

Federal Reserve Bank of New York  
Staff Reports

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Linda Goldberg  
April Meehl

Staff Report No. 880  
February 2019  
Revised September 2019



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## **Complexity in Large U.S. Banks**

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*Federal Reserve Bank of New York Staff Reports*, no. 880

February 2019; revised September 2019

JEL classification: F32, G11, G20

### **Abstract**

The structural complexity of the largest U.S. bank holding companies (BHCs) has been changing. Using a range of measures of organizational, business and geographic complexity, we show that large U.S. BHCs remain very complex. Organizational complexity has declined the most since the global financial crisis, as the average number of legal entities within US large BHCs has 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. Locations with favorable tax treatment still attract a significant share of the foreign bank and nonbank entities while informationally opaque locations are losing their share of such entities.

Key words: bank, bank holding company, size, complexity, global bank

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Goldberg: Federal Reserve Bank of New York and National Bureau of Economic Research (email: [linda.goldberg@ny.frb.org](mailto:linda.goldberg@ny.frb.org)). Meehl: University of Wisconsin-Madison (email: [aimeehl@wisc.edu](mailto:aimeehl@wisc.edu)). The authors thank Nicola Cetorelli, João Santos, and Anna Kovner for providing helpful comments and insights, as well as Kevin Lai for providing excellent research assistance. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York, the Federal Reserve System, or the National Bureau of Economic Research.

To view the authors' disclosure statements, visit  
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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), identified bank size and complexity as determinants of systemic importance, with both features are viewed as contributing to risks to financial stability. In the decade since the Dodd Frank Act, big U.S. banks have not shrunk in size (Cetorelli and Stern, 2015; Avraham, Selvaggi and Vickery, 2012; Goldberg and Meehl, 2018). In this paper, we ask if they have simplified in the decade after the global financial crisis. We present new evidence on the evolving complexity of large U.S. BHCs, comparing 2007 and 2017.

As a starting point, we recognize that complexity of bank holding companies (BHCs) cannot be well captured by a single metric. The system established to address global systemically important banks<sup>1</sup> presents complexity as a combination of balance sheet and derivatives exposures and the number of distinct legal entities within the BHC. These components are associated with bank balance sheet opacity and enhanced difficulty of valuing asset portfolios and exposures of banks when they fail.<sup>2</sup> We instead focus exclusively on the structural complexity of BHCs, using information on all the legal entities that are under the umbrella of each BHC conglomerate. Our work builds on discussions of structure and size comparisons for U.S. BHCs by Avraham, Selvaggi and Vickery (2012) and for global banks by Cetorelli and Goldberg (2014). The structure data, described in Cetorelli, Jacobides and Stern (2017), is used both for metrics established in these prior studies and also in new measures that cover organizational, business, and geographic complexity. We also look more in depth at the industry and geography of BHC subsidiaries. Our discussion zooms in on the changes that have occurred in complexity from 2007 just prior to the global financial crisis to ten years later. This full period spans time beyond both the crisis and the implementation of reforms such as the Dodd Frank Act and guidance around Living Wills.

First, we use the term organization complexity to refer to the number of separate legal entities within a BHC, following the approach in a broader literature more aimed at understanding why banks choose to be complex and arguing that larger numbers contribute to higher resolution and systemic costs if a BHC fails (Carmassi and Herring, 2016). The term business complexity is used to capture the scope and concentration of businesses and industries across these legal entities. Finally, the term geographic complexity captures the domestic versus international locations of these entities, utilizing information on their span and dispersion across countries.<sup>3</sup>

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<sup>1</sup>The classification of these banks and the criteria used can be found here.

<sup>2</sup>Chernobai et al. (2018) and Demsetz and Strahan (1997) evaluate complexity using balance sheet measures such as nonbank asset and non-interest income in order to capture effects on operational and firm-specific risk, respectively.

<sup>3</sup>? and Carmassi and Herring (2016) focus on shares of the total number of entities that fall into categories such as foreign-located, size larger than \$10B in assets or \$1B in operating income, or within a given financial industry. Cetorelli and Goldberg (2014) created metrics for the count of non-bank entities to bank entities and of general

Comparing the organizational, business and geographic complexity measures over this decade for the largest of the US BHCs, we conclude that BHCs have mixed outcomes around simplifying their organizations. Large BHCs remain very complex across organizational, business and geographic dimensions. Nonetheless, 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 industries. Many of these subsidiaries are vehicles for community housing investments that increase the scope of BHCs without necessarily complicating bank resolution (Cetorelli and Wang, 2016). More generally, BHC performance tends to improve following expansion into financial businesses that were not previously their points of focus (Cetorelli et al., 2017).

There has been a small decline in the number of large US BHCs that have entities in foreign locations. 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. The continued prominence of countries with status as low tax locations stands in contrast with the reduced prominence of having affiliates in some emerging markets and informationally opaque locations. Many of the non-bank foreign subsidiaries are concentrated in the UK and the Cayman Islands, while specific industries such as insurance and real estate have higher shares of subsidiaries in other locations.

Section 2 presents 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 a pre-crisis snapshot and 2017 as a post-crisis snapshot. Section 4 delves more deeply 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. Section 5 conducts a similar exercise looking at foreign locations, including divisions across advanced economies, emerging markets, tax havens, and financial secrecy locations. Further, in this section we also examine the locations of subsidiaries operating in specific industries.

Section 6 concludes with observations about 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). The main argument is that greater complexity, all else equal, can contribute to agency problems and make a failing

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business types, including non-financial industries, while Cetorelli et al. (2017) counted the number of NAICs codes that a banks' subsidiaries span. Avraham et al. (2012) generated a measure of the number of countries and the given regions of the world in which a bank chooses to locate subsidiaries.

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, the overall implications for types of BHC risks is not well understood, as diverse business lines and activities across countries can add value, synergies, diversification benefits, and efficiencies. So far, the dominant forms of change have been in numbers of legal entities, without wholesale reductions in scope and dispersion. Additional research is needed to further understand these important consequences of organizational, business, and geographic complexity.

## 2 Defining and Measuring Complexity

Many BHCs are corporate conglomerates with significant ownership positions or controlling interests in a range of legal entities (alternatively referred to as affiliates or subsidiaries) and can span both bank and nonbank activities. As in the complexity measures of Cetorelli and Goldberg (2014), we utilize information on the structure, number, location, and industry type of bank and non-bank affiliates under each BHC. The core data for U.S. BHCs 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) and updated quarterly. Each affiliate within a BHC is coded with information on its primary industry, captured by one of 203 4-digit level NAICS codes, and its country location.

Respective complexity metrics – organizational, business, and geographic – rely on counts of legal entities in each BHC, combined to explore different business or industry types, international versus United States locations of entities, and dispersion of entities across the respective component. Our notation for complexity indices at the level of the BHC keeps implicit that an index is both BHC- and time-specific. The notation only includes subscripts that distinguish the number and characteristics of the legal entities within each BHC.

