THE EFFECT OF THE DODD-FRANK ACT 2010 ON THE RISK EXPOSURE OF COMPLEX BANK HOLDING COMPANIES

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ABSTRACT

We examine the impact of the 2010 Dodd-Frank Act on the risk exposure of Bank Holding Companies. Our findings show that the Dodd-Frank Act enhances the stability of those complex banks classified as either credit-extending institutions or defined as complex by supervisory-judgment and high-risk activities, while it did not impact on other types of institutions. Our findings for shadow-banking activities are mixed. Complex institutions with credit-extending activities and complex by supervisory-judgment are the only entities to have reduced respectively their income derived from activities with their non-bank affiliates and investments in their non-bank subsidiaries. Instead, complex institutions with high risk activities and complex by management factor increased their investments with non-bank affiliates after the regulatory change. At the aggregate level, consolidated bank holding companies appear to have increased engagement in non-traditional financial activities with their non-bank affiliates.

Keywords: Stability, shadow-banking activities, regulation, bank holding companies.

JEL classification: G21, G32, G28.

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1. Introduction

Beginning with the 1994 Riegle–Neal Act and followed by the Gramm Leach Bliley Financial Modernization Act of 1999, US banks began to grow and expand into non-banking sectors.[1,2] This led to the rise of organizationally complex bank holding companies (BHCs) characterized by their control over a network of non-bank subsidiaries, dubbed "shadow banks" (see, for example, Cetorelli *et al.*, 2014 and Adrian and Ashcraft, 2012).[3] Shadow banking refers to a diverse set of institutions and markets that carry out traditional banking functions outside the traditional system of regulated depository institutions. Examples of shadow banking include securitization vehicles, asset-backed commercial paper conduits, money market funds, markets for repurchase agreements, investment banks, and mortgage companies. Both the size and the complexity of these BHCs and their shadow banking activities make them very difficult to monitor from a regulatory perspective. When the beginning of the financial crisis declared itself in 2007, these complex BHCs and their shadow banking activities played a crucial role in generating and spreading the financial crisis (e.g.

[1] The deregulation process over recent decades has contributed to changes in the business model of US banks and intensified increases in the size and complexity of banks. Before the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 (Riegle-Neal Act.), banks were geographically clustered in specific locations and limited in their business activities. Starting with the Riegle-Neal Act., banks were allowed to expand their branching network outside their home state and to enter into non-traditional banking sectors by acquiring non-bank subsidiaries (Olson, 2012; Cetorelli *et al.*, 2014). Later, the Gramm Leach Bliley Financial Modernization Act. of 1999 (Gramm-Leach-Bliley Act.) intensified the increased bank complexity by reducing the remaining barriers between investment banking and commercial banking.

[2] We use the terms: *bank* as an independent commercial bank, *BHC* as a bank holding company, and *FHC* as a financial holding company that controls one or more commercial banks.

[3] These changes in the law allowed BHCs to increase their number of branches and subsidiaries as well as to enter into new non-traditional banking activities to achieve economies of scale and/or scope (Stiroh and Rumble, 2006; Anderson and Joeveer, 2012). This also explains the wave of merger activity over the last two decades, where the number of BHCs declined from 5,860 in 1991 to 4,660 by the end of 2011 (Avraham *et al.*, 2012).

Simkovic, 2009; and Gorton, 2009). As a result, the US government enacted the Dodd-Frank Wall Street Reform and Consumer Protection Act on July 21, 2010 to better regulate these entities. It was aimed at tackling the riskiness and complexity of banks by fixing limits on their non-traditional banking activities (Avraham *et al.*, 2012).

Although the problem of complexity and non-traditional banking is a key objective of Dodd-Frank, prior literature that analyses its effectiveness does not distinguish between complex and non-complex entities (e.g. Andriosopoulos et al., 2016; Balasubramniana and Cyree, 2014). To fill this gap this research paper focuses on complexity and non-traditional banking for the first time to our knowledge to study the simple but powerful research question: "How effective was the Dodd-Frank regulatory change in enhancing the stability and risk exposure of US BHCs?" To answer this question, we use the difference-in-difference methodology and consider several aspects of BHC activity. We look at BHC stability, measured by the Z-score, and BHC riskiness, measured as volatility of return on assets (ROA). We also look directly at BHC exposure to internally generated shadow banking using three measures. The first measure is the ratio of balances due to non-bank subsidiaries to total liabilities. This ratio allows us to observe how the change in regulation has affected bank holdings of non-bank liabilities with their affiliates that are considered to be riskier than traditional funding due to the absence of guarantee schemes (Pozsar *et al.*, 2010). The second is the level of non-equity investments held by BHCs in their non-bank partners. This dependent variable allows us to analyse how

the regulatory change affects bank investing in their non-bank subsidiaries. The third is the total of non-bank income that banks receive from their non-bank subsidiaries. This dependent variable allows us to observe if the regulatory change of 2010 reduces the income that banks receive from their non-bank subsidiaries.

We also recognize the differing dimensions of complexity in US Bank Holding Companies and refer to code RSSD9057 from the Consolidation Report of Condition and Income (Call Reports) of the entities that breaks complexity into seven different categories: "credit-extending-activities", "non-bank-financial-factors", "high-risk-activities", "public-debt", "management-factors", "multiple-factors" and "supervisory-judgment". The first classification, "credit-extending-activities", is for entities that increase their credit lending activities either with their parent BHCs or non-bank subsidiaries or engage in debt outstanding to the general public. The second classification, "non-bank-financial-factors", refers to the nature and scale of non-bank activities that determine whether the BHC is complex in this way. "High-risk-activities" is for entities that engage, directly or through their subsidiaries, in considerably high-risk non-banking activities, such as securities broking or dealer activities, and insurance underwriting, among others. The "public-debt" category is when the entity issues significant debt to the general public in which unsophisticated investors may be at risk of loss. The "management-factors" classification is when entities show complex management practices such as inter-company transactions or centralised risk management practices. The "multiple-factors" category is when entities

have the presence of two or more of the fore-mentioned complex categories. Lastly, the "supervisory-judgement" is when non-complex institutions are designated as complex organizations for supervisory purposes.[4]

Our results, show that the Dodd-Frank Act 2010 improved the stability and riskiness of complex institutions and caused a reduction of internal shadow banking. However, it did not affect all the categories of complex institutions equally. Only complex banks classified as "credit-extending-activities" and "supervisory-judgment" improved their stability and riskiness, and respectively reduced their income derived from non-bank subsidiaries and investments in their non-bank affiliates.[5] Instead, complex institutions with high risk activities and complex by management factor increased their investments in non-bank affiliates after the regulatory change. Interestingly, we also found evidence that, despite BHCs reducing their activities with the non-bank affiliates inside the group, they increased their engagement in non-traditional financial activities with non-bank affiliates outside the group. This would suggest that BHCs have found a way to bypass the restrictions imposed by Dodd-Frank by engaging in shadow-banking activities with non-bank entities outside the group.

We perform several checks for robustness to further confirm our results. For example, we rerun the main model excluding the "credit-extending" complex category and the four US States where 25% of the total number of observations is concentrated (California, Illinois, New York and

[4] Appendix A displays details of the different classifications of complexity.

[5] These two complexity categories accounted for almost 44% of the sample of complex institutions.

Texas). We control for the possibility that alternative forces are driving our results by using placebo experiments. In particular, we examine whether banks had started to change their behaviour before the introduction of the Dodd-Frank Act. Furthermore, we apply the coarsened exact matching algorithm to take into account that the complexity classification we use does not occur randomly. Finally, we examine the changes in the flows between the BHCs with the non-banking institutions for the consolidated balance sheet. This allows us to infer whether BHCs increase their flows with non-banking institutions outside the group as a consequence of more restrictive requirements at the group level.

We contribute to the existing literature in several ways. It is the first study that analyses how, and to what extent, complex BHC stability and volatility has been impacted by the Dodd-Frank Act. Secondly, by taking a close look at the flows between a BHC and its non-banking institutions, this paper also shows how BHCs have reshaped their activities through increased non-bank transactions with non-bank affiliates inside and outside the group. Finally, by breaking down BHC complexity by type, it shows how the impact of Dodd-Frank differs across the different categories of complex institutions.

This paper is organised as follows: Section 2 provides an overview of shadow banking activities. Section 3 shows the re-regulation framework for the U.S. financial sector, while Section 4 shows a review of the related literature. Section 5 provides the methodology and data used to conduct this

study, Section 6 presents our findings and, finally, Section 7 presents the conclusions of our research.

