Complexity in Large US Banks

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Abstract

While both size and complexity are important for the largest U.S. bank holding companies (BHCs), specific types of complexity and their patterns across banks are not well understood. We introduce a range of measures of organizational, business and geographic complexity. Comparing 2007 with 2017, we show that large U.S. BHCs still remain very complex, with some declines along organizational and geographical complexity dimensions. The numbers of legal entities within some large BHCs have fallen. By contrast, the multiple industries spanned by legal entities within the BHCs have shifted more than they have declined, especially within the financial sector. Nonfinancial entities within US BHCs still tilt heavily toward real estate related businesses and span numerous other industries. Fewer large BHCs have global affiliates and the geographic span of the most complex has declined. Favorable tax treatment still attract a significant share of the foreign bank and nonbank entities, while fewer are present in informationally opaque locations.

JEL Classification: F32, G11, G20.
Keywords: Bank; Bank holding company; Size; Complexity; Global bank.

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1 Introduction

The global financial crisis, and the ensuing Dodd-Frank Wall Street Reform and Consumer Protection Act (hereafter called the Dodd Frank Act or DFA), identified bank size and complexity as determinants of systemic importance, as both features are viewed as contributing to risks to financial stability. In the decade since the Dodd Frank Act, it has already been observed that big banks have not shrunk in size (Cetorelli and Stern (2015), Avraham et al. (2012), Goldberg and Meehl (2018)). Here we consider whether these large banks have simplified in the decade after the global financial crisis. We present new measures of complexity for banking organizations, building on Cetorelli and Goldberg (2014), and explore these measures across the largest U.S. bank holding companies (BHCs) comparing 2007 and 2017.

Complexity is a multidimensional concept. In the system established to address global systemically important banks, complexity is considered to be a combination of balance sheet and derivatives exposures and the number of distinct legal entities within the BHC. The balance sheet components highlighted are associated with asset opacity that enhances the difficulty of valuing asset portfolios and exposures of the bank. The legal entities information is viewed as important in part because larger numbers are expected to contribute to higher resolution and systemic costs if a BHC fails, as argued in Carmassi and Herring (2016). Our approach constructs complexity measures using information drawn from the structure of the full conglomerate, introducing a range of organizational, business and geographic complexity measures. These measures utilize information from regulatory reporting on the subsidiaries owned by a BHC, discussed in Cetorelli and Stern (2015) and updated quarterly, with counts plus additional attributes that informs the span of a BHC across industries (including nonbank industries) and countries.[1]

Using our organizational, business and geographic complexity measures, we document the changes that have occurred in the decade after the financial crisis, concluding that BHCs have mixed outcomes around simplifying their organizations. Large BHCs still remain very complex across organizational, business and geographic dimensions, although with important caveats: the most organizationally complex have reduced the number of legal entities within their conglomerates, and in some cases reduced the number of countries in which they have affiliates. The number of broad businesses spanned within BHCs remained similar across time while the industries spanned by entities within the BHCs have shifted more than they have declined, especially with respect to the financial industry breakdown. The nonfinancial entities within US BHCs continue to heavily tilt toward real estate related.

In terms of geographic complexity, fewer large US BHCs have entities in foreign locations.

[1]Structure and size are compared for U.S. BHCs through 2011 by Avraham et al. (2012) and for global banks by Cetorelli and Goldberg (2014). Cetorelli et al. (2017) explores consequences of the changing scope of US BHCs.

For those that remain global, geographic complexity is somewhat reduced. The large BHCs that have entities in a variety of countries also tend to have a significant share of those affiliates in locations associated with favorable tax regimes. Many non-bank foreign subsidiaries are located in the UK and the Cayman Islands, although specific industries such as insurance and real estate have higher shares of subsidiaries in other locations.

In Section 2, we present the various measures of BHC organizational, business, and geographic complexity. Section 3 compares the evolution of complexity across the 50 largest US BHCs for 2007 as the pre-crisis snapshot and 2017 as the post-crisis snapshot. Section 4 delves into the business complexity of BHCs, and provides details on the evolution of scope of those legal entities specifically within the financial services and nonfinancial sectors. This evolution also has been the focus of Avraham et al. (2012) and Cetorelli et al. (2017) with the latter study arguing that BHC performance was improved with the expansion into other financial sectors. Section 5 explores different aspects of geographic complexity, including the pattern of foreign locations of banking, financial and nonfinancial entities. This latter evidence shows the continued prominence of countries with status as low tax locations, and the reduced prominence in some emerging markets and informationally opaque locations.

Section 6 provides concluding observations about the relevance of the facts on the current complexity landscape, noting the potential importance of external forces and policy as drivers of this landscape. Regulators have clearly signaled that complexity should be lowered (Haldane (2015)). Greater complexity, all else equal, can contribute to agency problems and make a failing bank harder to resolve, adding to systemic risk and the "too complex to fail" problem. Within the Dodd Frank Act, efforts to reduce complexity include the requirement that large BHCs periodically submit resolution plans or living wills. Yet, balancing costs and benefits are important as diversification in business lines and across countries can add value and efficiencies. Our presentation of a range of metrics supports a deeper analytical effort targeted at understanding these broad consequences.

2 Defining and Measuring Complexity

Our starting unit of observation for creating the complexity metrics is the bank holding company (BHC). Many BHCs are essentially corporate conglomerates with significant ownership positions or controlling interests in a range of legal entities which are alternatively referred to as affiliates or subsidiaries and can span both bank and nonbank activities. We build on the complexity concepts first introduced in Cetorelli and Goldberg (2014) and utilize information on the structure, number, location, and industry type of bank and non-bank affiliates under each BHC. For U.S. BHCs, the core data we use in construction is a complete and time-consistent panel of legal

entities in all existing BHCs created using their Federal Reserve's form FR Y-6 and FR Y-10 filings, described in Cetorelli and Stern (2015). Each affiliate is coded with information on its primary industry, captured by one of 203 4-digit level NAICS codes, and its host country location. Respective complexity metrics rely on counts of legal entities in each BHC, combined to explore different business or industry types and international versus United States locations of entities, and dispersion of entities across the respective component.

In defining the notation of complexity indices at the level of the BHC, we keep implicit that an index is both BHC and time specific. The notation instead only includes subscripts that distinguish the number and characteristics of the legal entities within each BHC. Industry type is indexed by i, or summed over every i for a BHC at a date and denoted by I; business-type is indexed by b and spans 6 types of business activities (Banking, Insurance, Mutual and Pension Funds, Other Financial, Nonfinancial Management, Other Nonfinancial)[2]; geographical location is denoted by country c, and the sum of all locations is denoted by C, taking a minimum value of 1 if all affiliates of the BHC are situated within the U.S.

2.1 Organizational Complexity

The most basic measure of organizational complexity is the total number of legal entities within the BHC, ***Count***. A second organizational complexity measure, ***Has Foreign***, indicates whether the BHC has any foreign-located affiliates and takes a value of one if the BHC has any affiliates in foreign locations, and is otherwise zero.

2.2 Business Complexity

Measures of business complexity utilize information on the industries and businesses of entities within the ownership structure of each BHC. These measures are alternatively constructed as counts, or as Herfindahl type indices normalized and defined to take values between 0 and 1, and increase in the dispersion of activities within the BHC.[3]

Our first measure, ***Nonfinancial count share***, is the share of legal entities that are not in the more broadly defined financial sector (2 digit NAICS code 52). The next business complexity measures use 4 digit NAICS industry codes to capture more details about the composition of industries spanned within the BHC. ***CountN*** is the number of 4 digit NAICS industries spanned

[2]Business types are defined according to NAICS codes as follows: (1) Bank: NAICS code == 5221; (2) Insurance: NAICS code == 5241, 5242; (3) Mutual and Pension Fund: NAICS code ==52511, 52591; (4) Other Financial: 2 digit NAICS code 52, but subsidiary does not fall into the categories of Bank, Insurance, or Mutual and Pension Fund; (5) Nonfinancial Management Firms: NAICS code == 5511; (6) Other Nonfinancial: 2 digit NAICS code is not 52 and 4 digit NAICS code is not 5511.