The most basic measure of complexity and the only measure in the organizational complexity category is the total number of legal entities within the BHC, *Count*.

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.<sup>4</sup> *Nonfinancial count share*, is the share of legal entities that are not in the more broadly defined financial sector (2 digit NAICS code 52). *CountN* is the number of 4 digit NAICS industries spanned by the legal entities in the BHC.

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<sup>4</sup>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.

Industry type is indexed by  $i$ , or summed over every  $i$  for a BHC at a date and denoted by  $I$ .  $CountB$  is the total number of business types (maximum 6) spanned by BHC affiliates, where we define business types as Banking, Insurance, Mutual and Pension Fund, Other Financial, Nonfinancial Management Firms, and Other Nonfinancial.<sup>5</sup> The dispersion of affiliate business types within the BHC and across its legal entities is given by a modified Herfindahl type index, with  $BHHI = \frac{CountB}{CountB-1} \left( 1 - \sum_{b=1}^B \left( \frac{count_b}{\sum_{b=1}^B count_b} \right)^2 \right)$ , 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  $b$ . These measures take a value of zero if all entities are in banking, and increases as the dispersion of entities across types of businesses rises.

Geographic measures begin with an indicator created to identify banks which hold at least one foreign-located subsidiary, *HasForeign*. This metric takes a value of one if the BHC has any affiliates in foreign locations, and is otherwise zero. Geographical location is denoted by country  $c$ , and the sum over all locations is denoted by  $C$  which takes a minimum value of 1 if all affiliates of the BHC are situated within the U.S. Other measures include the count of countries spanned by the affiliates  $CountC$ , and a Herfindahl-Hirschman Index of location dispersion across countries indicated by  $CHHI = \frac{CountC}{CountC-1} \left( 1 - \sum_{c=1}^C \left( \frac{count_c}{\sum_{c=1}^C count_c} \right)^2 \right)$  where  $C$  is the set of countries and  $count_c$  is the count of a BHC's subsidiaries in each country  $c$ .  $CHHI$  is zero when all of the BHC's legal entities are within the United States, and increases as the dispersion across countries rises.<sup>6</sup>

### 3 Complexity Patterns in the Largest 50 US BHCs

Asset size and complexity are concentrated within the largest of the thousands of U.S. BHCs. Accordingly, our exploration of complexity evidence begins with the BHCs that are over \$1 billion in assets<sup>7</sup> and have a U.S. top holder,<sup>8</sup> The quarterly value of total BHC assets and number of U.S. domestic BHCs satisfying these criteria are shown in Figure 1 for the period from 2007 through 2017. The red line and right scale show the total number of these BHCs, which gradually increased from about 400 in 2007 to over 500 by 2017. Their total assets rose from about \$10 trillion in

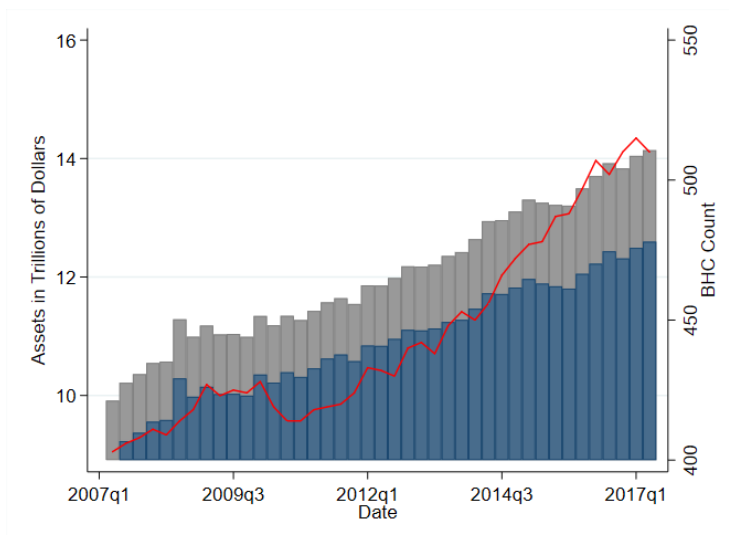
<sup>5</sup>Business types are defined according to NAICS codes as follows: (1) Bank: NAICS code == 5221; (2) Insurance: NAICS code == 5241, 5242; (3) Mutual and Pension Fund: NAICS code == 52511, 52591; (4) Other Financial: 2 digit NAICS code 52, but subsidiary does not fall into the categories of Bank, 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.

<sup>6</sup>These 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.

<sup>7</sup>All analysis in this paper excludes the seven large BHCs that were designated as BHCs after 2008: Goldman Sachs, Morgan Stanley, American Express, CIT Group, Ally Financial, Discover Financial Services, and Metlife.

<sup>8</sup>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>.

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.

2007 to \$14 trillion by 2017 (left scale, upper grey contour). The assets of the largest 50 of these BHCs in each quarter, shown by the blue shaded portion of assets, represent over 85 percent of the overall BHC assets. As complexity is also concentrated in the largest BHCs, below we focus solely on the largest 50 BHCs and compare complexity pre-crisis (2007) versus a decade later (2017).

### 3.1 Broad Patterns in BHC Complexity

Patterns in complexity across the largest 50 U.S. BHCs are presented in summary form in Table 1, which provides the minimum, median, mean, and maximum values of each complexity metric in 2007:Q2 and 2017:Q2. On balance, compared to the pre-crisis date, by 2017 the largest U.S. BHCs tended to simplify organizational, business and geographic complexity, while increasing in size. The average number of legal entities within a BHC declined from 232 to 189, demonstrating a clear decline in organizational complexity despite increases in BHC assets. While average BHC assets increased from 2007 to 2017, this increase in size is driven mainly by the largest of the large BHCs. The changes in organizational, business, and geographical complexity between 2007 and 2017 are spread more broadly across the largest 50 BHCs.

Declines in business and geographic complexity are less pronounced than observed for organizational complexity. On average, the 50 largest BHCs maintained 5 of the 6 business types, and marginally reduced the number of NAICs industries spanned by their affiliated entities (by 2).