2. Shadow banking activities in complex institutions

As mentioned above, shadow banking refers to a diverse set of institutions and markets that carry out traditional banking functions outside the traditional system of regulated depository institutions using a wide range of specialized financial instruments and funding techniques. In this way, shadow banking can convert risky loans into short-term instruments that are supposedly free of risk (Cetorelli *et al.*, 2012). However, there are risks associated with shadow banking activities. As pointed out by Adrian (2015), most of the shadow banking activities have no explicit liquidity support in the case of a downturn. [6]Adrian (2015) also point out that many shadow financial activities do not need to fulfil capital requirements. Furthermore, agency problems can arise between all the participants in shadow banking activities, such as the originators of the loans, lenders, investors, invested funds, asset managers, and credit rating agencies, which can give a false impression of the price of this activity. As such, non-banking activities have modified the way in which we look at the traditional bank model, where banks are deposit-funded institutions that keep their loans until maturity. It has evolved into a more complex model

[6] They can, however, benefit indirectly from government backstops through the credit lines of commercial banks, which can distort the pricing of shadow banking activities.

that is wholesale-funded with securitized loans that involve a range of shadow banking entities (Strahan, 2010; Cetorelli *et al.*, 2012).

The phenomenon of shadow banking can be dated to the de-regulation process in the 1990s. Since the 1990s, banks have started to move into non-traditional banking sectors by acquiring a variety of non-bank subsidiaries, such as broker-dealers, insurance brokers, investment companies, asset management entities, and insurance underwriters among others (Cetorelli *et al.*, 2012). With the enactment of the Gramm-Leach-Bliley Act in 1999, BHCs were able to become Financial Holding Companies (FHC) in order to house banks and non-bank entities in the same institution, even though they had different supervisory regulators (Avraham *et al.*, 2012). Moreover, with the support of the traditional banks, non-bank institutions considerably increased their financial activities, which also helped to increase bank size on their consolidated balance sheets (Bord and Santos, 2012).

The basic shadow banking activities of BHCs with their non-bank subsidiaries are that the BHC invests in the non-bank affiliate through loans, advances, notes, bonds, debentures and other receivables due from their subsidiaries. Meanwhile, from the non-bank subsidiaries the holding company receives loans, financial intermediation and income, such as dividends, interest management and services fees. Related to the financial intermediation, the BHC generates loans, which are packaged into sophisticated financial instruments, such as asset-backed securities (ABS) or collateralized debt obligations (CDOs), to be sold in the financial markets with the help of the non-bank entities. Adrian and Ashcraft (2012) found that

the type and number of non-bank entities involved in the financial intermediation might depend on the quality of the loans generated by the bank. Lower quality assets, such as subprime mortgages, might require re-packaging into another type of financial instrument to achieve the quality needed to be acquired by another non-bank entity. Figure 1, below, shows a basic flow of how BHCs engage in non-banking activities with their non-bank affiliates within the same group and with non-bank entities outside the holding group.

INSERT FIGURE 1 HERE

Since the onset of the 2007 financial crisis, a large amount of research focuses on the growth of shadow banking activities (DeYoung and Torna, 2013; Peni *et al.*, 2013; Jacobides, 2015). In a more recent paper, Pozsar *et al.,* (2010) explain how the fragile shadow banking system led to a run on liquidity in the mortgage subprime market, resulting in the bursting of the mortgage bubble in 2007. Compared to previous crises, this caught the attention of governments because of its impact on the entire global financial system, which led to the adoption of extreme measures to recover financial and economic stability (Laeven and Valencia, 2012). Another strand of the literature explains how shadow banking activities increased after the 2007 financial crisis to satisfy the risk appetite of a growing financial market (Pozsar *et al.*, 2010). This has increased the concerns of policy makers. Controlling these activities represent in fact a major challenge for central

banks to prevent a systemic meltdown of the financial markets (Grung-Moe, 2014), especially because most of the non-bank activities involve subsidiaries under different regulatory frameworks (Afonso *et al.*, 2014).

3. Re-regulation changes in the U.S. financial sector

The US government enacted the Dodd-Frank Wall Street Reform and Consumer Protection Act on July 21, 2010 in order to tackle the growing complexity of banking institutions, which was considered to be one of the main drivers of the 2007 financial crisis. One of its main objectives was to reorganise and simplify the banks' business models and to place limits on their non-banking activities (Lippe *et al.*, 2015). As reported in Section 112 (a)(1)(A) STAT. 1395, the Dodd-Frank Act states: "*to identify risks to the financial stability of the United States that could arise from the material financial distress or failure, or ongoing activities, of large, interconnected bank holding companies or non-bank financial companies, or that could arise outside the financial services marketplace*."

However, much of the concern of policy makers was related to the reduction of investment and borrowing activities of intra-groups (i.e. non-equity investments). Therefore, the Act attempted to introduce some limits to these "shadow" banking activities by forcing banks to report intra-group activities. In particular, BHCs with assets of $50 billion or more are required to produce a report with the following information: "*(4) the extent to which the activities and operations of the company and any subsidiary thereof,*

could, under adverse circumstances, have the potential to disrupt financial markets or affect the overall financial stability of the United States."[7]

Despite these re-regulatory changes, various scholars have argued that the complexity problem of financial entities is not completely solved (Strahan, 2013; and Cetorelli and Goldberg, 2014) and that the increasing complexity of global commerce and legal frameworks has not been fully addressed (Lippe *et al.*, 2015). Therefore, a complete regulatory reform is needed (Gorton *et al.*, 2010; Cetorelli and Goldberg, 2014). As such, the impact of Dodd-Frank Act on the volume of transactions between subsidiaries of BHCs is still not clear and further research is warranted.

4. Literature on complexity of financial institutions

Little attention has been paid to the problem of the complexity of institutions, despite its importance for the stability of the financial system. Some studies have focused their analysis on how to measure the complexity of financial institutions. Cetorelli and Goldberg (2014) provide measures of the business and geographic complexity of the entities for domestic and foreign banking organisations from the US that have had a worldwide presence. They find that size is not necessarily related to all their measures of complexity. Avraham *et al,*. (2012) describe how the number of subsidiaries of the fifty top Tier US BHCs are related to their industry and geographic concentration, both inside and outside to the US.

[7] Dodd-Frank Wall Street Reform and Consumer Protection Act. § 116(a)(1)–(4) STAT. 1406.

There are only a handful of papers that have examined the main factors that enable financial entities to become more complex. Cetorelli *et al.,* (2014) argue that complexity is seen as part of the evolution of the structure of banks. They investigate changes in the family network and argue that banks reduce their "centric" activities through expanding geographically with new subsidiaries, in most cases with non-bank entities. Furthermore, most of these new subsidiaries reshaped the activity range of the banks, in that complexity was not exclusive to the largest financial entities in the sector. Similarly, from an international perspective, Carmassi and Herring (2015) show how the current legislation encourages banks to adopt complex structures in relation to their different subsidiaries located in other countries. They claim that regulations which help to maintain some independence between subsidiaries and their headquarters will contribute to maintaining the stability of these entities if their head office fails.

The existing literature also examines the problems of size and the systemic risk posed by financial institutions. These studies analyse how "too big to fail" (TBTF) institutions continue to grow, although policy makers try to set boundaries on their activities which might affect all the industrial sectors that are related to them in the case of a downturn (Strahan, 2013). Furthermore, this literature emphasises that the largest TBTF institutions have more interrelationships with more companies from other sectors. Thus, these entities are the priority for governments to be included in a bailout to overcome a crisis (Kaufman, 2015). Nevertheless, the literature does not fully investigate how the variety of business structures within a holding

creates more risky entities when there is a regulatory change. Additionally, most of these studies only consider the largest complex entities and do not compare them to their largest non-complex counterparts, which might also have a significant influence on their markets.

5. Methodology

5.1. The complexity and shadow banking activities of BHCs

In order to have a better understanding of the relationship between regulatory changes and the complexity of banks, in this study we analyse how the Dodd-Frank Act affects the stability of complex banks and the financial activities with their non-banking subsidiaries. We use the BHCs complexity indicator of the Federal Reserve (FED) to identify the complex and non-complex entities. We select a time window sample to capture the pre- and post-period times using a difference-in-difference estimation to compare the evolution of the risk to default and non-banking activities of the two groups. To measure the complexity of BHCs we refer to code RSSD9057 from the Consolidation Report of Condition and Income (Call Reports) of the entities. In the mid-1990s, the FED established an indicator to classify the complexity of BHCs into seven different categories: credit-extending-activities, non-bank-financial-factors, high-risk-activities, public-debt, management-factors, multiple-factors and supervisory-judgment.[8]

We also use Call Reports data from US domestic BHCs to capture part of the shadow banking activities that banks engaged in with their non-bank

[8] Please see Appendix A for more details on complexity definitions.

affiliates from the same holding. We consider the non-equity investments in non-bank subsidiaries, which are the sum of advances, notes, bonds, debentures and other receivables due from these entities. Furthermore, we take into account balances due to non-bank subsidiaries. In this way, we can observe the degree of funding those banks receive from their non-bank partners, which are considered to be riskier than traditional liability funding. The main reason for this is that non-bank affiliates do not have any support shelter from their regulatory authorities compared to the bailout programs launched by the banking authorities in order to overcome a financial crisis (Pozsar *et al.*, 2010). We also consider the income derived from non-bank affiliates that can be used in regulatory arbitrage, in order to see the benefits that banks receive due to intermediation activities, interest management, service fees and dividends from their shadow banking partners.[9]

5.2. Data description

The data for this project is obtained through the Federal Reserve Bank of Chicago website. It contains the Call Reports from the small, large and consolidated holding companies, such as BHCs, savings and loan holding companies and savings holding companies. We selected quarterly data from the large BHCs (reporting forms FR Y-9LP) from which it is possible to

[9] Note, data for non-equity investments and non-bank income for the consolidated BHCs is not available so we only consider balances due to non-bank subsidiaries in our analysis of this type of entity.

obtain the data on income and non-equity investments derived from non-bank activities with their non-bank subsidiaries.