[3]As discussed in Goldberg and Shen (2018), more dispersion could be associated with greater agency and control problems within a BHC or with enhanced diversification benefits.

by the legal entities in the BHC. ***CountB*** is the total number of business types spanned by BHC affiliates, where we define business types as Banking, Insurance, Mutual and Pension Fund, Other Financial, Nonfinancial Management Firms, and Other Nonfinancial. The dispersion of affiliate business types within the BHC and across its legal entities is given by $\boldsymbol{CountBHHI} = \frac{\boldsymbol{CountB}}{\boldsymbol{CountB}-1}\left(1-\sum_{b=1}^{B}\left(\frac{count_b}{\sum_{b=1}^{B} count_b}\right)^2\right)$[4]. where B is the set of business types, and $count_b$ is the number of a BHC's subsidiaries that are classified in accordance with each business type b. This measure take a value of zero if all entities are in banking, and increases as the dispersion of entities across types of businesses rises.

2.3 Geographical Complexity

The majority of all US BHCs do not have affiliates located outside of the United States, which is already reflected by the organizational complexity measure ***Has Foreign***. For those BHCs with foreign affiliates (***HasForeign***=1), two additional complexity measures capture the degree and dispersion of geographic complexity. ***CountC*** is the count of countries spanned by a BHC's subsidiaries.[5] The dispersion of BHC affiliate locations across countries is indicated by $\boldsymbol{CountCHHI} = \frac{\boldsymbol{CountC}}{\boldsymbol{CountC}-1}\left(1-\sum_{c=1}^{C}\left(\frac{count_c}{\sum_{c=1}^{C} count_c}\right)^2\right)$ where C is the set of countries and $count_c$ is the count of a BHC's subsidiaries in each country c. Dispersion is zero when all of the BHC's legal entities are within the United States, but increases as the dispersion across countries internationally rises. [6]

3 Complexity Patterns in the Largest 50 US BHCs

While there are thousands of U.S. BHCs, asset size and complexity are concentrated within the largest cohort. Even after focusing exclusively on the BHCs that have a U.S. top-holder,[7] and are over $1 billion in assets, the remaining hundreds of BHCs are very diverse in size and complexity. [8]

The quarterly value of total assets and count of all of these remaining U.S. domestic BHCs for the period from 2007 through 2017 are shown in Figure 1. Their total assets rose from $10

[4]Derivation of ***CountBHHI*** and ***CountCHHI*** is explained in A.1

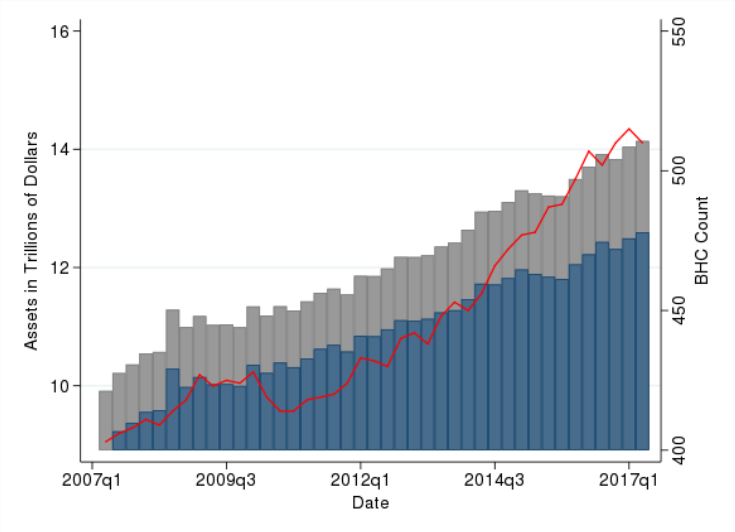
[5]A variant of this measure could be the counts of locations spanned by banking subsidiaries and branches per se. Moreover, if appropriate data is available, balance sheet and income data for the BHC could be used to construct additional metrics.

[6]This measures of geographic complexity do not address the concept of dispersion of branch locations or businesses within the United States, a topic considered in some research on the consequences of the historic elimination interstate banking restrictions through the 1980s and with the Riegle-Neal Act in 1994.

[7]Banking regulatory micro data reference manuals have specific details on the distinctions between BHC top holder and regulatory top holder, `https://www.federalreserve.gov/data/mdrm.htm`.

[8]Our analysis also excludes the seven large BHCs that obtained this status after 2008: Goldman Sachs, Morgan Stanley, American Express, CIT Group, Ally Financial, Discover Financial Services, and Metlife.

Figure 1: Total Assets and Number of BHCs Larger than $1 billion: 2007Q2 to 2017Q2

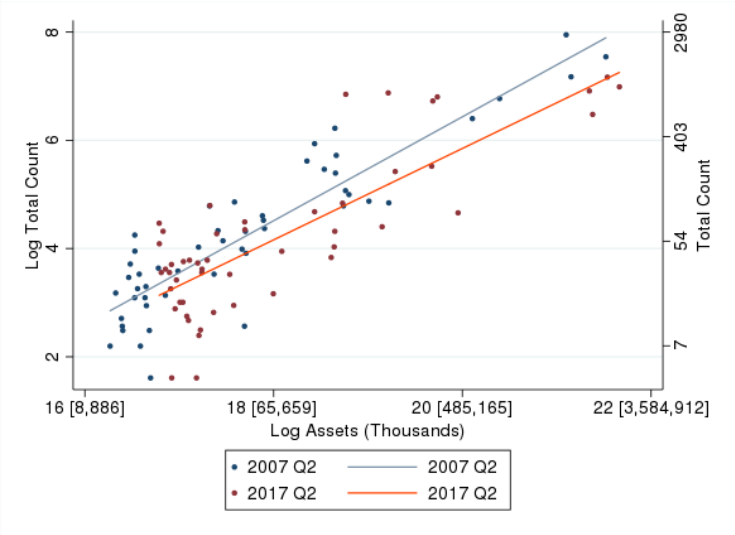


Note: Gray bars represent assets of U.S. owned BHCs as form FR Y-9C filers with assets over $1 billion. Excludes GS, MS, AMEX, CIT, Ally, Discover, and Metlife. Red line indicates the count of BHCs in that sample. Blue bars represent assets of the largest 50 BHCs.

trillion in 2007 to $14 trillion by 2017 (left scale, upper grey contour). The red line and right scale show the total number of these BHCs. This number gradually increased over time, from 400 in 2007 up to over 500 by 2017. The assets of the largest 50 of these BHCs, as defined by assets in each quarter, is shown by the blue shaded portion of assets. These largest BHCs represent the vast majority of the overall BHC assets, at over 85 percent. As complexity also is concentrated in the largest BHCs in this group, below we focus solely on the largest 50 BHCs and compare pre-crisis (2007) versus a decade later (2017).

As a first observation using the complexity measures it is important to notice that forms of complexity are distinct from, and correlated to different degrees with, BHC size. Figure 2a shows the relationship between BHC total affiliate count and assets in 2007 (blue dots) and in 2017 (red dots). The solid fitted lines show that larger BHCs tend to have more legal entities within their organizations. The rightward shift of the line in the top panel shows that BHC assets are larger post-crisis for a given number of entity counts (or counts are smaller given BHC asset size) in 2017 compared with 2007. Every vertical slice of this chart, regardless of whether using information from 2007 or 2017, illustrates that for any given size BHC there is substantial diversity in organizational complexity as represented by numbers of legal entities. Panel (b) shows that business complexity, as indicated by the share of BHC entities in nonfinancial industries, also is quite diverse across BHCs and less correlated with BHC assets than the counts of entities in the BHCs. The fitted relationship is similar for 2007 and 2017.

Figure 2: Complexity versus BHC Assets: 2007 versus 2017



(a) Organizational Complexity: Log Total Count

(b) Business Complexity: Nonfinancial Count Share

Note: Dots represent the largest 50 BHCs by assets in 2007 and in 2017. In brackets are the total assets equivalent of log assets. (a) right vertical axis shows the total count corresponding to the log total count on the left axis; (b) vertical axis is nonfinancial count share.

3.1 Patterns across BHC Complexity Metrics

Complexity differs substantially among the largest 50 U.S. BHCs. To illustrate this point, we split the 50 largest BHCs into the bottom 25 (indicated by Low) and top 25 (indicated by High) as determined by the BHC's value of each complexity metric by date. Each row of Table 1 shows the split by metric and the respective means and standard deviations of that complexity measure.