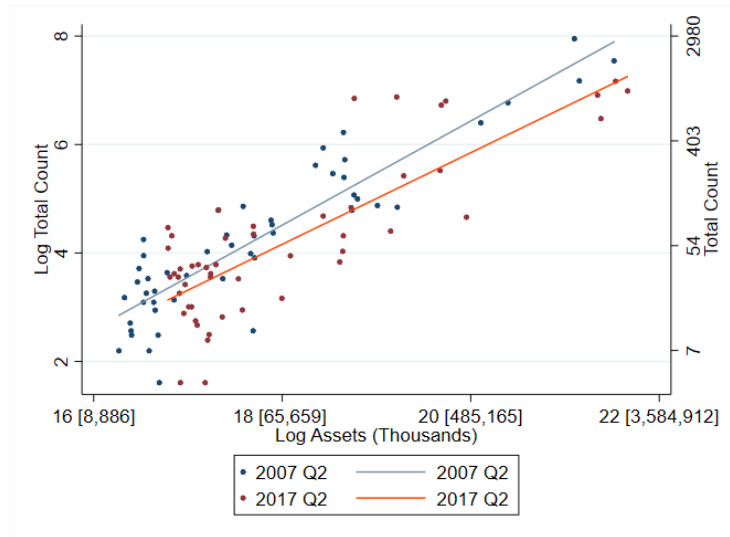
Table 1: Summary Statistics Of Complexity Variables

	2007Q2				2017Q2			
	min	median	mean	max	min	median	mean	max
BHC Assets	11.61	37.41	178.19	2220.87	19.53	34.10	251.94	2563.17
<b>Organizational</b>								
<i>Count</i>	5.00	59.50	231.68	2834.00	4.00	39.00	189.48	1258.00
<b>Business</b>								
<i>Non-financial Count Share</i>	0.05	0.36	0.38	0.92	0.05	0.38	0.40	0.97
<i>CountB</i>	4.00	5.00	5.14	6.00	3.00	5.00	4.88	6.00
<i>BHHI</i>	0.24	0.86	0.83	0.99	0.09	0.83	0.77	1.00
<i>CountN</i>	5.00	13.00	13.56	33.00	4.00	10.00	11.52	29.00
<b>Geographical</b>								
<i>Has Foreign</i>	0.00	1.00	0.58	1.00	0.00	1.00	0.54	1.00
<i>CountC</i>	1.00	2.00	7.94	80.00	1.00	2.00	7.42	69.00
<i>CHHI</i>	0.00	0.06	0.18	0.84	0.00	0.03	0.17	0.81

<sup>a</sup> 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.



Figure 2: Organizational Complexity versus BHC Assets for the Largest 50 BHCs: 2007 versus 2017



Note: Dots represent the largest 50 BHCs by assets in 2007 and in 2017. In brackets are the total assets equivalent of log assets. Right vertical axis shows the total count corresponding to the log total count on the left axis.

The average share of non-financial subsidiaries increased only slightly between 2007 and 2017, from 38 percent to 40 percent. The share of BHCs with any foreign affiliates declined from 58 percent to 54 percent, implying that 27 instead of 29 of the largest 50 BHCs had affiliates in foreign locations. The average number of country locations spanned by these affiliates remained between 7 and 8 with a dispersion rate near 18 percent.

The two most organizationally complex BHCs held 2836 and 1900 subsidiaries, respectively, in 2007.<sup>9</sup> By contrast, the most complex BHC held 1335 subsidiaries in 2017. The number of subsidiaries within the top 10 BHCs contrasts sharply with counts in the bottom 40. Business complexity patterns are less differentiated. The count of unique 4-digit NAICS codes by BHC size rank shows a general decreasing pattern as asset size declines. The number of NAICS codes within BHCs tended to decline from 2007 to 2017, especially among the largest BHCs.

Asset size and complexity are correlated but not comparable statistics across U.S. BHCs.<sup>10</sup> Figure 2 shows the relationship between BHC total affiliate count and assets in 2007 (blue dots) and in 2017 (red dots). The positive slopes of 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

<sup>9</sup>Box plots illustrate how complexity measures differ throughout the distribution of the largest 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 (b).

<sup>10</sup>Cetorelli and Goldberg (2014) reached a similar conclusion for large non US global banks.

panel shows that BHC assets are larger post-crisis and entity counts 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, shows the substantial diversity in organizational complexity as represented by numbers of legal entities and conditional on size.

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

Complexity Metric	BHC Assets	Count	Nonfin count share	CountB	BHHI	CountN	Has Foreign	CountC	CHHI
BHC Assets	1								
<b>Organizational</b>									
<i>Count</i>	0.76	1							
<b>Business</b>									
<i>Non-financial count share</i>	0.03	0.27	1						
<i>CountB</i>	0.49	0.53	0.24	1					
<i>BHHI</i>	-0.22	-0.59	-0.30	-0.27	1				
<i>CountN</i>	0.81	0.74	0.21	0.75	-0.34	1			
<b>Geographical</b>									
<i>Has Foreign</i>	0.36	0.47	0.15	0.40	-0.43	0.50	1		
<i>CountC</i>	0.84	0.78	-0.02	0.56	-0.23	0.83	0.47	1	
<i>CHHI</i>	0.44	0.41	-0.20	0.47	-0.18	0.54	0.69	0.69	1

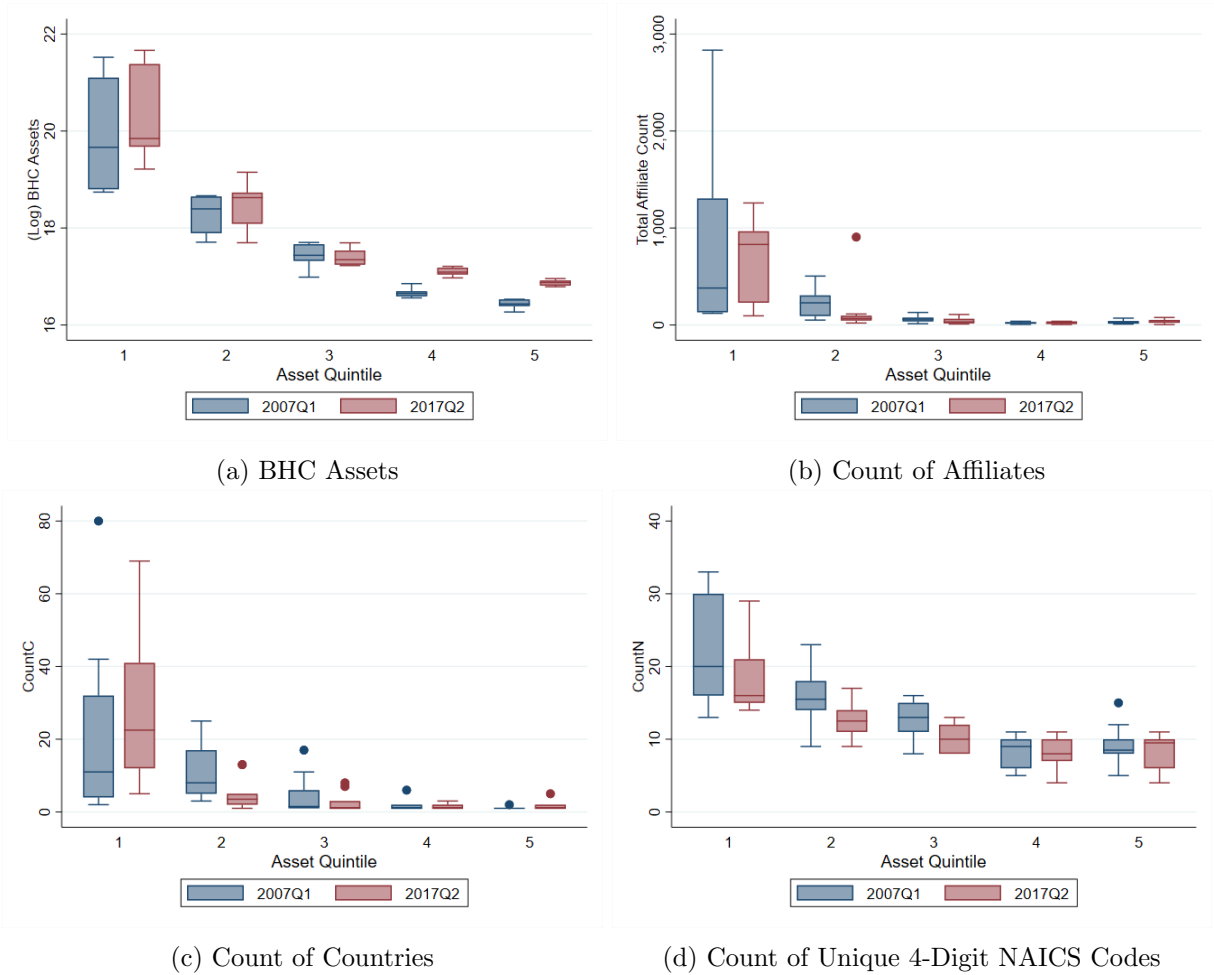
Note: Pearson correlations between complexity measures using 2017 quarterly data.