Our sample window covers the period 2009Q4 to 2011Q2. This is based on the Dodd-Frank Act introduction in July 2010. First, we test for immediate impact (three-quarter window) of the Dodd-Frank on stability and the non-bank activities of complex BHCs. More specifically, we focus on the period 2009Q4 –2010Q2 (3Q-window) before the regulatory change and 2010Q4 – 2011Q2 (3Q-window) after the regulatory change. The choice of a short timeframe is consistent with other studies that have tested the impact of regulatory changes on banks' balance sheets on US banks (see for example, Park and Van Horn, 2015). As a robustness check, we also rerun our analysis using a 5Q-window to assess the long-term effects of Dodd-Frank by considering the period 2009Q2 –2011Q4. In particular, we consider 2009Q2-2010Q2 (5Q-window) for the period before the regulatory change and 2010Q4- 2011Q4 (5Q-window) for the period after the regulatory change. We did not extend our period of analysis before the 2009Q2 because several banks were bailed-out under the Capital Purchase Program (CPP) of TARP during the period 2008Q4-2009Q1. This could have affected banks' volatility and default risk (Duchin et al., 2014).

Criteria for selecting our sample are as follows. We drop entities that do not appear for all the quarters of the sample and, at the same time, we delete the savings and loan holding companies. We also remove all the non-domestic institutions and non-mainland institutions, such as Puerto Rico and Hawaii. Furthermore, we only choose those entities which maintain

their complexity or non-complexity indicators over the whole selected time span.

Our final sample is a balanced dataset which contains 129 complex entities, 938 non-complex entities and a total of 7,469 observations for the 3Q-windows and 9,867 for the 5Q-window.[10] Regarding the composition of our sample, the 50 complex institutions classified as credit-extending-activities represent 38% of the complex banks from our sample, followed by 34 with management-factors (25%). Panels A and B in Table 1 display details of the composition of our sample by complexity category for unconsolidated balance sheets for the 3Q-window and the 5Q-window respectively. Panel C shows details of the composition of our sample by complexity category for consolidated balance sheets for the 3Q-window.

>>INSERT TABLE 1 HERE<<

5.3. Empirical framework

We use the difference-in-difference estimations to compare the evolution of the risk between two groups: a treated group that integrates complex BHCs and a control group with non-complex BHCs, which are considered unaffected by the change in regulation. This enables us to analyse the effectiveness of the Dodd-Frank Act on the complexity of the BHCs. We include state and bank fixed effects to control for unobserved heterogeneity.

[10] For details about sample selection, see Panel A in Appendix B.

Furthermore, we cluster heteroscedasticity-adjusted standard errors at the bank level in order to avoid serial correlation between banks.

First, we analyse the effects of the regulatory changes on risk for the complex BHCs using the following model:

$$\triangle ln(\mathrm{y}_{it}) = \alpha + \beta_1 Complex_i + \beta_2 Complex_i * Post_i + \beta_3 X_{i,t-1} + \delta + \varepsilon_{it} \quad (1)$$

where, $\triangle ln(\mathrm{y}_{it})$ is the growth rate of the dependent variable for the BHC i at time t; $Complex_i$ is a dummy variable equal to 1 for the complex BHCs, 0 otherwise; $Post$ is a dummy variable equal to 1 for the quarters 2010Q4 – 2011Q2 following the change in regulation in 2010Q3, 0 for 2009Q4 – 2010Q2; $X_{i,t-1}$represents the vector for the control variables lagged; δdepicts fixed-effects dummy variables, while ε_{it} is an error term. By using the growth of the dependent variable in our analysis we eliminate unobserved variables that are individual-specific and constant over time and not relevant to our analysis.

Our main explanatory parameter of interest is the coefficient β_2 from the interaction term $Complex_i * Post_i$ which represents the impact of the change in regulation for the periods following its implementation. The analysis of this coefficient allows us to see how complex BHCs responded to the new requirements of the Dodd-Frank Act. Additionally, we use lagged values for the control variables in order to avoid correlation with omitted variables. Our second test is to focus our analysis on how the different categories of complexity impact bank stability. To conduct this analysis, we

modify our original equation (1) and decompose our main explanatory variable into six different variables, which represent the interaction between each type of complexity and the change in regulation. This means that we generate interaction variables for each of the following complexity categories: "credit-extending-activities", "non-bank-financial-factors", "high-risk-activities", "management-factors", "multiple-factors" and "supervisory-judgment". Note that we do not include a variable for "public-debt" complexity as none of the entities from our sample has this indicator. Thus, our modified equation is as follows:

$$\triangle \ln(Y_{it}) = \alpha + \beta_1 Complex + \sum_{i=1}^{6} \beta_{2j}\, Complex\ indicator_{ij} * Post_i + \beta_3 X_{i,t-1} + \delta + \varepsilon_{it} \quad (2)$$

where $Complex\ indicator$ is the dummy variable equal to 1 for each type of the complexity indicator for the BHC i, and 0 otherwise. The coefficient β_{2j} captures the difference-in-difference effect of the re-regulatory change on the dependent variable for each j type of complexity category.

5.4. Variable definitions

We use different measures to represent risk and non-banking activities as dependent variables to analyse the effects of the Dodd-Frank Act. Firstly, we include the Z-score which has been commonly used in the banking literature as a proxy for bank stability (Stiroh and Rumble, 2006; Elyasiani and Zhang, 2015; Meslier *et al.*, 2016). The interpretation is that lower

values of Z-score signal a higher probability of default. Following Lepetit and Strobel (2015) the Z-score is calculated as follows:

$$Z = (\text{CAR} + \text{ROA})/\sigma_{roa} \tag{3}$$

where the Z-score is defined as the sum of the capital-to-asset ratio and the return on assets divided by the standard deviation of the return on assets. We calculate the standard deviation over a four-quarter rolling time window. This enables us to avoid the changes in the Z-score being affected exclusively by variations in capital levels and profitability. We use a log transformation of this measure to control for the skewed distribution.

As our second risk measure we use volatility of ROA, which is a component from the Z-score. This measure has also been used by previous researchers in order to depict return volatility (Laeven and Levine, 2009; Berger *et al.*, 2010a; Beck *et al.*, 2013). It is calculated as the negative of the natural logarithm of the standard deviation of ROA over a four-quarter rolling time window. We use this time window in order to capture the changes of volatility of the year prior the regulatory change. The negative sign is needed to be comparable with bank stability, in which higher levels of this variable reflect lower return volatility. The formula for this dependent variable is the following:

$$Volatility\ ROA = -\ln(\sigma_{roa}) \tag{4}$$

We consider three different measures to represent the non-banking activities that BHCs engage in via their non-bank subsidiaries, which are proxies of the activities that regulators seek to control through the Dodd-Frank Act 2010. First, we calculate the ratio of balances due to non-bank subsidiaries to total liabilities. This ratio allows us to observe how the change in regulation has affected bank holdings of non-bank liabilities with their affiliates that are considered to be riskier than traditional funding due to the absence of guarantee schemes (Pozsar *et al.*, 2010). The second measure of non-banking activities is based on the non-equity investments that entities hold in their non-bank partners. To calculate this variable, we consider the sum of the loans, advances, notes, bonds, debentures and other receivables due from non-bank subsidiaries and associated non-bank companies. We take the log transformation in order to include it our equation. Our last measure of non-banking activities is computed using the total of non-bank income that banks receive from their non-bank subsidiaries. To calculate this variable, we consider the operating income and equity income. In this way, we take into account the sum of dividends, interest, management, services fees, and other income, as well as the equity in undistributed income (losses) derived from non-bank subsidiaries. As with the previous dependent variable, this one also requires a log transformation.

We include different control variables to identify specific features from the BHCs that can affect their risk of default. First, we select a variable to depict bank size, calculated as the natural log of total assets. Previous research has shown that larger institutions are less risky and this implies a

lower likelihood of bank insolvency (De Haan and Poghosyan, 2012). We analyse the ability of banks to meet their financial obligations through the total liabilities to total equity ratio. High levels of leverage mean that banks have been aggressive in financing their growth with debt. However, uncontrolled debt levels can be risk enhancing. Thus, the relation with the dependent variable is expected to be negative (Saunders *et al.*, 1990). We also include a loan-loss-provision to total assets ratio to represent the ex-ante measure for the level of expected losses. Previous research has shown that bank managers use their loan loss provisions as a tool to smooth their income during peak times of loan demand (Shrieves and Dahl, 2003), which has an adverse effect on bank stability. Furthermore, we compute an additional control variable in order to analyse how the strategy to diversify funding resources affects their default risk. Following Berger *et al.,* (2010b), we use the Hirschman Herfindahl Index (HHI) to calculate the degree of concentration in their liabilities.[11] To calculate this variable we consider the following items: total deposits, borrowing with a maturity of one year or less, securities sold under agreements to repurchase, other borrowed money with a remaining maturity of more than one year, subordinated notes and debentures, balances due to subsidiaries and related institutions and other liabilities. Moreover, we also consider a variable for gross domestic product (GDP) to capture the growth in demand for credit in each state of the USA.[12] Lastly, we include a dummy for the institutions that were enrolled in the

[11] The Hirschman Herfindahl Index (HHI) measure is defined as the sum of all exposure fractions under a specific classification.

