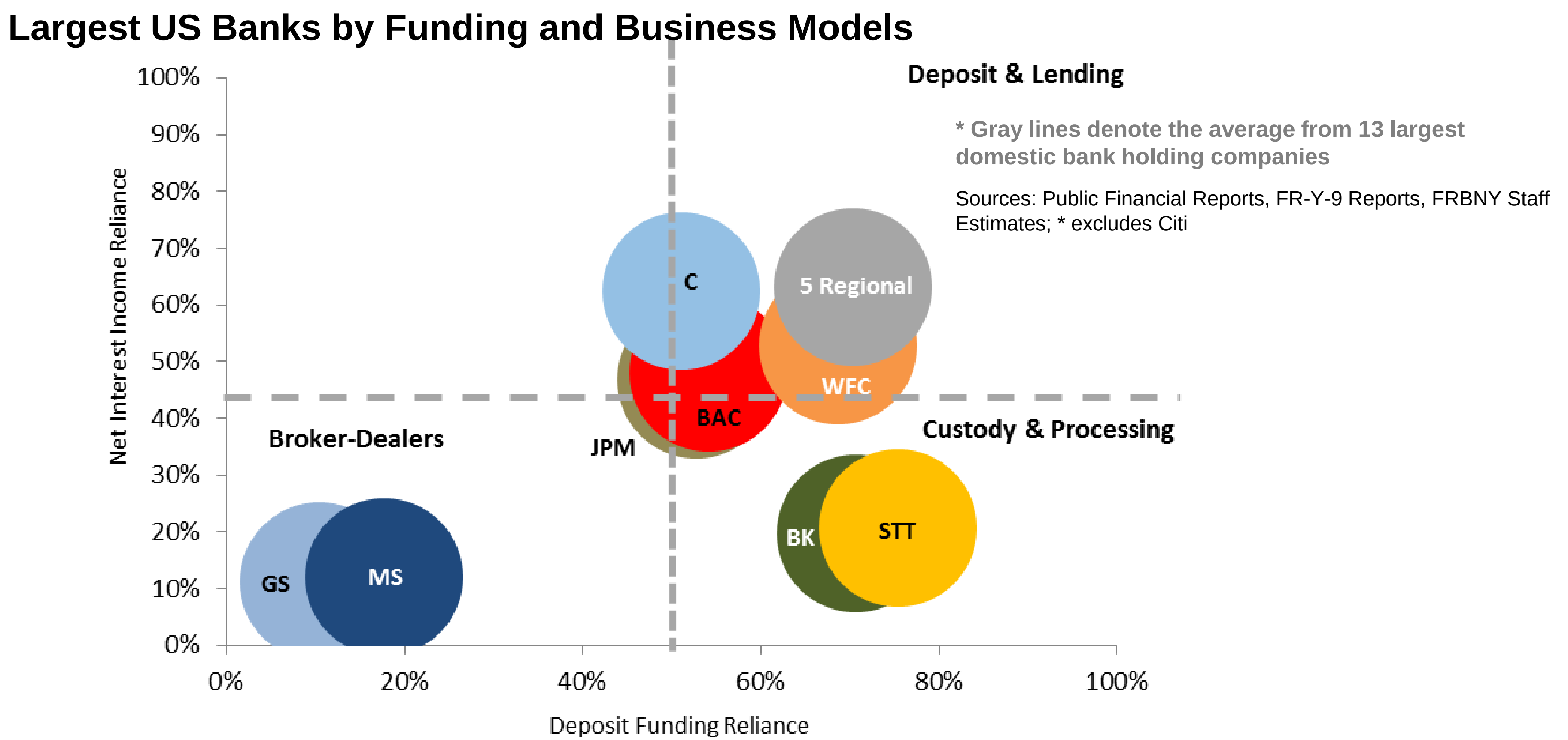


- Regional banks have interest rate exposures that depend on the structure of competition in deposit funding and loan extension
- Broker dealers less vulnerable to interest rate risks (more fully hedged) and more sensitive to volumes of trading transactions (earnings stem from fees)
- Custody banks more sensitive to asset valuations on larger securities portfolios, with larger potential for loss of equity from market corrections

In the spirit of the balance sheet telling the story of the firm, cluster characteristics and then name business models

Bank balance sheet variables reflect strategic choices by management

Loans-to-Assets, Trading Book-to-assets, Trading Assets-to-Total Assets, Interbank Lending-to Assets, Interbank Borrowing-to-assets, Deposits-to-Assets, Wholesale Funding-to-Assets, Stable Funding Ratio

Clustering techniques over data: endogenously generate business models.