Table 1: Means and Standard Deviations of Complexity Metrics for Large U.S. BHCs

	2007Q2		2017Q2	
Complexity Metric[a]	Low	High	Low	High
BHC Assets	18.77	337.60	25.42	478.46
	(1.44)	(112.71)	(0.86)	(152.78)
Organizational				
Count	27.12	436.24	22.64	356.32
	(3.03)	(132.26)	(2.20)	(82.31)
Has Foreign		0.58		0.54
Business				
Non-financial count share	0.25	0.52	0.23	0.56
	(0.02)	(0.03)	(0.02)	(0.04)
CountB	4.84	6.00	4.60	6.00
	(0.07)	(0.00)	(0.09)	(0.00)
CountBHHI	0.73	0.93	0.61	0.92
	(0.02)	(0.01)	(0.03)	(0.01)
CountN	9.36	18.91	8.19	15.13
	(0.46)	(1.28)	(0.38)	(0.98)
Geographical				
CountC	1.19	15.25	1.18	15.36
	(0.08)	(3.38)	(0.07)	(3.60)
CountCHHI	0.01	0.43	0.002	0.47
	(0.01)	(0.05)	(0.00)	(0.04)

[a] Units are: BHC Assets - billions of $, ***Count*** - total number of subsidiaries; ***Has Foreign*** and ***Non-financial count share*** - share of subsidiaries; ***CountB*** - count of business types; ***CountN*** - count of 4 digit NAICs codes ;***CountBHHI*** and ***CountCHHI*** - scale of 0-1; ***CountC*** - count of countries.
The first (second) row for each complexity variable presents mean values (standard deviations) of the complexity variable for each group and date. Low represents the 25 least complex BHCs and High represents the 25 most complex BHCs. ***Has Foreign*** means in High columns show the share of all Low or High BHCs that have foreign affiliates.

For the Low group, the mean for every complexity measure decreased from 2007 to 2017. The largest U.S. BHCs that started out relatively less complex generally simplified organizational, business and geographic complexity post-crisis. Patterns were more mixed for the High group. Within the more complex BHCs, the number of legal entities declined from a mean of 436 to

356. The share of large and complex BHCs with any foreign affiliates declined from 58 percent to 54 percent. There has been a clear decline in organizational complexity. By contrast, neither business complexity nor geographical complexity has declined substantially in this BHC group. The High complexity BHCs have over 50 percent of their affiliates in nonfinancial firms, spanning all 6 types of businesses and in excess of 15 separate NAICs industries. The average number of country locations spanned is 15 with a dispersion rate near 50 percent. Overall, the High group has even larger geographic and business complexity, with somewhat less organizational complexity. While BHC Assets for the largest 50 BHCs increased from 2007 to 2017, this increase in size is driven mainly by the largest of the large BHCs.

Only some forms of complexity are highly correlated (Table 2). The larger BHCs tend to have more affiliates that span more industries and more countries. However, size is not strongly correlated with the dispersion of these affiliates across businesses or across locations. When the number of businesses expands, the dispersion of businesses tends to fall. There is little correlation between the ***Nonfinancial count share*** and numbers of businesses and countries of affiliates. Indeed, when a BHC adds more non-financial subsidiaries, these tend to be either domestic or in existing foreign locations, business types, and industries. The dispersion of business types, ***CountBHHI***, is negatively correlated with all other complexity variables.

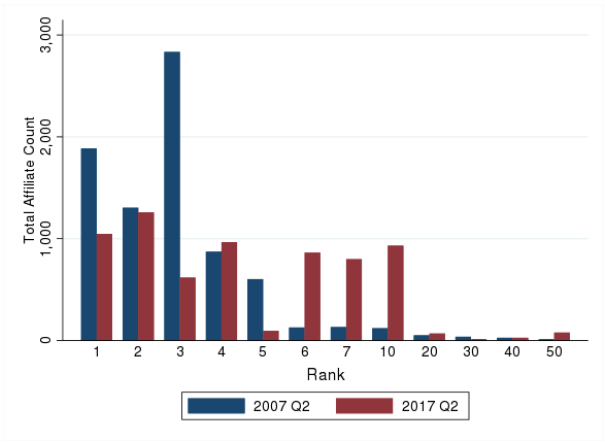
Table 2: Pearson Correlation, of Complexity Metrics of Largest U.S. BHCs, 2017

Complexity Metric	BHC Assets	Count	Has Foreign	Nonfin count share	CountB	CountBHHI	CountN	CountC	CountCHHI
BHC Assets	1								
Organizational									
Count	0.76	1							
Has Foreign	0.36	0.47	1						
Business									
Non-financial count share	0.03	0.27	0.15	1					
CountB	0.49	0.53	0.40	0.24	1				
CountBHHI	-0.22	-0.59	-0.43	-0.30	-0.27	1			
CountN	0.81	0.74	0.50	0.21	0.75	-0.34	1		
Geographical									
CountC	0.84	0.78	0.47	-0.02	0.56	-0.23	0.83	1	
CountCHHI	0.36	0.31	0.79	-0.19	0.37	-0.12	0.45	0.59	1

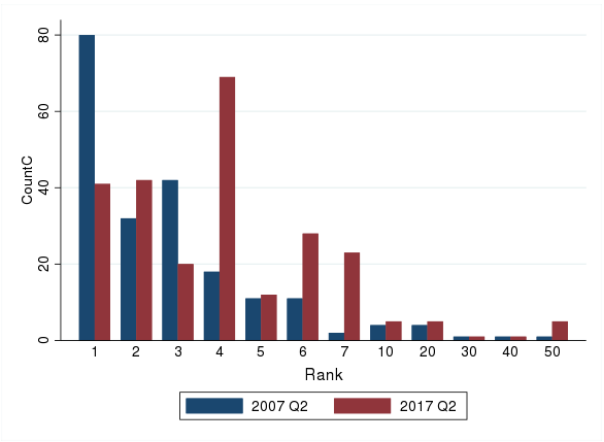
Note: Pearson correlations between complexity measures using 2017 quarterly data.

Bar graphs illustrate how complexity measures differ throughout the distribution of the largest

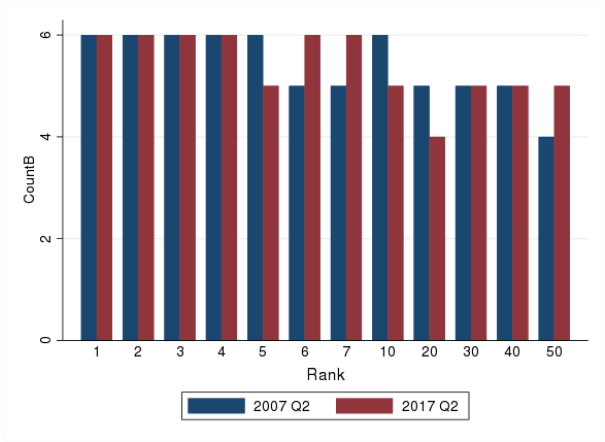
Figure 3: Complexity of the Largest 50 BHCs by Asset Size Rank in 2007 and 2017



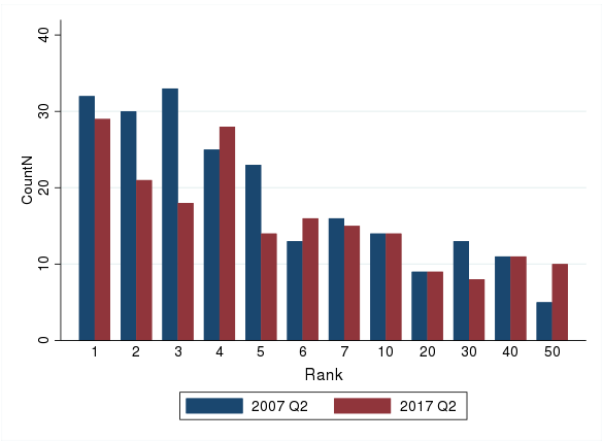
(a) Count of Affiliates



(b) Count of Countries



(c) Count of Business Types



(d) Count of Unique 4-Digit NAICS Codes

Note: Each bar is based on the complexity measure for each of the largest 50 US BHCs at the respective dates, ranked by highholder assets, with largest ranked as 1 and smallest ranked as 50.