[12] See Appendix C for details about the items taken from Call Reports to calculate all the variables considered in this study.

Capital Purchase Program (CPP) of TARP during the time window of our sample. This variable takes the value of 1 for every month that each bank received extraordinary liquidity from this program until they repaid, and 0 otherwise.

We are also concerned by the fact that some banks could have changed their risk attitude and shadow banking activities before the effective introduction of the Dodd-Frank Act. Therefore, we perform a placebo experiment and rerun our analysis by using the four-quarter period immediately preceding the Dodd-Frank Act.

5.5. Parallel trends and summary statistics

In order to fulfil the validity of the difference-in-differences estimation, we conduct a parallel trend analysis for the dependent variables between the two groups for the period prior to the treatment. This means that, in the absence of the change in regulation, the treated group would have performed similarly to the control group. Figure 2, below, shows visual evidence that our data supports the assumption of parallel trends for our five dependent variables for the periods prior the regulatory change. The graphs in this figure represent the logarithm values of our two measures of risk (Z-score and volatility of ROA) and our three proxies of non-banking activities (non-bank balances to liabilities, non-bank investments and non-bank income). This shows that during the three periods prior to the regulatory change the continuous lines that represent the treatment group from our sample move parallel to the dotted lines, which represent the control group. This gives

evidence that complex entities do not behave differently from their non-complex counterparts and that complex BHCs do not anticipate any change in their risk levels or non-banking activities with their non-bank subsidiaries up to three-quarters before the law was enacted.

INSERT FIGURE 2 HERE

Additionally, to support the graphic illustration of the evolution of bank stability, we conduct t-tests to verify the assumption of parallel trends. We examine whether there are significant differences in the quarterly growth rate of each dependent variable between the treatment and control group during each pre-treatment quarter. The diagnostics in Table 3 support the assumption of parallel trends: the null of equality of means cannot be rejected. It is important to mention that to satisfy this assumption it does not require equal levels between the two groups, simply that they are different (Lemmon and Roberts, 2010). Lastly, the descriptive statistics and correlation matrix are reported in Table 3 (respectively Panel A and Panel B).

INSERT TABLE 2 HERE

INSERT TABLE 3 HERE

6. Results

The difference-in-difference regressions results shown in Table 4, in the next page, present the effects of the Dodd-Frank Act on risk for complex BHCs. In this analysis we run our model 1 with only two explanatory variables: *Complex* and our main independent variable, the interaction term between complex and the change in regulation. We note that the *Complex* variable is negative and significant for our two variables to depict stability and it is positive for the non-bank investments and non-bank income. The coefficients for the interaction variable (Complex*Dodd-Frank) are positive and significant for the Z-score and volatility and negative and significant for the non-bank income in column 5. These results support the idea that the implementation of the Dodd-Frank Act enhanced the stability of the complex BHCs and caused a reduction in their income derived from their non-bank affiliates.

INSERT TABLE 4 HERE

Our second analysis is shown in Table 5 where we include the control variables for all the equations. The *Complex* variable continues being negative and significant in relation to both measures of stability, but changes to negative and significant for non-bank income. Importantly, our main explanatory variable, *Complex*Dodd-Frank*, remains positive and significant for stability and risk in the first two columns and negative and significant non-bank income. Regarding the control variables, we find that

bank size impacts negatively on bank stability and positively on non-bank income. The financial leverage is positive for the risk of default and for non-bank income. The loan loss provision is only significantly negative in the case of non-bank income. The diversification in liabilities variable is negative for non-bank balances. These results support the argument that, in general terms, the re-regulatory change enhances stability for complex institutions and reduces their balances held with their non-bank partners. However, the growth of bank size in terms of assets worsens stability and riskiness and increases the shadow banking income derived from non-bank activities. BHCs that maintain their financial leverage levels can improve their stability but, at the same time, enhance their non-bank income. Moreover, institutions with higher levels of loan loss provisions reduce their shadow banking income. Banks with low variety in their funding strategies manage to reduce their income derived from non-bank subsidiaries. Lastly, entities that received capital injection through the TARP-CPP during the time span of our analysis show a positive impact on their balances due to non-bank affiliates.

INSERT TABLE 5 HERE

Next, we focus our analysis on the impact of the Dodd-Frank Act on the individual categories of complexity. Results in the Table 6 show evidence that the Dodd-Frank Act 2010 enhances stability and riskiness only for the complex BHCs classified as "credit-extending activities" and by "supervisory-

judgment" over the sample time window. BHCs classified as "supervisory-judgment" manage to decrease their investments with their non-bank partners, while BHCs classified complex by "management-factors" and "high risk activities" show an increase. Furthermore, we find significant evidence that the complex BHCs with "credit-extending-activities" are the only ones to cut down their income derived from non-bank subsidiaries after the change in the law (*Credit extending activities*Dodd-Frank*). There is no evidence that the BHCs classified complex by "non-bank-financial factors", "management factors" and "multiple-factors" improve their stability and riskiness or reduce their shadow banking activities after the regulatory change. These results show evidence that the regulatory change had a significant effect only on certain types of complexity and that the effect varied across the different complexity types.

INSERT TABLE 6 HERE

6.1. Aggregated analysis of shadow banking activities for the whole sample

We also control for shadow banking activities in the entire sample by comparing the trend of balances due to non-bank affiliates for the BHCs in the case of unconsolidated balance sheet and consolidated balance sheet. Figure 3 shows a steady decrease after the re-regulatory change for unconsolidated balance sheets while, for the consolidated balance sheets, it can be seen to have increased following the change in the law. This provides evidence that, despite BHCs reducing their activities with the non-bank

affiliates inside the group, they increased their engagement in non-traditional financial activities with non-bank affiliates outside the group. This would suggest that BHCs have found a way to bypass the restrictions imposed by Dodd-Frank by engaging in shadow-banking activities with non-bank entities outside the group. This could have happened because the law mainly established restrictions to bank activities for entities at the group level.

INSERT FIGURE 3 HERE

6.2. *Additional Analysis and Robustness checks*

We conduct several additional analyses to verify the robustness of our findings. First, we consider the possibility that the complexity classification does not occur randomly. This can cause a selection problem. To address this issue, we make use of a propensity score matching method that allows us to construct a control group of BHCs that have similar probabilities to be classified as complex BHCs but have not been classified as such. In particular, we employ the coarsened exact matching that reduces the imbalance problem in covariates between treated and control groups (Blackwell et al., 2009). In other words, we calculate the probability of being complex for all the BHCs, conditional on pre-treatment variables. Table 7 presents the treatment effects for the model both with and without the control variables we [use the control variables of the main model, efficiency (total costs to total income), return on assets and equity over total assets].

The results for *Complex*Dodd-Frank* are consistent with those of Tables 4 and 5.

INSERT TABLE 7 HERE

Second, we randomly allocate a complexity category only to all the non-complex banks from our sample, thereby creating another fictional treatment and control group. The aim of this analysis is to check whether the regulatory change only affects the real complex institutions from our original sample. In this way, we expect to obtain non-significant values for our key variables compared to those obtained in the previous analysis. Table 8 shows the results for this test. We find that almost none of the coefficients for the different interaction variables and types of complexity are significant compared to those displayed in Table 6. As expected, we fail to find significant values for the interaction variable for this simulated sample, and we confirm that there are no alternative forces that influence our main results.

INSERT TABLE 8 HERE

Third, we also consider a longer window. In particular, we rerun our model for the period 2009Q2-2011Q4 (5Q-window). The period before the regulatory change covers 2009Q2-2010Q2, while the period after the regulatory change covers 2010Q4- 2011Q4. The main results for

*Complex*Dodd-Frank* are consistent with those we have found for the 3Q-window in Tables 4 and 5.

INSERT TABLE 9 HERE

Fourth, we also remove banks located in four US States that account for 25% of the total observations to check if our results are biased by this concentration. These US States are California, Illinois, New York, and Texas. Table 10 shows these results, which are comparable to those presented in Table 6. We confirm that after eliminating one-quarter of the total entities of the sample concentrated in four US States, the complex institutions classified as "credit-extending-activities" and "supervisory-judgement" improved their stability and riskiness. We also find consistent results for bank size and diversification of liabilities, while the leverage ratio is not significant to any of the stability measures or for the non-bank income.