Many uses

- ✓ *Monitoring evolution of activities/types in banking system.*
- ✓ *Relating business models to risk measures (z-score, loan loss provisioning, stock return volatility)*

Ayadi and de Groen (2014), "Banking Business Models Monitor 2014: Europe", Montreal, Joint Centre for European Policy Studies (CEPS) and International Observatory on Financial Service Cooperatives (IOFSC)

Roengpitya, Tarashev, Tsatsaronis, Villegas (2017). Bank business models: popularity and performance" (BIS wp 682 December)

Or focus more on individual components of balance sheets

“Structural changes in banking after the crisis” CGFS no 60 (Jan 2018)

- Many large AEs moved away from trading and x-border activity, but have not retrenched from core credit provision.
- Some moved away from wholesale funding.
- Scope reduction: repositioning towards less complex and less capital intensive activities like retail banking and wealth management.
  - *Regulatory changes (e.g. capital, leverage ratio, NSFR) cited as drivers*
- Some evidence of enhanced concentration.
- Less significant changes occurred in the EME space.

One of the open questions: do similar business models and strategies engender excess competition among banks and common exposures among banks and banking systems?

Alternative approach: Treat bank as a unit of a more complex business conglomerate. Explore the form of the organization.

Structure-based approach to complexity

Carmassi & Herring 2014 On complexity, resolvability and systemic risk

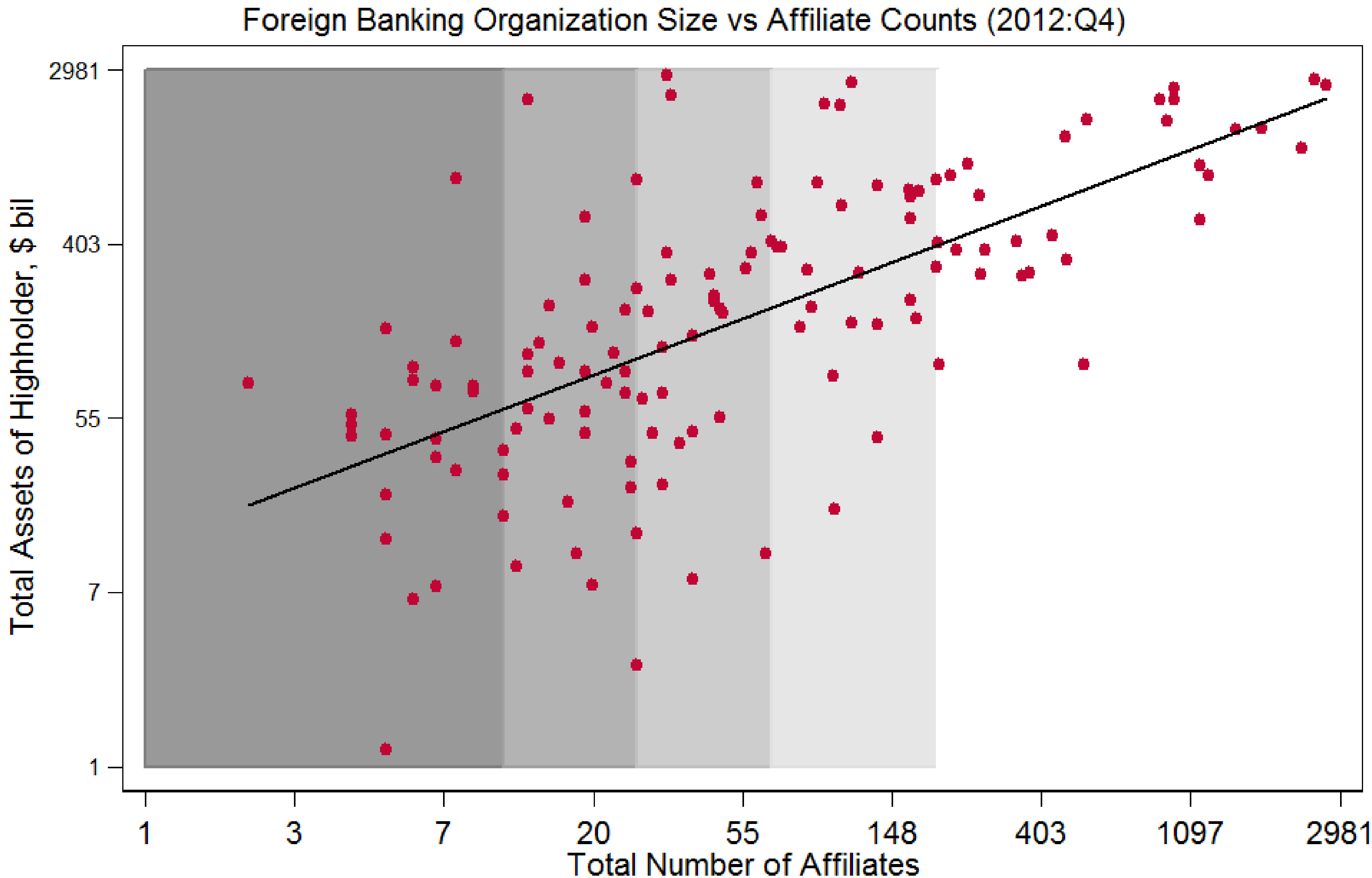
Cetorelli & Goldberg 2014 On building measures to target specific policy or conceptual issues. Use data on entity structure from bank regulatory reporting.