Only some forms of complexity are highly correlated with BHC size or with each other, as shown by Pearson Correlations presented in Table 2. The broad patterns by size are further illustrated in Figure 3. At each date, BHCs are sorted into quintiles by size, with quintile 1 capturing the largest 10 BHCs and quintile 5 the smallest 10 BHCs among this top 50 group. The panels provide box and whisker representation of the distribution of the complexity variable within the sample of BHCs and across dates.<sup>11</sup> 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. The dispersion of business types, *BHHI*, is negatively correlated with all other complexity variables. There is little correlation between the *Non-financial count share* and numbers of businesses and countries of affiliates. When a BHC adds more non-financial subsidiaries, these tend to be either domestic or in existing foreign

<sup>11</sup>The upper and lower whiskers values represent  $1.5 \times IQR$  above and below the 75th and 25th percentile respectively. Values outside of the upper and lower whiskers are shown with dots.

locations, business types, and industries. Pre- vs post-crisis, the declines in counts of industries spanned and country locations were particularly concentrated in the largest quintiles of U.S. BHCs.

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



Note: Box plots represent the distribution of the complexity metric for BHCs falling into each quintile of the size distribution of the largest 50 BHCs as determined by BHC assets. Asset quintile 1 represents the 10 largest BHCs.

## 4 Business Complexity and BHC Affiliate Scope

BHCs have long been operating in sectors outside of banking, including other financial and nonfinancial industries. Drivers and consequences of the decision to expand into or leave these

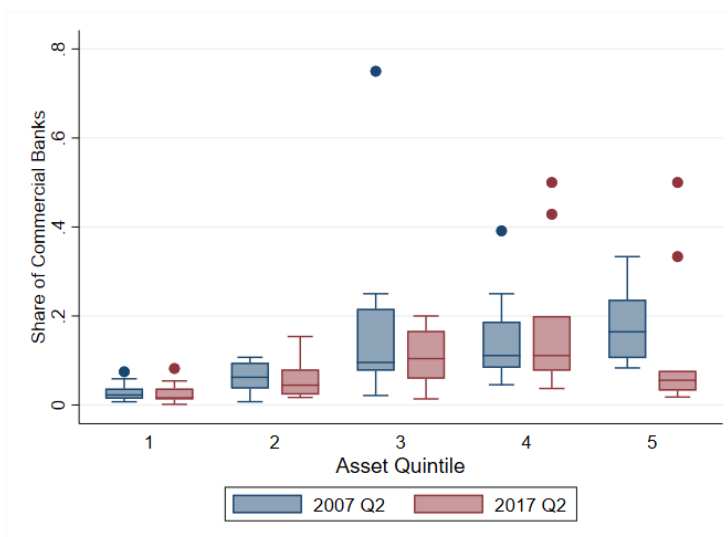
industries is a ripe topic for research. For example, Cetorelli and Wang (2016) emphasize that the growth of BHCs community housing affiliates has occurred to support obtaining Community Reinvestment Act credits and FHLS tax benefits and Cetorelli et al. (2017) find that BHCs improve performance on average when they altered their scope to resemble that of the modal BHC. Some BHCs may have first expanded into particular industries in order to seize opportunities, such as reallocating capital, bringing production in-house, or benefiting from synergies from combining activities. Other BHCs then diversified similarly 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. We observed that most BHCs have not decreased their industry scope since 2007; instead they have shifted their concentration across industries. Correa and Goldberg (2019) show that BHC idiosyncratic and liquidity risks decrease with organizational complexity and geographic scope, which also may be providing diversification gains.

#### **4.1 Financial Entities**

Only a small fraction of the legal entities within BHCs are commercial banks, even if these entities hold a large share of BHC total assets. 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. As shown in Figure 4, which depicts the top 50 BHCs sorted by size into quintiles at 2007 and again at 2017, that share changed in idiosyncratic ways across BHCs. The majority of their subsidiaries fall into the category of “Other Financials” (Table A1).

In the past decade, large U.S. BHCs have shifted the composition of their financial subsidiaries away from the bank intermediaries (Figure 5). There has been a large increase in subsidiaries classified in portfolio management, 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 percent. 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. The change in this share of BHC entities in other portfolio management is particularly pronounced: one large BHC had a share greater than 50 percent in 2007 compared to four BHCs in 2017 (Table A2). The decline in the share of other types of financial intermediaries is also clear: five BHCs had shares over 30 percent in 2007 compared to only one in 2017. Insurance companies are a greater proportion of financial affiliates for the smaller BHCs both in 2007 and 2017.

Figure 4: Share of Commercial Banks in Total Financial Affiliates by BHC Asset Size Quintile



Note: Box plots represent the distribution of the share of commercial banks for BHCs falling into each quintile of the size distribution of the 50 largest BHCs as determined by BHC assets. Asset Quintile 1 represents the largest BHCs.