50 BHCs (Figure 3). BHC rank at each date is determined using BHC assets. The decline in the mean subsidiary count, previously shown in Table 1, is further elaborated in panel (a). In 2007 the two most organizationally complex BHCs held 2836 and 1900 subsidiaries, respectively. By contrast, the most complex BHC in 2017 held 1335 subsidiaries. Moreover, the number of subsidiaries within the top 10 BHCs contrasts sharply with counts in the bottom 40. Country count (panel b), shows starkly that even within the 50 largest US BHCs there are large distinctions in geographic complexity.

Business complexity patterns are less differentiated (panel c). Even the 50th ranked BHC covered only one less business type in 2007 than the top 10 BHCs. No strong pattern of change in business types is evident during the decade after the recession. However, the count of unique 4-digit NAICS codes by BHC rank (panel d) shows a general decreasing pattern in the count of NAICS codes as rank declines. The number of NAICS codes within BHCs tended to decline from 2007 to 2017, especially among the largest BHCs.

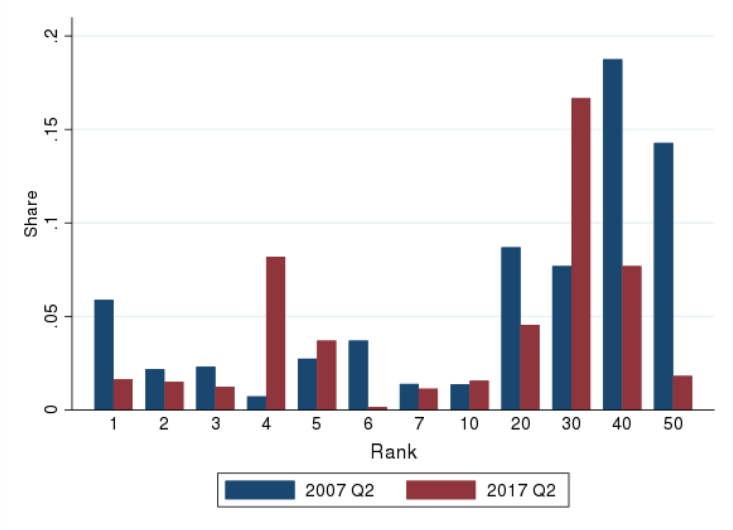
4 Business Complexity and Scope

BHCs have long been operating in sectors outside of banking, including other financial and non-financial industries. While most BHCs have not decreased their industry scope since 2007, they have shifted their concentration across industries. The decision to expand into these industries has been the focus of prior studies, such as Cetorelli and Wang (2016) which emphasized the growth of BHCs into community housing affiliates and Cetorelli et al. (2017) which showed the relationship between BHC performance and expansion of scope. BHCs appeared better off in regards to performance when they expanded their scope to resemble that of the "modal bank". Some BHCs may have first expanded into various industries in order to seize opportunities, such as reallocating capital, bringing production in-house, or benefiting from synergies from combining various activities. As the trend continued, other BHCs possibly began to diversify in a similar manner in order to replicate the new modal structure. Below we highlight the key changes BHCs have made in their industrial composition from 2007 to 2017, looking separately at financial and nonfinancial affiliates. We document both trends and differences across BHCs.

4.1 Financial Entities

In terms of structure, only a small fraction of entities within BHCs are commercial banks while the majority of their subsidiaries fall into the category of "Other Financials" (Table A1). Among the largest 50 US BHCs, the share of commercial banks in the financial entities of BHCs ranges from less than 1 percent to around 20 percent both pre and post crisis (Figure 4). That share changed in idiosyncratic ways across BHCs and over time.

Figure 4: Share of Commercial Banks by BHC Asset Size Rank



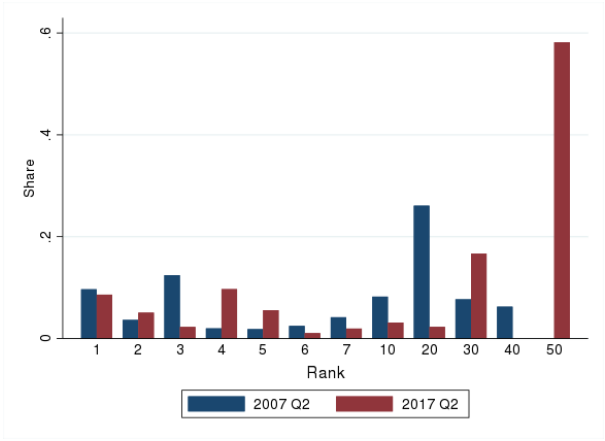
In the past decade, large U.S. BHCs have shifted their composition of financial subsidiaries away from the bank and nonbank intermediaries (Figure 5). There has been a large increase in subsidiaries involved in portfolio management (in addition to those labelled as mutual funds or pension funds), with three large BHCs more than tripling their share of affiliates in portfolio management from 2007 to 2017. The largest five BHCs' average share of portfolio management affiliates is over 40%. Also increasing was the share of financial subsidiaries involved in "other securities activities," defined as the catch-all for other financial investment activities but excluding activity categorized as relating to securities and commodity exchanges, portfolio management, and trust and custody activities.

In 2007 one large BHC had a share of other portfolio management subsidiaries greater than 50% compared to four BHCs in 2017 (Table A2). The decline in the share of other financial intermediaries is also clear: in 2007, five BHCs had shares over 30% compared to only one in 2017. Insurance companies are held in a greater proportion by the smaller BHCs both in 2007 and 2017.

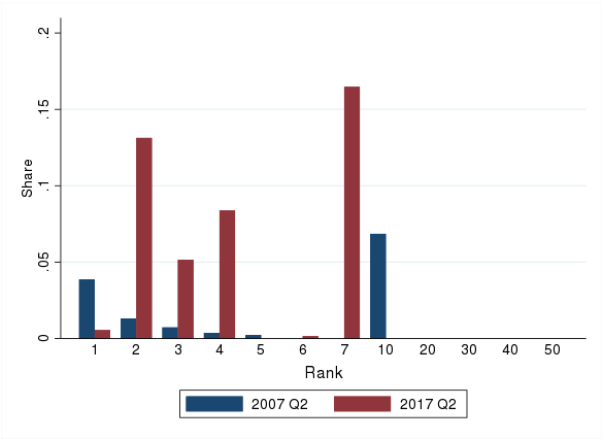
4.2 Non-Financial Entities

All of the large US BHCs have a substantial share of nonfinancial subsidiaries. In general, the largest categories of nonfinancial subsidiaries are within the industries for Housing, Real Estate, and Management Companies (Table A3). The total share of nonfinancial entities within these three categories rose significantly from 2007 to 2017, although there is considerable variation in the concentration of such entities across the BHCs. Management Companies are the most popular nonfinancail affiliate with the five largest BHCs holding an average share of around 30%

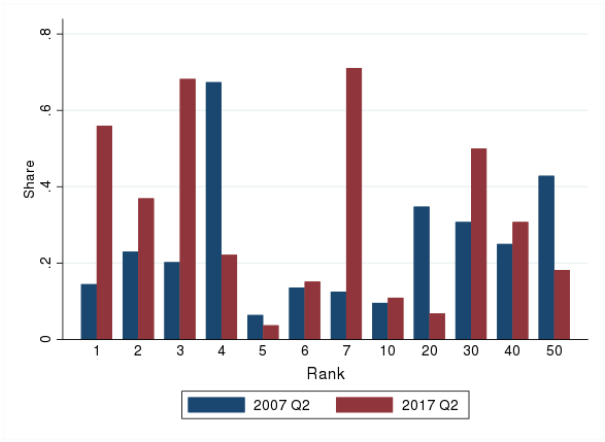
Figure 5: Share of Financial Affiliates by BHC Asset Size Rank