- ✓ *Business complexity*, which measures the concentration of the number of affiliates across types of business activities
- ✓ *Geographical complexity*, which measures the concentration of business activity (proxied by the number of affiliates) across regions
- ✓ *Organizational complexity*, which measures the breadth of activities (proxied by the number of non-bank and foreign subsidiaries).

Relies on counts of entities within Bank Holding Companies, instead of the balance sheet components. Introduce other attributes if sufficient data.

Usual word pairing of "Large and Complex Banks" can be split.

International banks, size & complexity correlate but can differ dramatically.

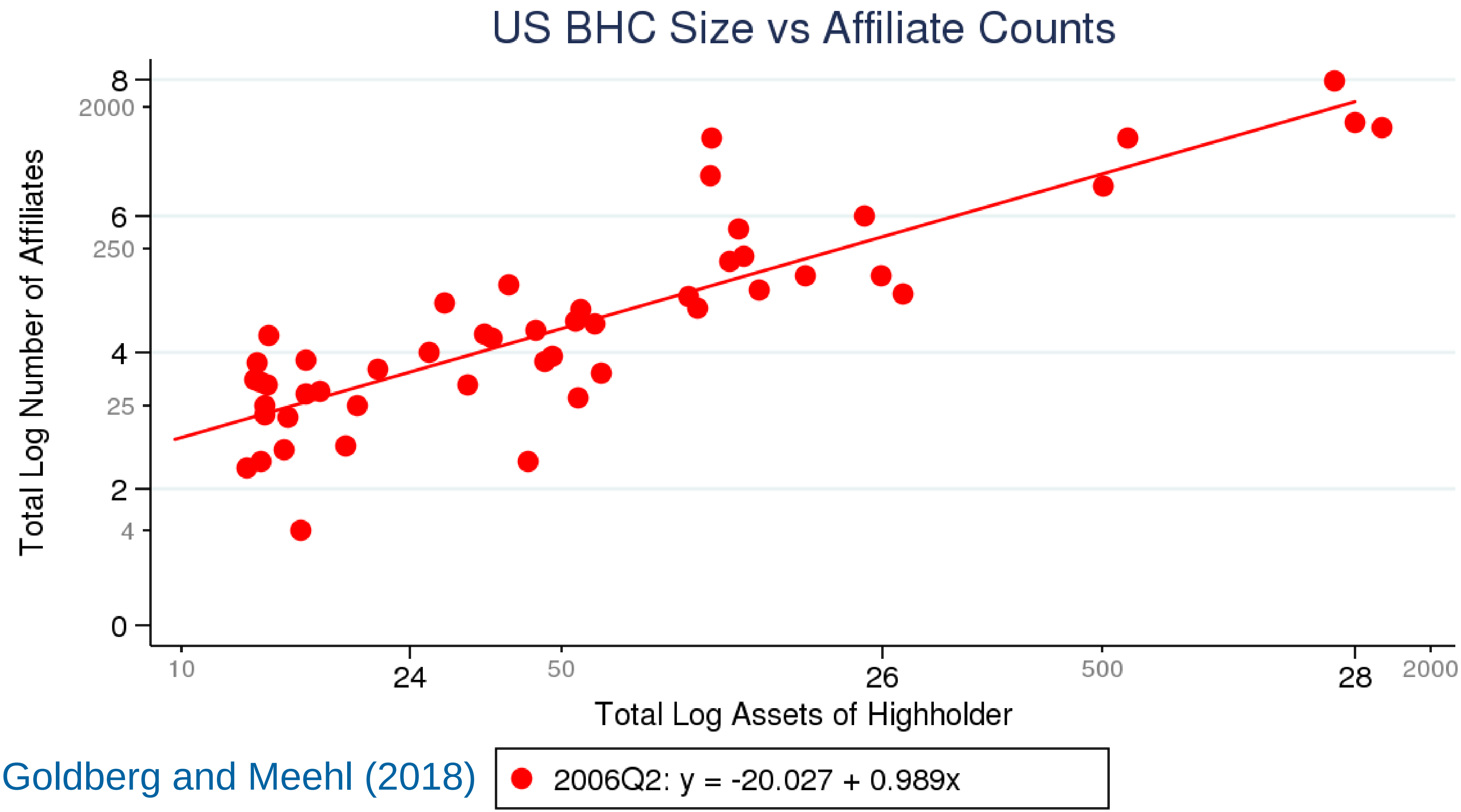


Slope of Fit Line = 0.673***
R Squared = 0.436
Gray shaded areas indicate quintiles of count. Tick marks on the x-axis and y-axis are spaced using log scale. X-axis labels indicate total number of affiliates per highholder. Y-axis labels indicate total assets per highholder. Sources: Bankscope, Capital IQ.

Cetorelli and Goldberg (2016)

US large BHCs: distinction between complexity and size

Pre-crisis, large US BHCs exhibit large dispersion of “organizational” complexity, even conditional on size.