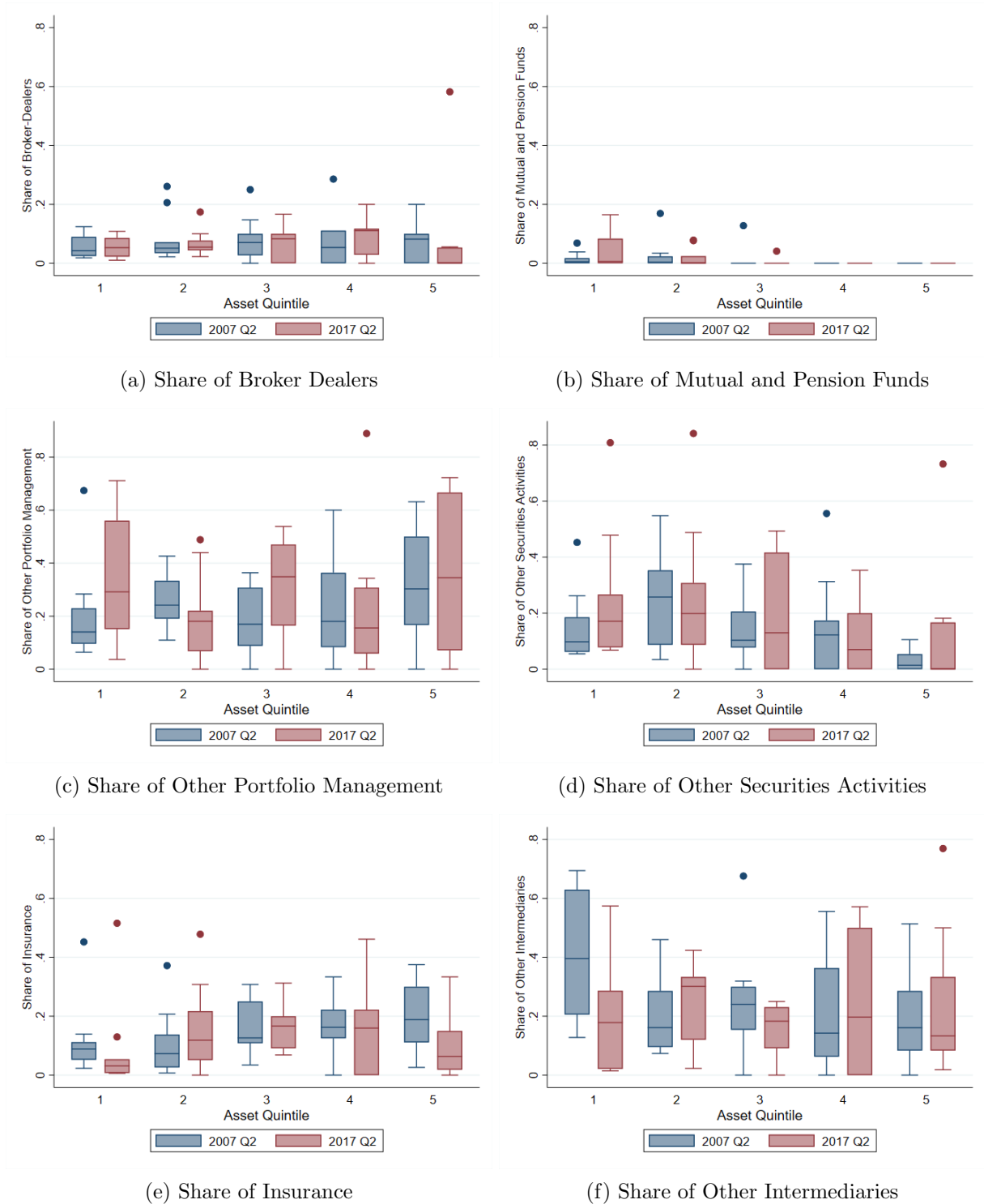
## 4.2 Non-Financial Entities

All of the large US BHCs have nonfinancial subsidiaries. The largest categories of nonfinancial subsidiaries tend to fall 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, with considerable differences across the BHCs. Management Companies are the most popular nonfinancial affiliate types with the five largest BHCs holding an average share of all nonfinancial entities of around 30 percent in both 2007 and 2017. Among the largest quintile of BHCs, the minimum share of Housing subsidiaries rose from 10 percent in 2007 to 25 percent in 2017. In terms of NAICS codes, some Housing entities (code 62422) replaced Real Estate-related entities (code 53) as the average share of the latter decreased from 20 percent in 2007 to 13 percent in 2017.

## 5 Geographic Complexity

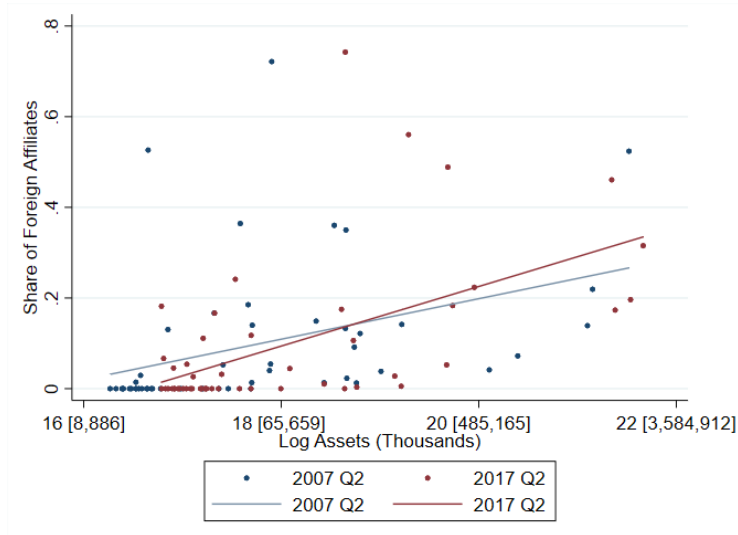
Comparing pre-crisis with post-crisis dates, 2 fewer BHCs among the 50 largest have foreign-located subsidiaries. The relationship between BHC size and the share of foreign affiliates is positive, as geographic complexity is more prevalent in larger BHCs but still highly differentiated even within size buckets among these large BHCs (Figure 6). While the ten largest BHCs in 2017 have a greater foreign share in total entity counts than in 2007, some of this change is due to

Figure 5: Share of Type of Financial Affiliates in Total Financial Affiliates by BHC Asset Size Quintile



Note: Box plots represent the distribution of the complexity measure for BHCs falling into each quintile of the size distribution of the largest 50 BHCs as determined by BHC assets. Asset quintile 1 represents the 10 largest BHCs.

Figure 6: Share of Foreign Affiliates versus BHC Assets for the Largest 50 BHCs: 2007 and 2017



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.

the larger reduction in domestically-located entities within BHCs, consistent with their broader decline in organizational complexity. Many of the largest U.S. BHCs operated in fewer countries in 2017 than in 2007, another sign of reduced geographical complexity. 45 percent of bank entities were outside the U.S. in 2017, up from 34 percent in 2007 (Table 3). Substantially higher shares of mutual and pension funds, and a lower share of insurance entities, are now located outside the U.S.

Table 3: Share of Foreign Affiliates by Business Type

	2007 Q2	2017 Q2
Banks	0.34	0.45
Insurance	0.16	0.10
Mutual and Pension Funds	0.34	0.54
Other Financial	0.26	0.29
Non-financial Management Firms	0.33	0.36
Other Non-financial	0.07	0.05

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

The locational choices of the foreign banking subsidiaries and branches of global banks has long been the subject of academic research and debate.<sup>12</sup> These choices have been linked to

<sup>12</sup>See for example, Berger et al. (2003), Buch (2005), Claessens and Horen (2014), Claessens et al. (2017), Russ and Valderrama (2012), and Niepmann (2015).

international trade in goods and services, country and institution growth rates, and comparative advantage in bank and country productivity rates. 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 around the world, even as fewer US BHCs are involved.