INSERT TABLE 10 HERE

Lastly, we control if our main results hold when we consider the consolidated balance sheet of BHCs. This is important because some of the rules imposed through the enactment of the Dodd-Frank Act apply to the consolidated BHCs. Thus, it is important to compare the effectiveness of this regulatory change between unconsolidated and consolidated balance sheets. For this analysis, we select data from the consolidated financial statements

for BHC reports (FR Y-9C), which is available from our main data source. For this sample, there is a total of 884 entities, of which 110 are complex institutions and 774 are non-complex.[13] Panel B in Table 1 depicts the number of entities for this sample according to their complexity category. In this case, the complex entities with the credit-extending-activities category are the only ones to increase their average of total assets compared to our previous sample. It is important to mention that consolidated financial information is not available for the non-bank investments and non-bank income derived from non-banking subsidiaries. Thus, we only use three dependent variables, for stability, riskiness and the non-bank balances from non-bank partners. Then, we rerun our model in equation (1) and the results are presented in Table 11. The results are quite similar to those shown in Table 5.

INSERT TABLE 11 HERE

7. Conclusion

This research examines how effective the Dodd-Frank Wall Street Reform and Consumer Protection Act on July 21, 2010 was in reducing the risk exposure of US BHCs. Our results show that overall the Dodd-Frank Act had a positive impact in improving the stability of complex BHCs, but it also increased their performance volatility. However, when broken down by

[13] See panel B in Appendix B for details of the sample selection.

complexity type, only entities considered complex due to their "credit-extending-activities" and non-complex institutions designated as complex entities by "supervisory-judgment" show a statistically significant improvement. When we shift our attention to the shadow banking system, the results are similar. Overall, the Dodd-Frank Act appears to have reduced BHC shadow banking income from non-bank affiliates. Again, however, when broken down by complexity type, only entities considered complex due to their credit-extending activities show a statistically significant reduction in income from non-bank affiliates. Interestingly, there is also a statistically significant reduction in investment in non-equity investments held by BHCs in their non-bank partners by non-complex institutions designated as complex organizations by "supervisory judgement" while entities classified as "management-factors" show a statistically significant increase of investment in non-bank activities. There is no evidence of any effect of the regulatory change on balances due to non-bank subsidiaries. Thus, it seems that the beneficial effect of Dodd-Frank fell primarily on entities considered complex due to their "credit-extending-activities" and on non-complex institutions designated as complex organizations by "supervisory-judgement". These results are robust with respect to exact matching, placebo testing and controlling for State concentration. They are also consistent when comparing consolidated versus non-consolidated balance sheets, with the exception that at the consolidated level, banks continue to engage in financial activities with non-bank institutions outside the group. Therefore, even though the Dodd-Frank Act has reduced the risk-exposure of BHCs and

shadow banking activities inside the group, it has not been fully successful in limiting shadow banking activities between BHCs. This indicates a further proliferation of non-banking activities, potentially with non-bank-institutions under the control of other BHCs through the intermediation of commercial banks.

This paper provides two important policy implications. Firstly, the 2010 Dodd-Frank Act has only partially enhanced the stability and volatility of US Bank Holding Companies. Some types of complex institutions appear to be continuing to engage in shadow banking activities (i.e. high-risk activities and management factors institutions). Secondly, by taking into consideration the nature of complexity, policy makers can better monitor and assess the risk taking of BHCs, and consequently intervene to limit their investment in risky activities. Only two types of complex institutions (credit-extending-activities and supervisory-judgment) appear to have responded positively to regulatory intervention.

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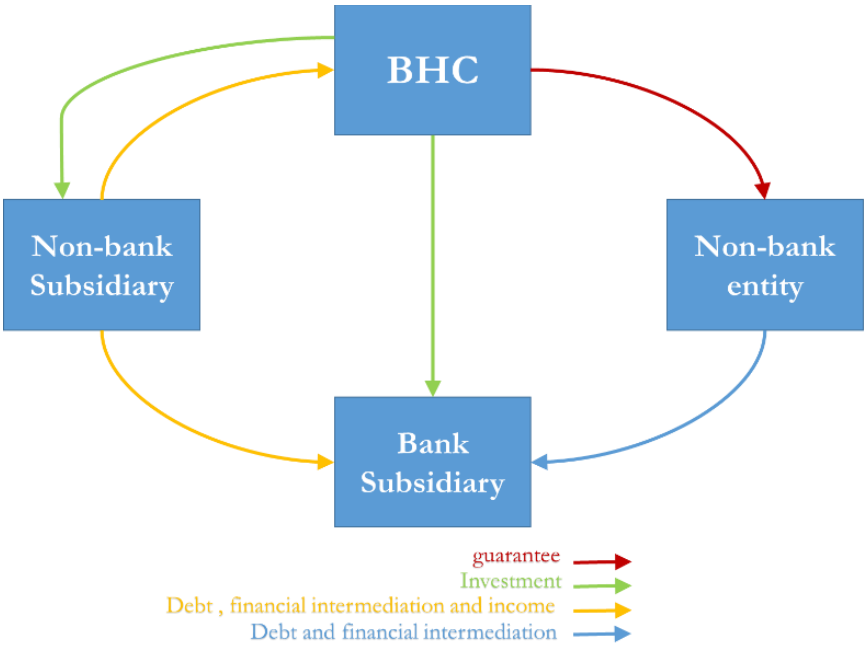
Figure 1. Financial activities between BHCs and their subsidiaries from the same holding



Note: Figure 1, shows part of the financial activities between BHCs and their subsidiaries from the same holding. The holding company continuously makes non-equity investments in both subsidiaries; this can be loans, advances, notes, bonds, debentures and other receivables due from their subsidiaries. BHCs receive from the non-bank subsidiary loans, financial intermediation and income such as dividends, interest management, services fees as well as the equity in undistributed income (losses). After the Dodd-Frank Act., had been enacted, BHCs were forced to reduce their non-banking activities with their non-bank subsidiaries. Therefore, they continue doing part of their non-financial activities with non-bank entities outside the holding company in which the subsidiary bank conducts financial intermediation, and BHCs can support them as a guarantor for these activities.

Table 1. Composition of the BHCs

Panel A. BHCs by complexity category: Unconsolidated Balance Sheet 2009Q4 –2010Q2 (3Q window)

Complexity category	BHCs	Obs	Total assets	Non-bank Balances	Non-bank investment	Non-bank income
Non-complex	938	6,566	1,499,391	103,014	383,195	19,572
Credit-extending-activities	50	350	51,858,921	3,948,853	5,596,823	276,058
Non-bank-financial-factors	8	56	334,729	30,374	3,703	23,096
High-risk-activities	11	77	415,362	21,405	849	63
Management-factors	34	238	1,597,499	170,996	6,112	4,323
Multiple-factors	20	140	6,512,532	377,715	100,447	-72,421
Supervisory-judgment	6	42	557,189	9,046	1,220	24

Panel B. BHCs by complexity category: Unconsolidated Balance Sheet 2009Q2-2010Q2 (5Q-window)