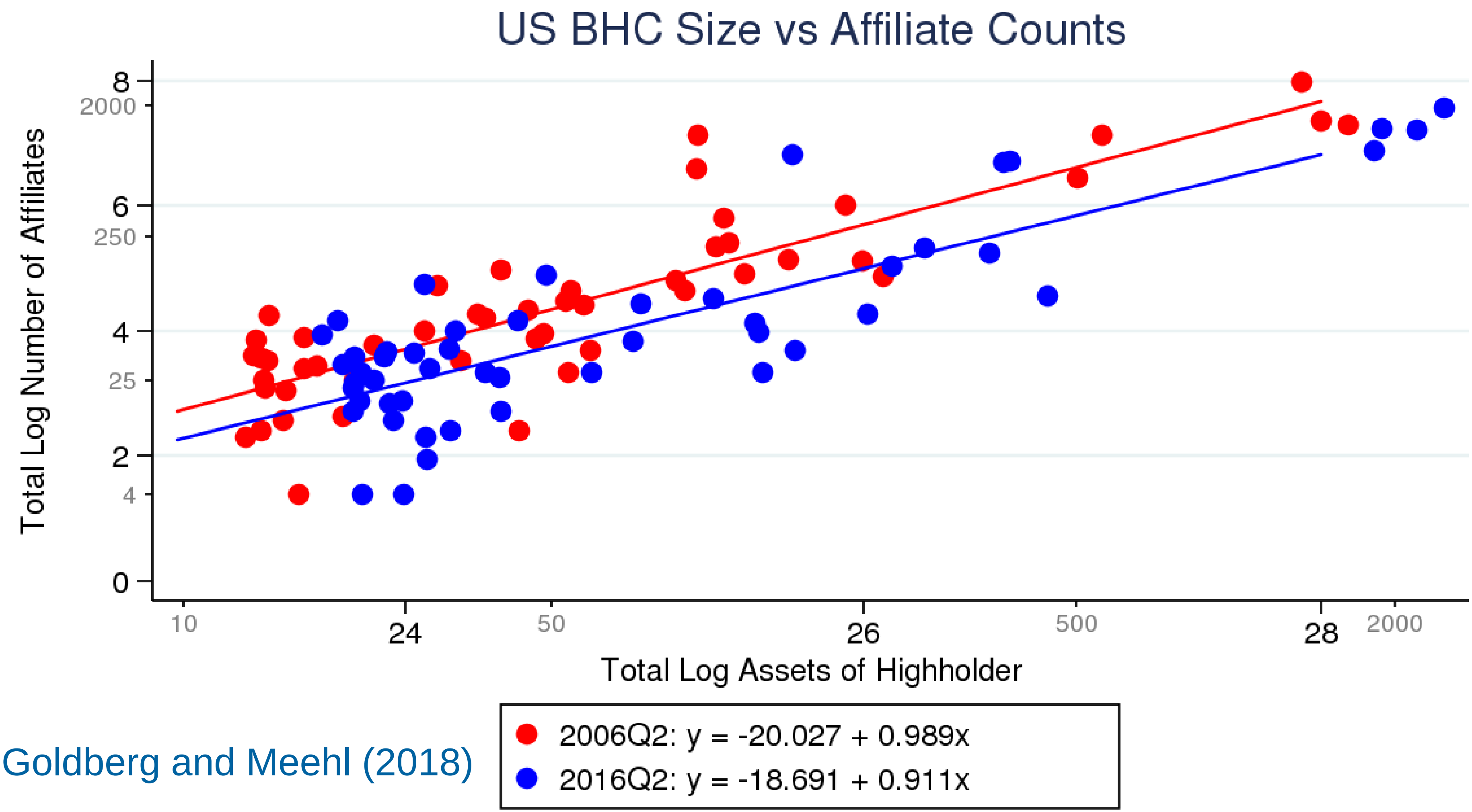


Goldberg and Meehl (2018)

Small, gray labels represent Total Assets of Highholder, $ bil (x-axis) and Total Number of Affiliates (y-axis)