Less attention has been paid to the other non-bank affiliates of these financial conglomerates, which dominate the absolute numbers of foreign affiliates within BHC conglomerates. Location choices could be driven by similar factors as observed for the bank affiliates. Additionally, 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. Know-your-customer (KYC), anti-money laundering (AML), and combating the financing of terrorism compliance costs also could play a role, as such concerns have been associated with derisking of global banks and reduced activity in some foreign markets (Erbenova et al., 2016).

We highlight some of these considerations by sorting the foreign affiliates of US BHCs according to location. The sort has two dimensions. First, it distinguishes between affiliates within advanced economies (AEs) versus within emerging markets (EMs). Second, it distinguishes locations that have low tax jurisdictions 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). The FSI metric of 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.<sup>13</sup> The Secrecy Score should capture at least some of the KYC and AML locations that have been the focus of international bank derisking discussions.<sup>14</sup>

Table 4 provides a breakdown of the number of BHCs that have affiliates in foreign locations, in low tax jurisdictions, and high financial secrecy locations by size quintile of BHC. This table also illustrates the stark positive relationship between size and involvement in low tax and high financial secrecy locations. The number of BHCs in the top quintiles with affiliates in low tax jurisdictions was unchanged, while the next quintile registered a decrease from 2007 to 2017. This second quintile also had fewer BHCs in high financial secrecy locations. The shares of total foreign affiliates in these locations also changed. In 2007, the median share of foreign affiliates in low tax

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<sup>13</sup>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.

<sup>14</sup>FSB (2017) provides statistics and related discussion of the status of international correspondent banking activity. Table A7 provides the country sorting for financial secrecy and low tax jurisdictions.

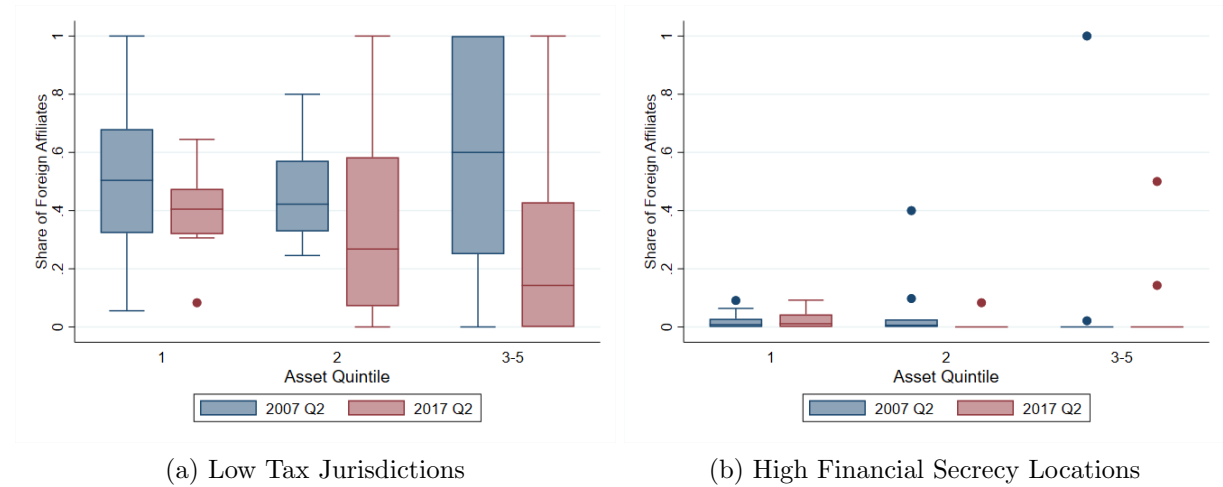


Table 4: Number of BHCs with High Fin Secrecy and Low Tax Jurisdiction, by Asset Size Quintile

Quintile	2007 Q2			2017 Q2		
	Foreign Affiliates	Low Tax Jurisdiction	High Financial Secrecy	Foreign Affiliates	Low Tax Jurisdiction	High Financial Secrecy
1	10	10	5	10	10	7
2	10	10	5	8	6	1
3	5	4	1	3	2	1
4	3	3	0	3	2	1
5	1	1	1	3	1	0

Note: This table presents the number of BHCs that have foreign affiliates and affiliates in low tax jurisdiction and high financial secrecy countries, by asset quintiles. The max number in each quintile is 10 BHCs.

Figure 7: Share of Foreign Affiliates located in Low Tax Jurisdiction and High Financial Secrecy Locations by BHC Asset Size Quintile



Note: Box plots represent the distribution of the share of foreign affiliates located in low tax jurisdiction or high financial secrecy locations falling into each quintile of the size distribution of the largest 50 BHCs as determined by BHC assets. Asset quintile 1 represents the 10 largest BHCs.

jurisdictions for BHCs in Quintile 1 was 50%, compared to 40% in 2017. For Quintile 2, these shares were 42% and 27% respectively. Of the few BHCs with affiliates located in high financial secrecy locations, these affiliates make up a very small share of their total foreign affiliates. In Quintile 1, the median share of foreign affiliates in these locations was 0.8% in 2007 and 0.6% in 2017. Out of all BHCs in the top 50, the maximum share of foreign affiliates in high financial secrecy locations was 100% in 2007 and 50% in 2017.

Tables 5 and 6 provide a more detailed look of the evolution of affiliate locations, also con-

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

<b>A. By BHCs</b>						
	Total Entities		Banking Entities		Non-bank Entities	
	2007	2017	2007	2017	2007	2017
<b>In AE</b>						
All Locations	25	22	11	8	25	22
Low Tax Jurisdiction	21	13	7	5	21	13
High Financial Secrecy	5	7	1	1	5	7
<b>In EM</b>						
All Locations	25	22	6	6	25	21
Low Tax Jurisdiction	24	19	4	3	24	19
High Financial Secrecy	10	8	1	1	10	8
<b>B. By Affiliate Count</b>						
<b>In AE</b>						
All Locations	1378	1222	40	26	1338	1196
Low Tax Jurisdiction	302	307	11	7	291	300
High Financial Secrecy	29	30	1	2	28	28
<b>In EM</b>						
All Locations	884	741	60	43	824	698
Low Tax Jurisdiction	531	442	17	10	514	432
High Financial Secrecy	64	49	5	2	59	47

Note: This table presents the locational breakdown of US BHCs and affiliates. Table A7 details countries within tax and secrecy categories.

sidering the numbers in Low Tax Jurisdictions or Financial Secrecy locations. In each table, the upper panel provides the total count of BHCs out of the 50 largest BHCs with at least one subsidiary located in advanced economies (AE) or emerging markets (EM). The lower panel provides the count of all affiliates out of the total sample of affiliates held by the 50 largest BHCs that are located in advanced economies or emerging markets. Each panel further enumerates those entities in low tax or financial secrecy jurisdictions. Table 5 focuses on all foreign affiliates, banks, and total nonbanks. Table 6 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 5). The total number of BHCs with banking affiliates in AE locations declined from 11 to 8, while those in EMs remained at only 6 BHCs out of the 50 largest. 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 high financial secrecy ratings. Among EMs, the Cayman Islands remains the most popular secretive location for subsidiaries of large U.S.