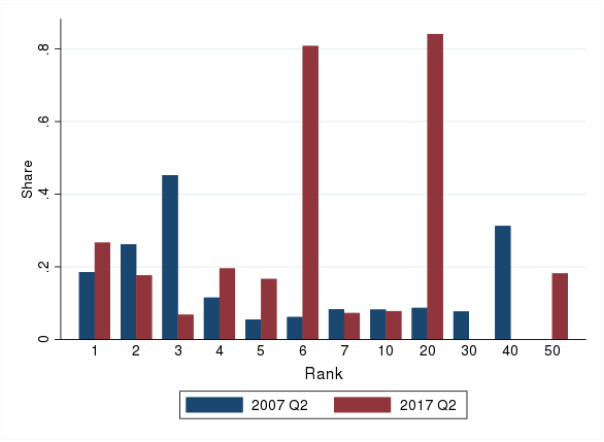
(a) Share of Broker Dealers



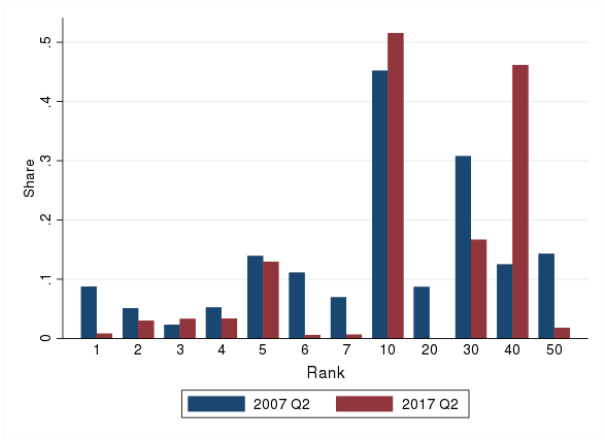
(b) Share of Mutual and Pension Funds



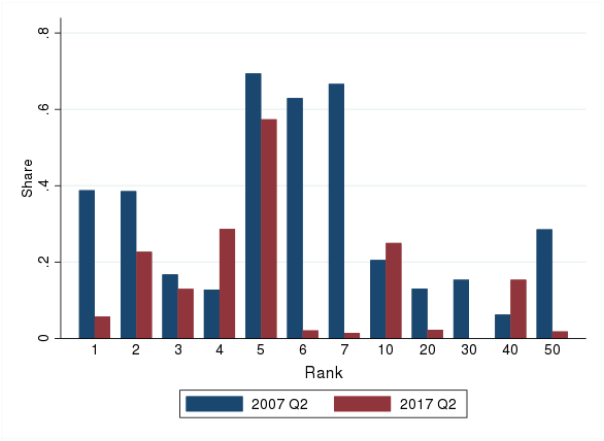
(c) Share of Other Portfolio Management



(d) Share of Other Securities Activities



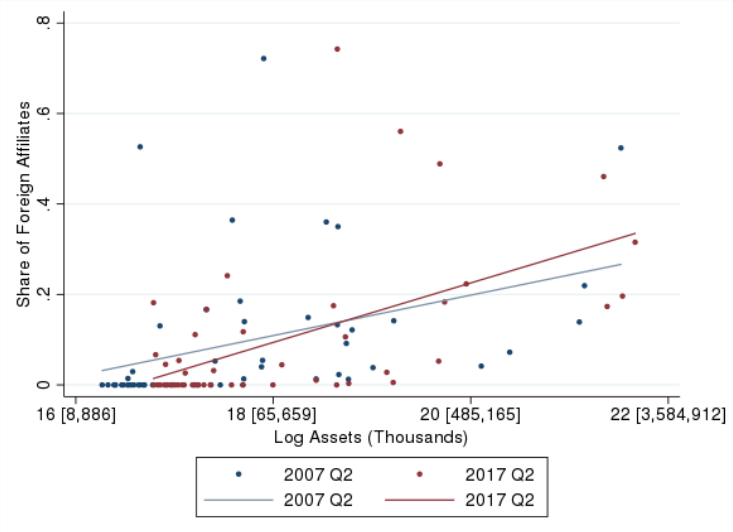
(e) Share of Insurance



(f) Share of Other Intermediaries

Note: Each bar is based on the complexity measure for each of the largest 50 US BHCs at the respective dates. BHCs are ranked in the according to its highholder assets at the respective dates, with largest BHCs having the lowest rank.

Figure 6: Share of Foreign Affiliates on Log Assets for the Largest 50 BHCs



Note: Observations represent the largest 50 BHCs by assets in 2007 and 2017. The values in brackets are the total assets equivalent of log assets.

of all nonfinancial entities in both 2007 and 2017. Housing subsidiaries are very popular as these subsidiaries can house activities that count toward Community Reinvestment Act requirements, discussed in Cetorelli and Wang (2016). The minimum share of Housing subsidiaries for the five largest BHCs rose from 10% in 2007 to 25% in 2017. Moreover specific firms evolved with Housing entities replacing Real Estate-related affiliates as the average share of such affiliates for these same BHCs decreased from 20% in 2007 to 13% in 2017.

5 Geographic Complexity

Substantial changes have occurred in the geographic complexity of large US BHCs. As already observed, fewer large US BHCs have any global subsidiaries: the percentage of largest 50 BHCs with at least one foreign subsidiary decreased from 58% in 2007 to 54% in 2017. The relationship between size and share of foreign affiliates is positive and has in fact increased from 2007 to 2017 (Figure 6). Overall the ten largest BHCs in 2017 actually have a greater foreign share in total entity counts than in 2007, yet, some of this change is due to a larger reduction in domestic entities, consistent with the broader decline in organizational complexity. Many of the large U.S. BHCs operated in fewer countries in 2017 than in 2007, another sign of reduced geographical complexity.

The locational choices of the banking subsidiaries and branches has long been the subject of

academic research and debate.[9] These choices are tied to trade activity, country and institution growth rates, and comparative advantage in productivity. Less attention has been paid to the other non-bank parts of these financial conglomerates, which dominate the number of bank foreign affiliates. Development of institutions and size and depth of financial markets should matter, along with potentially favorable tax treatment and degree of opacity or secrecy locally (weighed against associated costs). Additional factors in the post-crisis period are enhanced attention to know-your-customer (KYC), anti-money laundering (AML), and combating the financing of terrorism compliance costs. Such concerns have been associated with derisking of global banks and reduced activity in some foreign markets (Erbenova et al., 2016).

These changes on the extensive margin of locations are consistent with analyses of volumes of cross border flows, which also have changed for the entities that remain involved globally. The post crisis period has seen noteworthy waves of contractions in cross-border banking lending volumes, especially in bank to bank transactions (Milesi-Ferreti and Tille, 2011). Overall, there also has been a rebalance of global activities towards banking systems that are better capitalized and toward nonbank market-based financing (Avdjiev et al., 2017). The share of US banks has risen, even as fewer US BHCs are involved.

Our locational sorting distinguishes between affiliates within advanced economies (AEs) versus within emerging markets (EMs). We further distinguish according to whether locations have low taxes or weak transparency/ high secrecy, using indicators from the Financial Secrecy Index (FSI) of the Tax Justice Network (Secrecy Score and Tax Credits). Secrecy Score is calculated based on the average of 20 different indicators. The score is equal to a percentage between 0 and 100 with 100 representing the greatest amount of secrecy (least transparency). Each component indicator is assigned a percentage based on secrecy, with 100 representing the greatest amount of secrecy. The measure Tax Credits, one of the 20 indicators used to create the Secrecy Score, focuses specifically on a country's level of promotion of tax evasion based on the existence of unilateral tax credits. We define a country as a secrecy location if their Secrecy Score is greater or equal to 75 or if their Tax Credits score is less than or equal to 10. The Secrecy Score should capture at least some of the KYC and AML locations that have been the focus of international bank derisking discussions.[10]

5.1 Affiliate and BHC locations and Financial Secrecy

The mix of domestic versus foreign locations across different types of businesses evolved between 2007 and 2017, with increasing shares of foreign affiliates largely driven by relatively greater

[9] See for example, Berger et al. (2003), Buch (2005), Claessens and Horen (2014), Russ and Valderrama (2012), and Niepmann (2015).

[10] Table A7 provides the country sorting.

Table 3: Share of Foreign Affiliates by Business Type

	2007Q2	2017Q2
Banks	0.34	0.45
Mutual and Pension Funds	0.34	0.54
Insurance	0.16	0.10
Other Financial	0.26	0.29
Non-financial Management Firms	0.33	0.36
Other Non-financial	0.07	0.04

Note: This table presents the share of foreign affiliates for each business type across the largest 50 BHCs in 2007 and 2017.

declines in numbers of US entities within each type (Table 3). 45 percent of bank entities were outside the U.S. in 2017, up from 34 percent in 2007. Substantially higher shares of totals for mutual and pension funds are now located outside the U.S. A lower share of insurance entities is located outside of the United States. Tables 4 and 5 provide a more detailed look of the evolution of affiliate locations, also considering the numbers in Tax or Financial Secrecy locations. In each table, the upper panel provides total counts of legal entities in advanced economies and of their U.S. BHCs. The lower panel provides the corresponding breakdown of entities located in emerging markets. Each panel further enumerates those entities in low tax or financial secrecy jurisdictions. Table 4 focuses on all foreign affiliates, banks, and total nonbanks. Table 5 presents the disaggregation by non-bank business type.