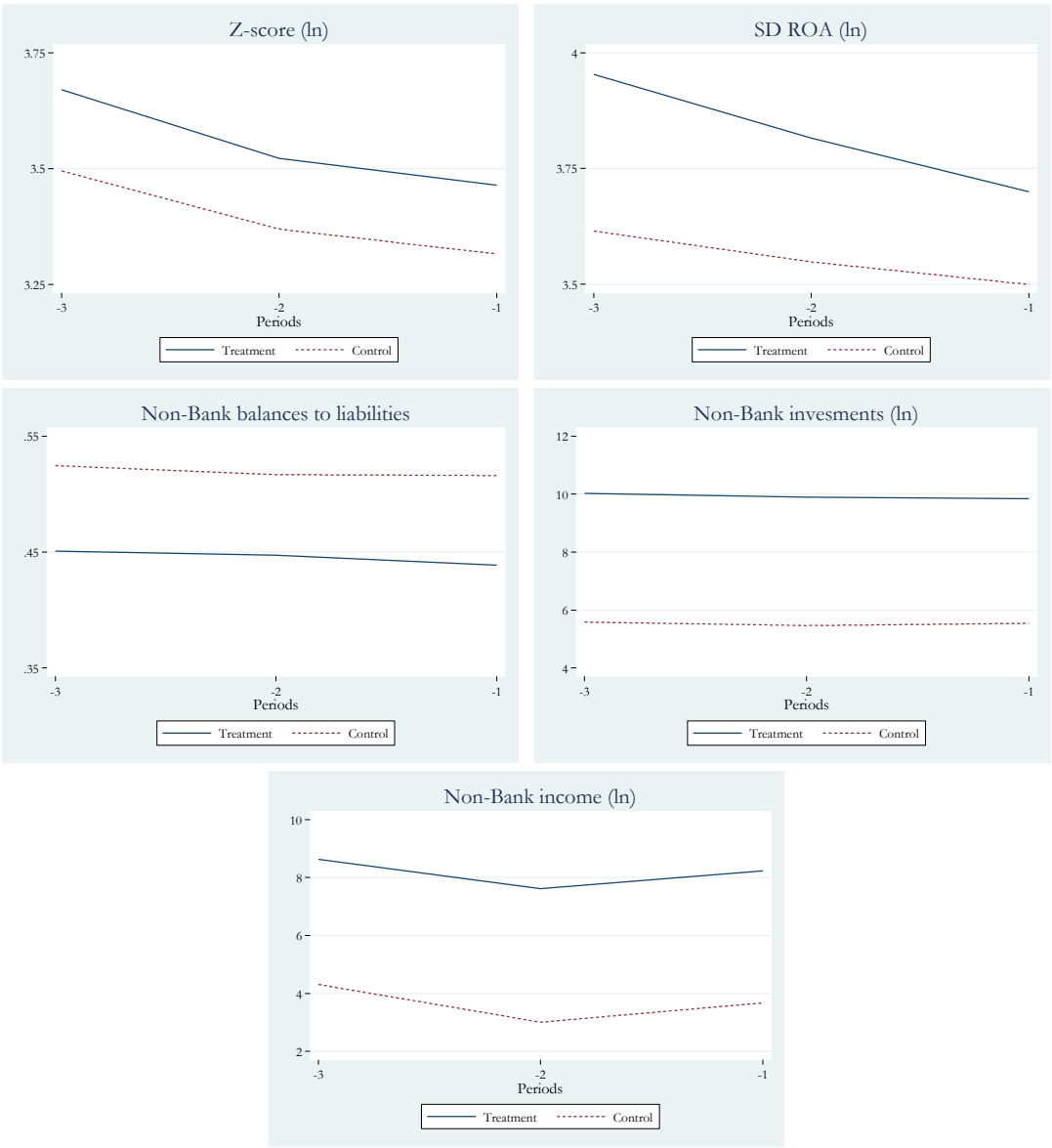
Complexity category	BHCs	Obs	Total assets	Non-bank Balances	Non-bank investment	Non-bank income
Non-complex	897	9,867	1,565,567	109,683	402,953	21,836
Credit-extending-activities	48	528	53,577,290	4,040,668	5,899,085	360,941
Non-bank-financial-factors	6	66	419,702	41,242	5,092	31,314
High-risk-activities	7	77	530,605	11,633	1,626	1,826
Management-factors	26	286	1,953,421	199,219	11,135	5,489
Multiple-factors	16	176	8,166,812	412,057	137,790	-119,834
Supervisory-judgment	6	66	555,037	9,078	1,124	230

Panel C. BHCs by complexity category: Consolidated Balance Sheet 2009Q4 –2010Q2 (3Q window)

Complexity category	BHCs	Obs	Total assets	Non-bank Balances
Non-complex	774	5,418	5,194,364	941,640
Credit-extending-activities	39	273	274,160,559	8,469,208
Non-bank-financial-factors	8	56	1,451,930	0
High-risk-activities	10	70	4,057,144	0
Management-factors	34	238	9,506,427	1
Multiple-factors	16	112	30,640,577	158,473
Supervisory-judgment	3	21	10,405,918	0

Note: Panel A depicts the composition of the large BHCs according to their complexity indicator code that appears in item RSSD9057 from the Call Reports. Total assets is taken from item BHCP2170. Non-bank balances due to non-bank subsidiaries are taken from item BHCP3606. Non-bank investments include the sum of loans, advances, bonds and debentures investments (item BHCP0537) and other receivables (item BHCP0538). While non-bank income is the sum of operating income (item BHCP1279) and equity income (losses) derived from non-bank subsidiaries (item BHCP3147), it does not include equity investments in order to observe the growth of the investments from banks to their non-bank affiliates during the time span. Panel B shows the composition of the consolidated BHCs during the same period of time. Total assets is taken from item BHCK2170 and balances due to non-bank subsidiaries is taken from item BHCK5045. Note that non-bank investments and non-bank income are not available for consolidated entities. Data obtained from Call Reports, reporting forms FR Y-9LP and FR Y-9C. All values are average in thousands of dollars.

Figure 2. Parallel trends - dependent variables graphic illustration



Note: Complex BHCs (the treatment group) are presented by a continuous line, whereas the non-complex large BHCs (the control group) are represented by a dotted line. Data source: Call Reports reporting forms FR Y-9LP. Coverage: 2009Q3 to 2011Q2.

Table 2. Treatment and control group in periods prior the Dodd-Frank Act. 2010

	Control	Treatment	Difference	t-Statistics	p-value
∆Z-score(ln)	0.03	0.06	-0.04	-1.60	0.11
∆Volatility of ROA	0.01	0.05	-0.03	-1.51	0.13
∆Non-bank balances/liabilities	-0.00	-0.00	0.00	0.29	0.77
∆Non-bank investments (ln)	0.01	-0.14	0.15	2.59	0.01
∆Non-bank income (ln)	-0.04	0.03	-0.07	-1.32	0.19

Note: ***p<0.01, **p<0.05, *p<0.1

Table 3. Summary statistics and correlation matrix

Panel A. Summary statistics

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	N	Mean	SD	Min	Max
Z-score (ln)	7259	3.442	1.256	-5.643	11.478
Delta Z-score(ln)	7173	0.031	0.662	-6.815	6.453
Volatility of ROA	7461	0.070	0.365	0.000	15.648
Nonbank balances/liabilities	6465	0.506	0.422	0.000	1.033
Nonbank investments (ln)	1035	7.253	4.938	0.000	19.078
Nonbank income (ln)	3062	4.541	3.196	0.000	16.994
Total assets (ln)	7466	11.849	1.819	0.000	19.949
Leverage ratio	7469	0.491	4.726	-137.777	148.763
Loan loss provision ratio	7468	0.000	0.003	-0.038	0.168
Diver liabilities	6465	0.811	0.216	0.224	1.092

Panel B. Correlation matrix

		1	2	3	4	5	6	7
1	Complex	1						
2	Complex*Dodd-Frank	0.627	1					
3	Bank size(LAG)	0.481	0.303	1				
4	Leverage ratio(LAG)	-0.003	-0.003	-0.032	1			
5	Loan loss provision(LAG)	-0.004	-0.032	-0.015	0.001	1		
6	Diver liabilities(LAG)	-0.248	-0.156	-0.252	-0.001	-0.030	1	
7	GDP	-0.012	0.045	-0.001	0.028	-0.026	-0.078	1
8	TARP	-0.029	-0.047	0.066	-0.029	0.001	0.003	-0.070

Note: Panel A presents summary statistics on all variables used throughout this chapter. Panel B shows the correlation matrix between the independent variables and our main measure of bank stability the ∆Z-score.

Table 4. Complexity of the BHCs, stability and shadow banking activities

	(1)	(2)	(3)	(4)	(5)
	∆Z-score(ln)	**∆Volatility ROA**	**∆Non-bank balances**	**∆Non-bank investments**	**∆Non-bank income**
Complex	-0.886***	-0.069***	0.000	1.281***	1.471***
	(0.041)	(0.017)	(0.000)	(0.000)	(0.011)
*Complex*Dodd-Frank*	0.080**	0.073*	-0.006	0.053	-0.165***
	(0.041)	(0.040)	(0.006)	(0.096)	(0.064)
Constant	0.481***	-0.044***	0.001***	-4.042***	0.759***
	(0.041)	(0.000)	(0.000)	(0.000)	(0.000)
Bank FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	7173	7425	6376	976	2859
R-squared	0.091	0.086	0.128	0.191	0.070
Number of Banks	1054	1066	938	170	519

Note: This table presents the results of difference-in-difference regressions examining the effect of Dodd-Frank Act. for large complex BHCs on their stability in columns 1 and 2 and on their non-bank activities in columns 3 to 5. We estimate $\triangle ln(y_{it}) = \alpha + \beta_1 Complex + \beta_2 Complex_i * Post_i + \delta + \varepsilon_{it}$ where $\triangle ln(y_{it})$ denotes the dependent variable of bank i at time t. In column 1 the dependent variable that represent bank's stability is the ∆(Z-score(ln)) and for column 2 is the volatility of ROA ($-\ln(\sigma_{roa})$). The proxy for non-bank income in columns 3 to 5 are ∆(balances held with non-bank subsidiaries to total liabilities ratio), ∆(non-bank investments from non-bank subsidiaries(ln)) and ∆(non-bank income derived from non-bank subsidiaries(ln)). The main explanatory variable is the interaction between Dodd-Frank and the complex dummy variables. $Post_i$ represents a dummy variable equal to 1 for all the quarters following the enactment of this law, and 0 otherwise; $Complex_i$ is a dummy variable equal to 1 for all the complex BHCs, and 0 otherwise. The coefficient β_2 represents the effect of the re-regulatory change on the complex institutions. The regressions include state-fixed effects and bank fixed effect and standard errors are clustered on bank level. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP. Coverage: 2009Q4 to 2011Q2.