BHCs.

Table 6: Location of U.S. BHC Foreign Entities by Affiliate Types, by BHCs and Counts of Entities

<b>A. By BHCs</b>										
	Mutual Fund		Insurance		Other Financial		Non-financial Management		Other Non-financial	
	2007	2017	2007	2017	2007	2017	2007	2017	2007	2017
<b>In AE</b>										
All Locations	7	6	5	3	23	19	16	14	14	15
Low Tax Jurisdiction	2	3	2	0	20	12	11	9	9	7
High Financial Secrecy	1	0	1	0	4	7	1	3	1	2
<b>In EM</b>										
All Locations	17	41	44	17	448	445	153	115	162	80
Low Tax Jurisdiction	11	36	32	12	271	277	109	75	91	32
High Financial Secrecy	0	0	5	1	33	30	11	8	10	8
<b>B. By Affiliate Count</b>										
<b>In AE</b>										
All Locations	18	97	31	3	885	793	239	220	165	83
Low Tax Jurisdiction	5	42	4	0	205	193	53	50	24	15
High Financial Secrecy	1	0	2	0	19	19	3	7	3	2
<b>In EM</b>										
All Locations	17	41	44	17	448	445	153	115	162	80
Low Tax Jurisdiction	11	36	32	12	271	277	109	75	91	32
High Financial Secrecy	0	0	5	1	33	30	11	8	10	8

Note: This table presents the locational breakdown of US BHCs and affiliates.

Among the foreign nonbank entities within US BHCs, numbers of BHCs declined in both AE and EM locations, with declines in each type of EM location (Table 5). The number of entities in AE low tax jurisdictions increased from 291 to 300, but spanned a smaller number of BHCs. Affiliates in secrecy locations remained stable. Entities in EM low tax jurisdictions are far more prevalent than those associated with financial secrecy, but still declined substantially from 2007 to 2017. The largest share of nonbank affiliates are in Other Financial which covers activities like other portfolio managers, broker dealers, other intermediaries, and other securities activities (Table A6). Foreign Non-Financial Management Companies, which perform activities such as financial planning, billing and recordkeeping, and physical distribution, declined substantially in both AEs and EMs, outside of the secrecy locations of AEs and primarily declining in the EM low tax locations. The rebalancing 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 occurring 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. We provide metrics of these complexity categories for U.S. BHCs pre-crisis and post-crisis. Organizational complexity, captured by the count of legal entities within respective U.S. BHCs, tends to be higher for larger BHCs (as measured by assets), with considerable variation by BHC size. Some of the largest BHCs had significant declines in affiliate counts in the decade after the financial crisis and the majority of the rationalized affiliates were located within the United States. While the largest BHCs hold a substantial number of subsidiaries in foreign locations, only about half of the top 50 BHCs have even one foreign subsidiary. The number of countries in which a BHC has subsidiaries has tended to decline, especially in locations associated with financial secrecy. Low tax locations remain popular among the geographically complex large US BHCs.

Business complexity, measured using information on the industries of entities within BHCs, has tended to transform more than simplify. Most large BHCs have entities that span banking, fund management, insurance, and nonfinancial activities, even if they differ substantially in the finer sub-industry composition. The nonfinancial share of entities within BHCs remains large, while the number of industries spanned by these entities is somewhat smaller than pre-crisis. Within the financial industries, BHCs shifted towards less traditional financial subsidiaries such as portfolio management firms and other securities activities, reducing shares of commercial banks, insurance firms, and other intermediaries.

Simplification of bank complexity 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 these BHCs in the event of failure (Stiroh, 2018). The concept of optimal complexity in US BHCs still warrants additional analysis. Further research is needed on the implications of complexity for the full bank holding company, for the specific entities within the BHCs and for financial stability more broadly. Research could establish which forms of business and geographic complexity support diversification, efficiencies and risk sharing, adding value by increasing performance and potentially enhancing institutional robustness. These positive attributes would contrast with the negative contributions to agency problems and moral hazard, and the systemic externalities that motivated strengthening bank resolution and resolution initiatives. While reducing the costs of bank failure has been targeted by policy initiatives, this additional analysis will better inform the consequences of the different forms of complexity during the lives of these large financial conglomerates.

## References

- Avdjiev, Stefan, Leonardo Gambacorta, Linda Goldberg, and Stefano Schiaffi.** 2017. “The Shifting Drivers of Global Liquidity.” Working Paper 23565, National Bureau of Economic Research.
- Avraham, Dafna, Patricia Selvaggi, and James I. Vickery.** 2012. “A Structural View of U.S. Bank Holding Companies.” *Economic Policy Review*, 18(2): 65–81.
- Berger, Alan, Qinglei Dai, Steven Ongena, and David C. Smith.** 2003. “To What Extent Will the Banking Industry be Globalized? A Study of Bank Nationality and Reach in 20 European Nations.” *Journal of Banking and Finance*, 27(3): 383–415.
- Buch, Claudia.** 2005. “Distance and International Banking.” *Review of International Banking*, 13(4): 787–804.
- Carmassi, Jacopo, and Richard Herring.** 2016. “The Corporate Complexity of Globally Systemically Important Banks.” *Journal of Financial Services Research*, 49(2): 175–201.
- Cetorelli, Nicola, and Linda Goldberg.** 2014. “Measuring Complexity in Global Banks.” *Federal Reserve Bank of New York Economic Policy Review*, 20(2): 107–126.
- Cetorelli, Nicola, Michael Jacobides, and Samuel Stern.** 2017. “Transformation of Corporate Scope in US Banks: Patterns and Performance Implications.” *Federal Reserve Bank of New York Staff Reports*(813): .
- Cetorelli, Nicola, and Samuel Stern.** 2015. “Same Name, New Businesses: Evolution in the Bank Holding Company.” *Liberty Street Economics*, URL: <https://libertystreeteconomics.newyorkfed.org/2015/09/same-name-new-businesses-evolution-in-the-bank-holding-company.html>.
- Cetorelli, Nicola, and Rose Wang.** 2016. “Bank Regulation and Bank Complexity.” *Liberty Street Economics*, URL: <https://libertystreeteconomics.newyorkfed.org/2016/04/bank-regulation-and-bank-complexity.html>.
- Chernobai, Anna, Ali Ozdagli, and Jianlin Wang.** 2018. “Business Complexity and Risk Management: Evidence from Operation Risk Events in U.S. Bank Holding Companies.” working paper, Society for Economic Dynamics.
- Claessens, Stijn, Omar Hassib, and Neeltje Van Horen.** 2017. “The Role of Foreign Banks and Trade.” Working Paper 11821, CEPR Discussion Papers.
- Claessens, Stijn, and Neeltje Van Horen.** 2014. “Foreign Banks: Trends and Impacts.” *Journal of Money, Credit and Banking*, 46(S1): 195–316.
- Correa, Ricardo, and Linda Goldberg.** 2019. “Bank Complexity, Governance, and Risk.” manuscript.
- Demsetz, Rebecca, and Philip Strahan.** 1997. “Diversification, Size, and Risk at Bank