In the past decade, the largest 50 BHCs have shifted the balance of locations of their foreign subsidiaries slightly toward advanced economies over emerging markets. Total counts of foreign entities under large US BHCs declined from 2007 to 2017. Bank affiliates significantly contracted in both AE and EM locations (Table 4). The total number of BHCs with banking affiliates in AE locations declined from 11 to 8, while those in EMs remained at 6 BHCs.

Within AEs, these declines were not only in the financial secrecy locations that have received attention around derisking. Indeed the banking affiliate declines were more substantial in low tax jurisdictions than in jurisdictions with the worst financial secrecy ratings. Among EMs, the Cayman Islands remains the most popular secretive location for subsidiaries of large U.S. BHCs.

Among the foreign nonbank entities within US BHCs, which account for a large share of the counts of total affiliates, there were likewise declines in both AE and EM locations, and declines in the number of BHCs in each type of location for EM locations (Table 5). The number of entities in AE low tax jurisdictions remained stable at 308, but was associated with a smaller number of BHCs. Affiliates in secrecy locations declined substantially. Entities in EM low tax jurisdictions are far more prevalent than those associated with financial secrecy, and also declined substantially. For the nonbank affiliates, the largest proportion are in Other Financial which covers activities

Table 4: Location of U.S. BHC Foreign Entities, by Counts of Entities and BHCs

	Total Entities				Total Banking Entities				Total Non-bank Entities			
	by Count		by BHC		by Count		by BHC		by Count		by BHC	
AE	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017
All locations	1378	1222	25	22	40	26	11	8	1338	1196	25	22
Low Tax Jur.	319	316	21	13	11	8	7	5	308	308	21	13
Fin. Secrecy	29	30	5	7	1	2	1	1	28	28	5	7
EM												
All locations	884	741	25	22	60	43	6	6	824	698	25	21
Low Tax Jur.	547	449	24	19	19	10	4	3	528	439	24	19
Fin. Secrecy	64	49	10	8	5	2	1	1	59	47	10	8

Note: This table presents the locational breakdown of US affiliates and BHCs. The *by Count* column refers to the number of affiliates found in advanced economies and emerging markets, broken down by all locations, low tax jurisdiction locations or financial secrecy locations. The *by BHC* column refers to the number of BHCs associated with the affiliates in the corresponding row. Bank and non-bank classifications are defined in Table A6. Table A7 details countries within tax and secrecy categories.

Table 5: Location of U.S. BHC Foreign Affiliates by Affiliate Types, by Counts of Entities and BHCs

	Mutual & Pension Fund				Insurance				Other Fin.				Non-fin Management				Other Non-fin			
	by Count		by BHC		by Count		by BHC		by Count		by BHC		by Count		by BHC		by Count		by BHC	
AE	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017
All locations	18	43	7	5	37	5	6	4	950	881	28	20	254	214	19	13	176	84	17	14
Low Tax Jur.	6	18	3	3	7	1	3	1	221	227	25	13	55	51	12	9	27	15	10	7
Fin. Secrecy	2	1	2	1	2	0	1	0	18	19	5	7	3	6	1	2	3	1	1	1
EM																				
All locations	18	38	5	4	48	15	15	8	478	462	22	17	182	121	14	11	163	79	19	12
Low Tax Jur.	9	31	4	4	36	11	14	7	298	296	21	14	137	81	14	10	97	35	15	9
Fin. Secrecy	0	0	0	0	5	1	4	1	33	29	7	5	12	9	5	5	10	8	2	3

Note: This table presents the locational breakdown of US affiliates and BHCs. The *by Count* column refers to the number of affiliates found in advanced economies and emerging markets, broken down by all locations, low tax jurisdiction locations or financial secrecy locations. The *by BHC* column refers to the number of BHCs associated with the affiliates in the corresponding row. Other Financial affiliates include other portfolio managers, broker dealers, other intermediaries, and other securities activities. Table A6 details affiliate types. Table A7 details countries within tax and secrecy categories.

like other portfolio managers, broker dealers, other intermediaries, and other securities activities (Table A6). Foreign Management Companies, which perform activities such as financial planning, billing and recordkeeping, physical distribution, etc., declined substantially in both AEs and EMs, outside of the secrecy locations of AEs and primarily declining in the EM low tax locations. The rebalance of activity away from insurance affiliates and toward pension and mutual funds is again reflected here, with the rise in mutual and pension funds largely occurred through affiliates in low tax jurisdictions in the decade after the financial crisis.

6 Conclusion

The largest U.S. BHCs entered the global financial crisis with substantial organizational, business and geographic complexity. Using a new dataset of BHC structures over time, we introduce and compare various measures capturing the organizational, business, and geographic complexity pre-crisis versus post-crisis. Within the organizational category, our measures include the count of legal entities, as well as a measure which identifies those BHCs that have expanded into locating subsidiaries in foreign countries. The number of legal entities within BHCs tends to rise with BHC size. However, even within the 50 largest US BHCs we show drastic differences between the organizational complexity for smaller and larger BHCs, with the organizational complexity exhibiting more of a step function relationship than a linear one. The metric shows that some of the largest BHCs had significant declines in affiliate counts in the decade after the crisis. While the largest BHCs hold a substantial number of subsidiaries in foreign locations, only 58 percent of these BHCs had even one foreign subsidiary in 2007, declining to 54 percent in 2017. Geographic complexity is measured by the number of countries in which a BHC has subsidiaries located. Declines in foreign subsidiaries tended to be in locations associated with financial secrecy. Low tax locations remain popular.

Business complexity is measured using information on the industries of entities within BHCs. We show that most large BHCs have entities that span banking, fund management, insurance, and nonfinancial activities. However, they can differ substantially in the finer industry composition. While organizational complexity generally declined post-crisis, business complexity outcomes are more mixed. The nonfinancial share of affiliates remains large, while the number of industries spanned by the affiliates is somewhat smaller. Within the financial industries, BHCs have shifted towards less traditional financial subsidiaries such as portfolio management firms and other securities activities rather, reducing shares of commercial banks, insurance firms, and other intermediaries.

Simplification of previously highly complexity BHCs was one of the policy priorities of the post-crisis period. Regulatory frameworks continue to focus on limiting the risk of failure by

improving risk absorption capabilities and on improving resolution mechanisms for dealing with these BHCs in the event of failure (Stiroh, 2018). Some forms of BHC complexity significantly declined, even while the largest of the large remain highly complex on organizational, business, and geographic dimensions. What is really uncertain is how to understand some degree of optimal or target complexity in US BHCs. This broad topic warrants additional analysis. Further research is needed on the implications of the complexity patterns we document, whether these implications are in the context of the overall BHCs, the specific entities - including banks - within the BHCs, or the financial sector and financial stability more broadly. Research could establish whether and which forms of business and geographic complexity support diversification, efficiencies and risk sharing, adding value by increasing performance and potentially enhancing institutional robustness. Further analysis could also establish the contributions to agency problems and moral hazard, and the role played by resolution and resolution initiatives that have been implemented post crisis. While reducing the costs of failure have been targeted by policy initiatives, more study is also needed on the consequences of the different forms of complexity during the lives of these complex financial conglomerates.

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A Appendix

A.1 Derivation of *CountBHHI* and *CountCHHI*

To capture dispersion in business types or countries of BHC affiliates, we have created modifications of the commonly-used normalized Herfindahl-Hirschman Index (HHI) as described in Cracau and Lima (2016). A normalized HHI for dispersion of business types, *NormBHHI*, would be defined as:

$$NormBHHI = \frac{\sum_{b=1}^{B}(\frac{count_b}{\sum_{b=1}^{B} count_b})^2) - \frac{1}{\boldsymbol{CountB}}}{1 - \frac{1}{\boldsymbol{CountB}}}$$

In this derivation, $0 \leq NormBHHI \leq 1$. If all of BHC's affiliates are concentrated in one business type, *NormBHHI* = 1, the same value as would be achieved using a non-normalized HHI. In contrast, a BHC with an equal number of affiliates in each business type would have *NormBHHI* = 0, opposed to a non-normalized HHI of $\frac{1}{\boldsymbol{CountB}}$. The normalization eliminates the effect of the count of business types in which a BHC may have affiliates. As the BHCs in our samples have a varying count of business types, as already summarized by the metric ***CountB***, this normalization is desired.