Table 5. Complexity of the BHCs, stability and shadow banking activities (with control variables)

	(1)	(2)	(3)	(4)	(5)
	ΔZ-score(ln)	**ΔVolatility ROA**	**ΔNon-bank balances**	**ΔNon-bank investments**	**ΔNon-bank income**
Complex	-0.606***	-0.261***	-0.008	-1.061	-2.931***
	(0.135)	(0.075)	(0.008)	(1.087)	(1.028)
*Complex*Dodd-Frank*	0.126***	0.095**	-0.004	0.044	-0.177**
	(0.043)	(0.042)	(0.006)	(0.113)	(0.072)
Bank size(LAG)	-0.665***	-0.342***	0.008	-0.142	0.516**
	(0.192)	(0.095)	(0.008)	(0.358)	(0.224)
Leverage ratio(LAG)	0.250**	0.004**	0.000	-0.001	0.025**
	(0.110)	(0.002)	(0.000)	(0.003)	(0.010)
Loan loss provision(LAG)	1.641	-2.286	-0.591	1.876	-37.413***
	(3.493)	(3.212)	(0.566)	(3.737)	(12.617)
Diver liabilities(LAG)	-0.074	-0.105	-0.160***	0.518	0.087
	(0.126)	(0.115)	(0.032)	(0.593)	(0.322)
GDP	-1.566***	-1.883***	-0.045	-0.984	-3.971***
	(0.500)	(0.431)	(0.055)	(0.869)	(0.395)
TARP	0.139	0.130	0.027**	-0.163	-0.209
	(0.113)	(0.104)	(0.013)	(0.232)	(0.211)
Constant	8.313***	4.190***	0.062	-0.144	-4.615*
	(2.202)	(1.126)	(0.095)	(5.893)	(2.572)
Bank FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	6204	6446	6374	938	2785
R-squared	0.112	0.098	0.159	0.196	0.089
Number of Banks	940	952	938	164	509

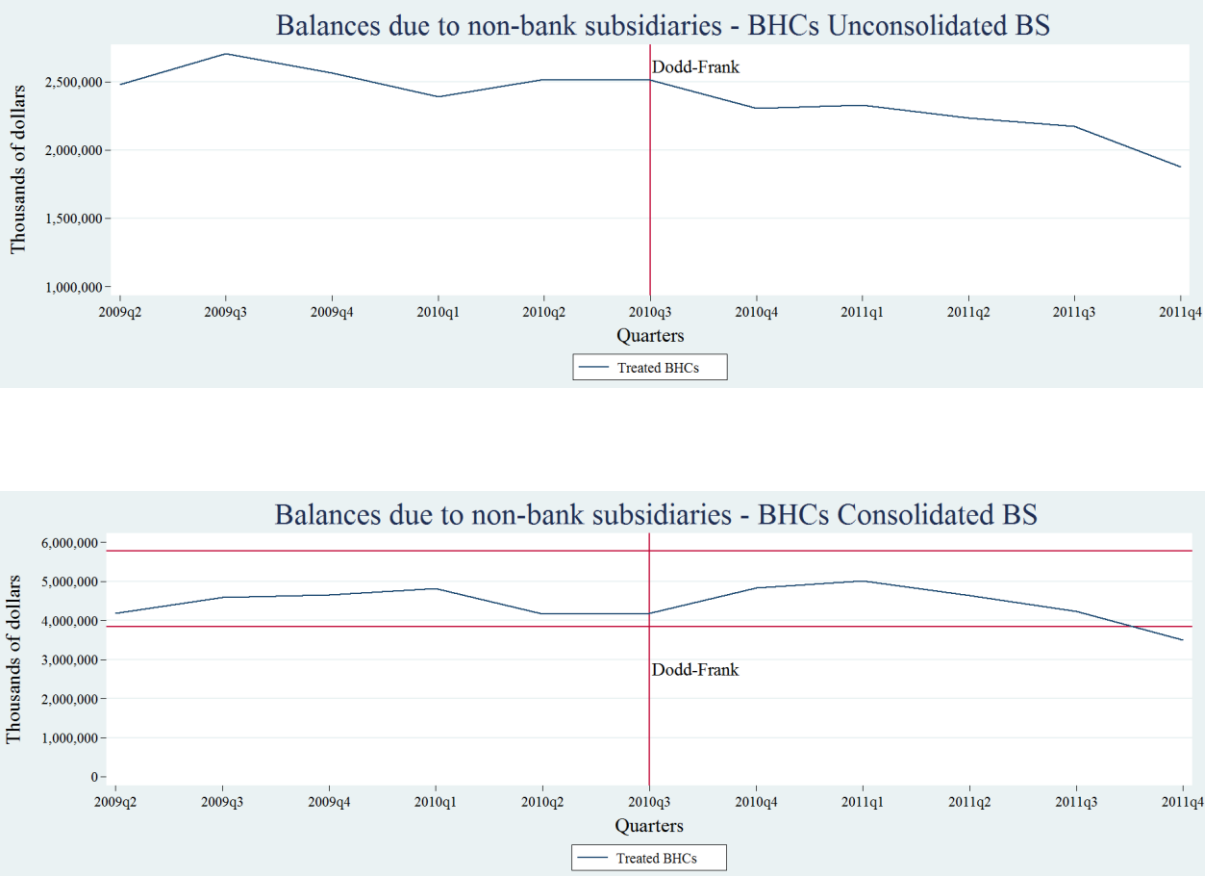
Note: This table presents the results of difference-in-difference regressions examining the effect of the Dodd-Frank Act. for large complex BHCs on their stability in columns 1 and 2 and on their non-bank activities in columns 3 to 5. We estimate $\Delta\, ln(y_{it}) = \alpha + \beta_1 Complex + \beta_2\, Complex_i * Post_i + \beta_3 X_{i,t-1} + \delta + \varepsilon_{it}$ where $\Delta\, ln(y_{it})$ denotes the dependent variable of bank i at time t. In column 1 the dependent variable that represents bank's stability is the Δ(Z-score(ln)) and for column 2 is the volatility of ROA ($-\ln(\sigma_{roa})$). The proxies for non-bank activities in columns 3 to 5 are Δ(balances held with non-bank subsidiaries to total liabilities ratio), Δ(non-bank investments from non-bank subsidiaries(ln)) and Δ(non-bank income derived from non-bank subsidiaries(ln)). The vector of lagged control variables $X_{i,t-1}$ include bank size (total assets (ln)), leverage ratio (total liabilities to total equity), loan loss provision ratio (loan loss provision to total assets) and diversification of liabilities calculated as the HHI of their liabilities, GDP and the dummy variable TARP that takes value 1 if the bank is still receiving support from TARP program, 0 otherwise. The main explanatory variable is the interaction between Dodd-Frank and the complex dummy variables. The Dodd-Frank is a dummy variable equal to 1 for all the quarters following this law was enacted, and 0 otherwise; Complex is a dummy variable equal to 1 for all the complex BHCs, and 0 otherwise. The coefficient β_2 represents the effect of the re-regulatory change on the complex institutions. The regressions include state-fixed effects and bank fixed effect and standard errors are clustered on bank level. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP. Coverage: 2009Q4 to 2011Q2.

Table 6. Regressions with disaggregated complex classification

	(1) ΔZ-score(ln)	(2) ΔVolatility ROA	(3) ΔNon-bank balances	(4) ΔNon-bank investments	(5) ΔNon-bank income
*Credit extending activities*Dodd-Frank*	0.156**	0.136**	-0.007	-0.048	-0.208**
	(0.065)	(0.067)	(0.011)	(0.157)	(0.086)
*Nonbank financial factors*Dodd-Frank*	-0.259	-0.240	0.050	-0.140	0.168
	(0.315)	(0.301)	(0.051)	(0.145)	(0.354)
*High risk activities*Dodd-Frank*	0.173*	0.136	-0.016	0.760*	-0.296
	(0.090)	(0.093)	(0.030)	(0.408)	(0.276)
*Management factors*Dodd-Frank*	0.123	0.054	-0.001	0.235**	-0.167
	(0.083)	(0.083)	(0.008)	(0.113)	(0.145)
*Multiple factors*Dodd-Frank*	0.089	0.088	-0.014	-0.088	-0.244
	(0.095)	(0.090)	(0.012)	(0.226)	(0.241)
*Supervisory judgment*Dodd-Frank*	0.316**	0.279**	0.001	-0.268***	0.052
	(0.138)	(0.123)	(0.006)	(0.007)	(0.112)
Bank size(LAG)	-0.679***	-0.349***	0.009	-0.177	0.528**
	(0.194)	(0.096)	(0.008)	(0.317)	(0.225)
Leverage ratio(LAG)	0.248**	0.004**	0.000	-0.001	0.025**
	(0.110)	(0.002)	(0.000)	(0.003)	(0.010)
Loan loss provision(LAG)	1.728	-2.156	-0.616	0.846	-37.748***
	(3.471)	(3.209)	(0.562)	(3.691)	(12.514)
Diver liabilities(LAG)	-0.083	-0.112	-0.159***	0.527	0.100
	(0.126)	(0.115)	(0.032)	(0.593)	(0.325)
GDP	-1.569***	-1.891***	-0.045	-1.078	-3.967***
	(0.501)	(0.432)	(0.054)	(0.893)	(0.398)
TARP	0.139	0.131	0.027**	-0.190	-0.215
	(0.114)	(0.105)	(0.013)	(0.239)	(0.219)
Constant	8.483***	4.286***	0.056	-0.743	-7.719**
	(2.232)	(1.139)	(0.094)	(4.362)	(3.580)
Bank FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	6204	6446	6374	938	2785
R-squared	0.110	0.100	0.160	0.200	0.089
Number of Banks	940	952	938	164	509