- Holding Companies.” *Journal of Money, Credit, and Banking*, 29(3): 300–313.
- Erbenova, Michaela, Yan Liu, Nadim Kyriakos-Saad, Alejandro Lopze-Mejia, Giancarlo Gasha, Emmanuel Mathias, Mohamed Norat, Francisca Fernando, and Yasmin Almeida.** 2016. “The Withdrawal of Correspondent Banking Relationships: A Case for Policy Action.” *IMF Staff Discussion Note*, SDN/16/06.
- FSB.** 2017. “FSB Correspondent Banking Data Report.” report, Financial Stability Board.
- Goldberg, Linda, and April Meehl.** 2018. “Have the Biggest U.S. Banks Become Less Complex?” *Liberty Street Economics*, URL: <https://libertystreeteconomics.newyorkfed.org/2018/05/have-the-biggest-us-banks-become-less-complex.html>.
- Goldberg, Linda, and Leslie Shen.** 2018. “Valuing Bank Complexity.” manuscript.
- Haldane, Andrew.** 2015. “On Microscopes and Telescopes.” In *Presented at Lorentz centre workshop on socio-economic complexity*. URL: [www.bis.org/review/r150330b.pdf](http://www.bis.org/review/r150330b.pdf).
- Milesi-Ferreti, Gian Maria, and Cedric Tille.** 2011. “The Great Retrenchment: International Capital Flows during the Global Financial Crisis.” *Economic Policy*(66): 285–342.
- Niepmann, Friederike.** 2015. “Banking Across Borders.” *Journal of International Economics*, 96(2): 244–265.
- Russ, Katheryn, and Diego Valderrama.** 2012. “A Theory of Bank Versus Bond Finance and Intra-industry Reallocation.” *Journal of Macroeconomics*, 34(3): 652–673.
- Stiroh, Kevin.** 2018. “Supervisory Implications of Rising Similarity in Banking.” In *Financial Times US Banking Forum*. November.

# A Appendix

Table A1: Breakdown of Business Types by Asset Size Quintile

Quintile	Banks		Insurance		Mutual & Pension Funds		Other Financial		Nonfin		Manage firms		Other Nonfinancial	
	2007 Q2	2017 Q2	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	0.015	0.038	0.008	0.453	0.109	0.377	0.012	0.015	0.035	0.504	0.103	0.330	0.103	0.330
2	0.018	0.029	0.013	0.369	0.072	0.499	0.010	0.026	0.004	0.203	0.048	0.708	0.048	0.708
3	0.101	0.067	0.009	0.399	0.136	0.288	0.033	0.060	0.007	0.394	0.253	0.253	0.253	0.253
4	0.093	0.098	0.000	0.498	0.149	0.163	0.115	0.081	0.000	0.488	0.115	0.201	0.115	0.201
5	0.131	0.093	0.000	0.455	0.076	0.245	0.041	0.033	0.000	0.631	0.047	0.248	0.047	0.248

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 categories: Banks, Insurance, Mutual and Pension Funds, Other Financial, Non-financial Firms, and Other Non-financial.



Table A2: Breakdown of Financial Entities by Asset Size Quintile

Quintile	Commercial Banks		Other Intermediaries		Broker Dealers		Other Portfolio Management	
	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.032	0.022	0.360	0.122	0.067	0.050	0.235	0.430
2	0.047	0.045	0.175	0.262	0.069	0.060	0.278	0.214
3	0.201	0.074	0.253	0.137	0.064	0.095	0.186	0.253
4	0.159	0.180	0.206	0.180	0.063	0.068	0.254	0.346
5	0.201	0.063	0.206	0.158	0.053	0.150	0.354	0.333
Other Securities Activities								
			Insurance		Mutual and Pension Funds			
Quintile	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.211	0.283	0.078	0.028	0.017	0.064		
2	0.324	0.286	0.076	0.114	0.032	0.018		
3	0.143	0.295	0.134	0.132	0.018	0.016		
4	0.151	0.098	0.167	0.128	0.000	0.000		
5	0.042	0.246	0.143	0.050	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 financial firms into 7 categories: commercial banks, other intermediaries, broker dealers, other portfolio management, other securities activities, insurance, and mutual and pension funds.

Table A3: Breakdown of Non-financial Entities by Asset Size Quintile

Quintile	Housing		Utilities & Construction		Manufacturing & Wholesale Trade	
	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.193	0.318	0.012	0.001	0.001	0.000
2	0.324	0.424	0.001	0.000	0.001	0.000
3	0.056	0.024	0.016	0.017	0.002	0.009
4	0.067	0.106	0.000	0.000	0.000	0.000
5	0.022	0.117	0.000	0.000	0.000	0.000
Non-financial Manage Firms						
Quintile	Other		Other		Real Estate	
	2007 Q2	2017 Q2	2007 Q2	2017 Q2	2007 Q2	2017 Q2
1	0.112	0.119	0.050	0.031	0.132	0.031
2	0.063	0.032	0.051	0.021	0.059	0.023
3	0.160	0.250	0.162	0.052	0.104	0.149
4	0.239	0.182	0.104	0.023	0.090	0.189
5	0.118	0.079	0.210	0.136	0.151	0.168

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 categories: 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

Rank	2007 Q2		2017 Q2	
	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

Rank	2007 Q2		2017 Q2	
	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	32.51152
28	SYNOVUS FC	33.29582	FNB CORP	30.75373
29	NEW YORK CMNTY BC	29.6384	SYNOVUS FC	30.68797
30	COLONIAL BANGROUP	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

	<b>Business Type</b>	<b>Affiliate Type</b>	<b>NAICS Codes</b>	
<b>Financial Affiliates</b>	Commercial Banks	Commercial Banks	5221	
	Mutual and Pension Funds	Mutual and Pension Funds	52511, 52591	
	Insurance	Insurance	5242, 5241	
	Other Financial	Other Portfolio Managers	Other Portfolio Managers	52599, 52392, 52590, 52519, 52592
		Broker Dealers	Broker Dealers	5231, 5232
Other Intermediaries		Other Intermediaries	5222, 5223	
	Other Securities Activities	Other Securities Activities	5239	
<b>Non-financial Affiliates</b>	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>).