In order to compare with our other complexity metrics, ***CountBHHI*** and ***CountCHHI*** should be increasing in complexity. For example, a BHC with the lowest level of dispersion of business types should have ***CountBHHI*** = 0 while a BHC with the highest level of dispersion should have ***CountBHHI*** = 1. Therefore, our final measure of ***CountBHHI*** will be equal to 1 − *NormBHHI*:

$$\begin{aligned}
\boldsymbol{CountBHHI} &= 1 - \frac{\sum_{b=1}^{B}(\frac{count_b}{\sum_{b=1}^{B} count_b})^2) - \frac{1}{\boldsymbol{CountB}}}{1 - \frac{1}{\boldsymbol{CountB}}} \\
&= \frac{1 - \frac{1}{\boldsymbol{CountB}} - \sum_{b=1}^{B}(\frac{count_b}{\sum_{b=1}^{B} count_b})^2) + \frac{1}{\boldsymbol{CountB}}}{1 - \frac{1}{\boldsymbol{CountB}}} \\
&= \frac{1 - \sum_{b=1}^{B}(\frac{count_b}{\sum_{b=1}^{B} count_b})^2)}{1 - \frac{1}{\boldsymbol{CountB}}} \\
&= \frac{1 - \sum_{b=1}^{B}(\frac{count_b}{\sum_{b=1}^{B} count_b})^2)}{\frac{\boldsymbol{CountB}-1}{\boldsymbol{CountB}}} \\
&= \frac{\boldsymbol{CountB}}{\boldsymbol{CountB} - 1}\left(1 - \sum_{b=1}^{B}\left(\frac{count_b}{\sum_{b=1}^{B} count_b}\right)^2\right)
\end{aligned}$$

The derivation of ***CountCHHI*** is computed similarly.

Table A1: Breakdown of Business Types

	Banks		Insurance		Mutual & Pension Funds		Other Financial		Nonfin Manage Firms		Other Nonfinancial	
Rank	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.036	0.011	0.053	0.006	0.023	0.004	0.568	0.694	0.173	0.162	0.147	0.123
2	0.012	0.006	0.027	0.013	0.007	0.056	0.513	0.355	0.147	0.099	0.294	0.471
3	0.006	0.010	0.006	0.026	0.002	0.041	0.247	0.728	0.069	0.075	0.671	0.122
4	0.005	0.046	0.033	0.019	0.002	0.047	0.618	0.458	0.061	0.164	0.281	0.268
5	0.020	0.021	0.101	0.074	0.002	0.000	0.625	0.500	0.086	0.074	0.166	0.330
6	0.024	0.001	0.071	0.005	0.000	0.001	0.575	0.787	0.079	0.063	0.252	0.144
7	0.008	0.009	0.038	0.005	0.000	0.128	0.550	0.673	0.168	0.145	0.237	0.040
10	0.008	0.001	0.275	0.035	0.042	0.000	0.358	0.034	0.150	0.004	0.167	0.925
20	0.040	0.029	0.040	0.000	0.000	0.000	0.500	0.647	0.300	0.235	0.120	0.088
30	0.028	0.100	0.111	0.100	0.000	0.000	0.222	0.500	0.028	0.100	0.611	0.200
40	0.115	0.038	0.077	0.231	0.000	0.000	0.462	0.308	0.154	0.115	0.192	0.308
50	0.111	0.013	0.111	0.013	0.000	0.000	0.667	0.792	0.111	0.065	0.000	0.117

Note: This table presents the breakdown of business types by share for a selection of each of the largest 50 BHCs ranked by assets. Business types are categorized into 6 bins: Banks, Insurance, Mutual and Pension Funds, Other Financial, Non-financial Firms, and Other Nonfinancial.

Table A2: Breakdown of Financial Entities

	Commercial Banks		Other Intermediaries		Broker Dealers		Other Portfolio Management	
rank	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.059	0.016	0.388	0.057	0.097	0.086	0.145	0.560
2	0.022	0.015	0.386	0.227	0.036	0.051	0.230	0.370
3	0.023	0.012	0.168	0.130	0.124	0.023	0.202	0.682
4	0.007	0.082	0.128	0.287	0.020	0.097	0.674	0.222
5	0.027	0.037	0.694	0.574	0.018	0.056	0.064	0.037
6	0.037	0.001	0.630	0.021	0.025	0.010	0.136	0.151
7	0.014	0.011	0.667	0.015	0.042	0.019	0.125	0.711
10	0.014	0.016	0.205	0.250	0.082	0.031	0.096	0.109
20	0.087	0.045	0.130	0.023	0.261	0.023	0.348	0.068
30	0.077	0.167	0.154	0.000	0.077	0.167	0.308	0.500
40	0.188	0.077	0.063	0.154	0.063	0.000	0.250	0.308
50	0.143	0.018	0.286	0.018	0.000	0.582	0.429	0.182

	Other Securities Activities		Insurance		Mutual and Pension Funds	
rank	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.185	0.266	0.088	0.008	0.039	0.005
2	0.262	0.176	0.051	0.030	0.013	0.131
3	0.452	0.068	0.023	0.033	0.007	0.052
4	0.115	0.196	0.052	0.034	0.004	0.084
5	0.055	0.167	0.139	0.130	0.002	0.000
6	0.062	0.808	0.111	0.006	0.000	0.001
7	0.083	0.073	0.069	0.006	0.000	0.165
10	0.082	0.078	0.452	0.516	0.068	0.000
20	0.087	0.841	0.087	0.000	0.000	0.000
30	0.077	0.000	0.308	0.167	0.000	0.000
40	0.313	0.000	0.125	0.462	0.000	0.000
50	0.000	0.182	0.143	0.018	0.000	0.000

Note: This table presents the breakdown of financial affiliates by share for a selection of the largest 50 BHCs ranked by assets. We use the 4-digit NAICS code to breakdown non-financial firms into 7 bins: Commercial banks, other intermediaries, broker dealers, other portfolio management, other securities activities, insurance, and mutual and pension funds.

Table A3: Breakdown of Non-financial affiliates

	Housing		Utilities & Construction		Manufacturing & Wholesale Trade	
Rank	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.098	0.248	0.000	0.003	0.002	0.010
2	0.380	0.730	0.007	0.003	0.005	0.000
3	0.516	0.306	0.000	0.008	0.001	0.000
4	0.319	0.396	0.295	0.005	0.003	0.000
5	0.191	0.263	0.000	0.000	0.007	0.000
6	0.119	0.596	0.000	0.000	0.000	0.000
7	0.000	0.027	0.019	0.000	0.000	0.000
10	0.000	0.988	0.000	0.000	0.026	0.000
20	0.000	0.045	0.000	0.000	0.000	0.000
30	0.478	0.000	0.304	0.000	0.000	0.000
40	0.111	0.000	0.000	0.000	0.000	0.000
50	0.000	0.000	0.000	0.000	0.000	0.000
	Non-financial Management Firms		Other		Real Estate	
Rank	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.541	0.567	0.225	0.097	0.134	0.074
2	0.333	0.174	0.063	0.014	0.212	0.079
3	0.093	0.380	0.047	0.074	0.342	0.231
4	0.178	0.379	0.064	0.141	0.141	0.079
5	0.342	0.184	0.296	0.368	0.164	0.184
6	0.238	0.303	0.357	0.028	0.286	0.073
7	0.415	0.784	0.245	0.108	0.321	0.081
10	0.474	0.005	0.158	0.002	0.342	0.005
20	0.714	0.727	0.190	0.227	0.095	0.000
30	0.043	0.333	0.087	0.000	0.087	0.667
40	0.444	0.273	0.111	0.000	0.333	0.727
50	1.000	0.357	0.000	0.143	0.000	0.500

Note: This table presents the breakdown of non-financial affiliates by share for a selection of the largest 50 BHCs ranked by assets. We use the 2-digit NAICS code to breakdown non-financial firms into 6 bins: Housing, Utilities and Construction, Manufacturing and Wholesale Trade, Management Companies, Other Non-financials, and Real Estate.