US large BHCs: distinction between complexity and size

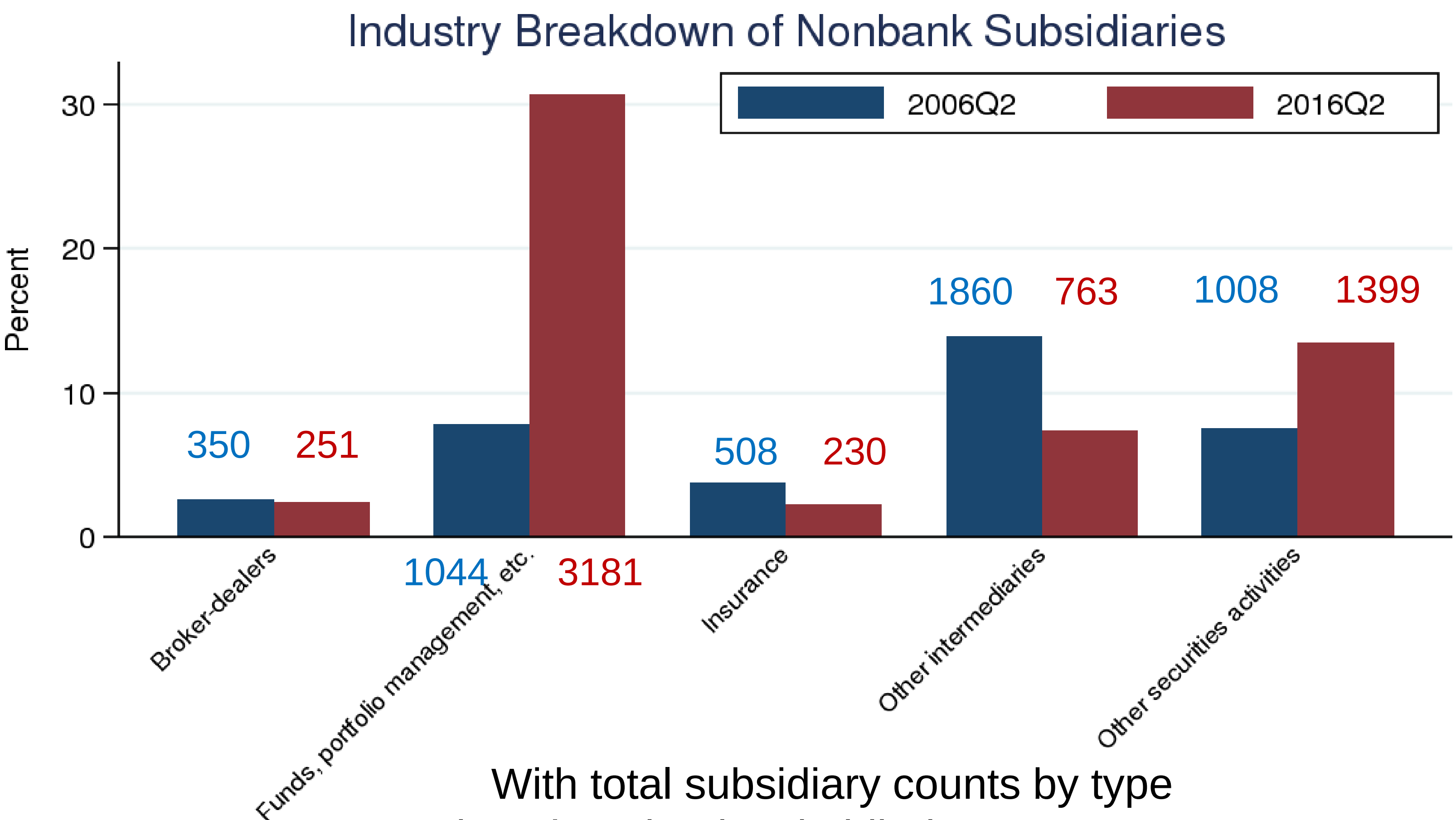
Post-crisis, US BHC complexity declined more than BHC size.