Table A4: Largest 50 (1-25) BHCs in 2007 and 2017

	2007 Q2		2017 Q2	
Rank	Highholder Name	Highholder Assets (billions)	Highholder Name	Highholder Assets (billions)
1	CITIGROUP	2220.866	JPMORGAN CHASE & CO	2563.174
2	BANK OF AMER CORP	1535.684	BANK OF AMER CORP	2256.095
3	JPMORGAN CHASE & CO	1458.042	WELLS FARGO & CO	1930.871
4	WACHOVIA CORP	719.922	CITIGROUP	1864.063
5	WELLS FARGO & CO	539.865	U S BC	463.844
6	U S BC	222.53	PNC FNCL SVC GROUP	372.357
7	SUNTRUST BK	180.3144	BANK OF NY MELLON CORP	354.815
8	CAPITAL ONE FC	145.938	CAPITAL ONE FC	350.5929
9	NATIONAL CITY CORP	140.6482	STATE STREET CORP	238.276
10	REGIONS FC	137.6242	BB&T CORP	221.192
11	BB&T CORP	127.5771	SUNTRUST BK	207.3181
12	BANK OF NY CO	126.457	FIFTH THIRD BC	141.0667
13	PNC FNCL SVC GROUP	125.7367	KEYCORP	136.3622
14	STATE STREET CORP	112.3458	NORTHERN TR CORP	125.6057
15	FIFTH THIRD BC	101.3897	REGIONS FC	124.7784
16	KEYCORP	93.4909	M&T BK CORP	120.8966
17	NORTHERN TR CORP	59.60973	HUNTINGTON BSHRS	101.4068
18	COMERICA	58.94573	COMERICA	71.63028
19	MARSHALL & ILSLEY CORP	58.32753	ZIONS BC	65.44616
20	CHARLES SCHWAB CORP	49.00381	SVB FNCL GRP	48.4353
21	ZIONS BC	48.70313	NEW YORK CMNTY BC	48.34345
22	COMMERCE BC	48.23133	PEOPLES UNITED FNCL INC	43.02292
23	POPULAR	46.985	POPULAR	41.243
24	MELLON FNCL CORP	43.38906	EAST WEST BC	35.92678
25	FIRST HORIZON NAT CORP	38.39583	FIRST CITIZENS BSHRS	34.76985

Note: This table presents the largest 25 BHCs based on highholder assets, in billions, in 2007 Q2 and 2017 Q2.

Table A5: Largest 50 (26-50) BHCs in 2007 and 2017

	2007 Q2		2017 Q2	
Rank	Highholder Name	Highholder Assets (billions)	Highholder Name	Highholder Assets (billions)
26	HUNTINGTON BSHRS	36.42208	RAYMOND JAMES FNCL	33.43343
27	COMPASS BSHRS	34.93894	BOK FC	32.5152
28	SYNOVUS FC	33.29582	FNB CORP	30.75373
29	NEW YORK CMNTY BC	29.6384	SYNOVUS FC	30.68797
30	COLONIAL BANCGROUP	23.82348	CULLEN/FROST BKR	30.23354
31	ASSOCIATED BANC CORP	20.84953	ASSOCIATED BANC-CORP	29.76903
32	BOK FC	19.3636	FIRST HORIZON NAT CORP	29.37272
33	W HOLD CO	17.8292	BANKUNITED	28.99374
34	FIRST BC	17.60505	WINTRUST FC	26.9312
35	INVESTORS FNCL SVC CORP	17.05827	HANCOCK HC	26.64195
36	WEBSTER FNCL CORP	16.96741	WEBSTER FNCL CORP	26.18713
37	SKY FNCL GROUP	16.80729	UMPQUA HC	25.25778
38	FIRST CITIZENS BSHRS	16.01204	COMMERCE BSHRS	25.10372
39	CITY NAT CORP	15.81365	INVESTORS BC	24.33433
40	COMMERCE BSHRS	15.53111	VALLEY NAT BC	23.44935
41	NEW YORK PRIV B&TR CORP	15.09547	TEXAS CAP BSHRS	23.11971
42	FULTON FNCL CORP	15.07842	PROSPERITY BSHRS	22.30127
43	TCF FC	15.06538	PACWEST BC	22.24689
44	FBOP CORP	14.38196	TCF FC	22.07081
45	SOUTH FNCL GROUP	14.13968	IBERIABANK CORP	21.79073
46	CITIZENS REPUBLIC BC	13.28319	PINNACLE FNCL PTNR	20.88615
47	BANCORPSOUTH	13.21191	UMB FC	20.3536
48	CULLEN/FROST BKR	13.09257	MB FNCL	19.96506
49	VALLEY NAT BC	12.31909	FULTON FNCL CORP	19.57151
50	R&G FNCL CORP	11.61087	STIFEL FNCL CORP	19.53358

Note: This table presents the largest 26-50 BHCs based on highholder assets, in billions, in 2007 Q2 and 2017 Q2.

Table A6: Classification of Affiliate Types

	Business Type	Affiliate Type	NAICS Codes
Financial Affiliates	Commercial Banks	Commercial Banks	5221
	Mutual and Pension Funds	Mutual and Pension Funds	52511, 52591
	Insurance	Insurance	5242, 5241
	Other Financial	Other Portfolio Managers	52599, 52392, 52590, 52519, 52592
		Broker Dealers	5231, 5232
		Other Intermediaries	5222, 5223
		Other Securities Activities	5239
Non-financial Affiliates	Non-financial Management Firms	(Non-financial) Management Companies	55
	Other Nonfinancial	Real Estate	53
		Housing	62422
		Utilities and Construction	21, 22, 23
		Manufacturing and Wholesale Trade	31, 32, 33, 42, 45
		Other	11, 48, 49, 51, 54, 56, 61, 62 (no 62422), 71, 72, 81

Note: This table presents our classification for Business Types, broken down into financial and non-financial entities, and the associated NAICS codes. The classification uses 4-digit NAICS codes for all financial entities and 2-digit NAICS codes for all non-financial entities. To further break down portfolio management, the classification uses 6-digit NAICS codes to differentiate between mutual and pension funds and other portfolio management. In other nonfinancial entities, NAICS code 62422 is community housing, so it is listed in its own category. The NAICS codebook can be found here.

Table A7: List of Countries by Low Tax Jurisdiction and High Financial Secrecy (2018)

Low Tax Jurisdiction	High Financial Secrecy	None
Aruba	Aruba	Australia
Bahamas	Bahamas	Austria
Bahrain	Bahrain	Belgium
Barbados	Bolivia	Botswana
Bermuda	Brunei	Brazil
Bolivia	Kenya	Bulgaria
British Virgin Islands	Liberia	Canada
Brunei	Liechtenstein	Chile
Cayman Islands	Monaco	China
Costa Rica	Panama	Cook Islands
Czech Republic	Paraguay	Cyprus
France	Saint Lucia	Denmark
Gibraltar	Seychelles	Dominican Republic
Guatemala	Switzerland	Finland
Hong Kong	Taiwan	Germany
Ireland	Thailand	Greece
Kenya	Turks And Caicos Islands	Hungary
Liberia	United Arab Emirates	Iceland
Liechtenstein	Vanuatu	India
Malta		Indonesia
Mauritius		Israel
Mexico		Italy
Netherlands		Japan
New Zealand		Lebanon
Paraguay		Luxembourg
Philippines		Macao
Russia		Malaysia
Saint Lucia		Marshall Islands
Seychelles		Norway
Singapore		Poland
Switzerland		Portugal
Thailand		Romania
Turks And Caicos Islands		Saudi Arabia
Ukraine		South Africa
United Arab Emirates		South Korea
Uruguay		Spain
Vanuatu		Sweden
		Tanzania
		Turkey
		United Kingdom
		United States
		Venezuela

Note: This table presents the countries that have low tax jurisdiction (tax credit < 10), high financial secrecy (secrecy score > 75), or neither (high tax jurisdiction or low financial secrecy) based on a time-invariant cutoff. The the tax jurisdictions and secrecy scores 2018 data are from the Tax Justice Network (`https://www.financialsecrecyindex.com/introduction/fsi-2018-results`).