Goldberg and Meehl (2018)

Small, gray labels represent Total Assets of Highholder, $ bil (x-axis) and Total Number of Affiliates (y-axis)

What about scope? BHC entity information complements bank balance sheet composition and bank size for understanding financial activities, implications, and policy issues.



With total subsidiary counts by type
and total nonbank subsidiaries 13061 10197

Goldberg and Meehl (2018)

In US large BHCs, post-crisis large increase in subsidiaries in funds, portfolio management; declines in broker dealers, insurance and other intermediaries

Is Organizational (or Geographic or Business) Complexity Bad?

Why do we care about complexity?

Some rationale for reducing BHC complexity is predicated on high costs of managing and resolving large complex institutions (Carmassi&Herring 2014).

- ➢In the event of failure, complexity in a financial firm raises risk of systemic disruptions. To reduce overall costs and externalities, improve resolution regimes, living wills, simplify organizations

Important open questions

Is there any rationale for complexity from advantages it delivers outside of failure episodes?

- What does complexity deliver during the life of the firm?
  - ➢Effects of Organizational, Geographic or Business?
- Implications of the form of the organization for the behaviors of the entities within the BHC? For risks and spillovers? Externalities?

Does complexity of the parent conglomerate matter for business conduct of its bank affiliates?*

− Maybe it doesn't:

- Separate entities run as if independent of one another,
- Bank balance sheet characteristics describe the bank's business.
- Role of conglomerate: In aggregate, achieve diversification benefits (or possibly some tax or profitability due to policy).

Research: value gains from diversification an open question.

Does complexity of the parent conglomerate matter for business conduct of its bank affiliates?*

− Or may be it does:

- Conglomerates form when synergies and complementarities across affiliated entities exist. Diversification benefits, efficiencies.
- Optimization of synergies result in subordinating business model of individual entities to interest of broader organization

  Rajan and Zingales (2000, 2001a, 2001b), Stein 2002

- Negatives around agency problems could have adverse effects.

− **First evidence for banks**

"Organizational Complexity and Balance Sheet Management in Global Banks" Cetorelli and Goldberg (NBER 22169)

Results show statistical and economic significance of complexity for lending response to funding shock

Devise test: Use an ideal funding shock, November 2010 from FDIC deposit insurance funding cost increase to US banks.

Exogenous positive shocks to availability of funding to FBOs in US.

- Sort branches of FBOs by complexity of parent (Organizational)
- Compare balance sheets and lending sensitivity across hosted branches
- Branch lending sensitivity to external funding shocks lower by about 30% for each quintile increase in organizational complexity, conditioning on size
- Branches of complex conglomerates are larger, greater access to external funding, and investment priority more toward support to the family
- Internal funding flows prioritized, more liquid branch balance sheet

Big Open Issues

Especially for BHCs, bank balance sheet does not tell the full story of the firm: financial conglomerates add broader considerations

Complexity matters, and is distinct from organizational size

Organizational, Geographic and Business complexity in financial conglomerates may impact the behavior of banks within the conglomerate

- Incidence of liquidity and funding risks may be altered, as nonbank affiliates may rely on bank affiliates for some liquidity needs.
- Prioritization of affiliates (domestic v. international) versus non-affiliates

Novel channel of "regulatory" transmission, as curbing complexity of financial conglomerates has impact on commercial banking activities, and potentially on liquidity and funding structures of nonbanks.

Lots of open questions to guide researchers!

Thank you!

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