Note: This table presents the results of difference-in-difference regressions examining the effect of Dodd-Frank Act. for large complex BHCs on their stability in columns 1 and 2 and on their non-bank activities in columns 3 to 5. We estimate $\triangle ln(y_{it}) = \alpha + \beta_1 Complex + \beta_2 \sum_{j=1}^{j=6} Complex\ indicator_i * Post_i + \beta_3 X_{i,t-1} + \delta + \varepsilon_{it}$ where $\triangle ln(y_{it})$ denotes the dependent variable of bank i at time t. In column 1 the dependent variable that represents bank's stability is the Δ(Z-score(ln)) and for column 2 is the volatility of ROA ($-\ln(\sigma_{roa})$). The proxies for non-bank activities in columns 3 to 5 are Δ(balances held with non-bank subsidiaries to total liabilities ratio), Δ(non-bank investments from non-bank subsidiaries(ln)) and Δ(non-bank income derived from non-bank subsidiaries(ln)). The vector of lagged control variables $X_{i,t-1}$ include bank size (total assets (ln)), leverage ratio (total liabilities to total equity), LLP ratio (loan loss provision to total assets) and diversification of liabilities calculated as the HHI of their liabilities, GDP and the dummy variable TARP that takes value 1 if the bank is still receiving support from TARP program, 0 otherwise. $Complex$ is a dummy variable equal to 1 for all the complex BHCs, and 0 otherwise. The $Complex\ indicator_i$ is a dummy variable that takes value 1 for one of the six complexity indicators of $bank_i$ and 0 otherwise. $Post_i$ is a dummy variable equal to 1 for all the quarters following the enactment of this law, and 0 otherwise. The main explanatory variable is the interaction between the $Post_i$ and the $Complex\ indicator_i$ dummy variables. The coefficient β_2 represents the effect of the re-regulatory change on the risk to default for the variety of complex institutions. The regressions include state-fixed effects and bank fixed effect and standard errors are clustered on bank level. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP. Coverage: 2009Q4 to 2011Q2.

Figure 3. Financial activities with non-bank subsidiaries. Unconsolidated and Consolidated Balance Sheet (BS)



Note: Complex BHCs (Treated BHCs) are presented by a continuous line. The vertical line in 2010Q3 represents the quarter in which the Dodd-Frank was enacted. The institutions considered in this time span are considered based on the following criteria: appear in all the periods, domestic entities, not located in US territories and maintain the same complexity indicator during the entire time span. Data source: Call Reports reporting forms FR Y-9LP for the large BHCs and FR Y-9C for the consolidated BHCs. Coverage: 2009Q2 to 2011Q4.

Table 7. Coarsened exact matching

	(1)		(2)		(3)		(4)		(5)	
	Z-score(ln)		**Volatility ROA**		**Non-bank balances**		**Non-bank investments**		**Non-bank income**	
*Complex*Dodd-Frank*	0.203**	0.214**	0.184**	0.192**	0.015	0.015	-0.114	-0.077	-0.542***	-0.583***
	(0.065)	(0.068)	(0.068)	(0.072)	(0.012)	(0.012)	(0.109)	(0.125)	(0.135)	(0.144)
Control Variables	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Observations	4030	3418	4070	3456	3409	3409	373	363	1461	1429
Number of Banks	890	786	897	793	779	779	108	105	376	370
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table presents results of the Coarsened exact matching method. We allocate a complexity category randomly to all the banks and then re-estimate the regression using model 2. The matching variables are *Bank Size*, *Leverage ratio, Loan loss provision, Diver liabilities, Efficiency (Total Costs to total Income), Equity over total assets, Return on Assets.* We show the treatment effects with and without the control variables of Model 2. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP.

Table 8. Placebo Test

	(1) ΔZ-score(ln)	(2) ΔVolatility ROA	(3) ΔNon-bank balances	(4) ΔNon-bank investments	(5) ΔNon-bank income
*Credit extending activities*Dodd-Frank*	0.045	0.044	-0.002	-0.10	-0.11
	(0.054)	(0.051)	(0.004)	(0.10)	(0.087)
*Nonbank financial factors*Dodd-Frank*	0.069	0.052	0.001	0.073	-0.12
	(0.047)	(0.043)	(0.004)	(0.11)	(0.075)
*High risk activities*Dodd-Frank*	0.0076	0.056	-0.001	-0.050	-0.17**
	(0.051)	(0.056)	(0.005)	(0.098)	(0.061)
*Management factors*Dodd-Frank*	0.021	0.0071	0.004	-0.22	-0.076
	(0.050)	(0.045)	(0.002)	(0.24)	(0.047)
*Multiple factors*Dodd-Frank*	-0.050	-0.074*	0.003	-0.12	-0.14
	(0.037)	(0.036)	(0.005)	(0.20)	(0.073)
*Supervisory judgment*Dodd-Frank*	0.085	0.071	-0.002	-0.11	-0.059
	(0.047)	(0.045)	(0.004)	(0.092)	(0.067)
Bank size(LAG)	-0.97***	-0.45***	0.015*	-0.41	0.62**
	(0.22)	(0.098)	(0.007)	(0.38)	(0.23)
Leverage ratio(LAG)	0.24	0.002	-0.000	-0.000	0.021*
	(0.13)	(0.002)	(0.000)	(0.002)	(0.008)
Loan loss provision(LAG)	4.90	0.83	-1.02	-16.0	-52.7*
	(4.57)	(4.53)	(0.84)	(16.2)	(21.5)
Diver liabilities(LAG)	-0.20	-0.20	-0.17***	0.62	-0.13
	(0.13)	(0.11)	(0.034)	(0.76)	(0.35)
GDP	2.74***	2.14***	0.0081	-1.52	-3.83***
	(0.33)	(0.25)	(0.031)	(1.13)	(0.42)
TARP	0.093	0.12	0.0096	-0.30	-0.092
	(0.17)	(0.14)	(0.012)	(0.20)	(0.21)
Constant	10.7***	4.98***	0.0059	4.62	-6.14*
	(2.43)	(1.08)	(0.085)	(4.25)	(2.76)
Bank FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	5363	5580	5515	544	2281
R-squared	0.150	0.140	0.180	0.240	0.088
Number of Banks	815	826	813	101	417

Note: This table presents results of the placebo test regressions. We allocate a complexity category randomly to all the banks classified as non-complex from our original sample and then re-estimate the regression using model 2. Complex entities are not considered in this analysis in order to capture alternative forces that might influence our main results. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP. Coverage: 2009Q1 to 2010Q2.

Table 9. Complexity of the BHCs, stability and shadow banking activities. 2010Q4- 2011Q4 (5Q-window)

	(1)	(2)	(3)	(4)	(5)
	Z-score(ln)	**Volatility ROA**	**Non-bank balances**	**Non-bank investments**	**Non-bank income**
*Complex*Dodd-Frank*	0.203**	0.214**	0.184**	0.192**	0.015
	(0.065)	(0.068)	(0.068)	(0.072)	(0.012)
Control Variables	YES	YES	YES	YES	YES
Observations	9239	9526	9474	1408	4171
Number of Banks	904	906	895	173	502
Bank FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes

Note: This table presents results of the Coarsened exact matching method. We allocate a complexity category randomly to all the banks and then re-estimate the regression using model 2. The matching variables are *Bank Size*, *Leverage ratio, Loan loss provision, Diver liabilities, Efficiency (Total Costs to total Income), Equity over total assets, Return on Assets.* We show the treatment effects with and without the control variables of Model 2. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP.

Table 10. Regressions removing the State concentration from our sample

	(1) ΔZ-score(ln)	(2) ΔVolatility ROA	(3) ΔNon-bank balances	(4) ΔNon-bank investments	(5) ΔNon-bank income
*Credit extending activities*Dodd-Frank*	0.166**	0.153*	-0.004	-0.010	-0.263**
	(0.084)	(0.088)	(0.015)	(0.216)	(0.102)
*Nonbank financial factors*Dodd-Frank*	-0.272	-0.249	0.050	-0.180	0.153
	(0.318)	(0.302)	(0.051)	(0.177)	(0.355)
*High risk activities*Dodd-Frank*	0.117*	0.081	-0.030	0.714	-0.363
	(0.060)	(0.060)	(0.043)	(0.601)	(0.408)
*Management factors*Dodd-Frank*	0.123	0.048	-0.001	0.237*	-0.168
	(0.086)	(0.086)	(0.009)	(0.129)	(0.145)
*Multiple factors*Dodd-Frank*	0.009	0.003	-0.002	-0.148	-0.130
	(0.119)	(0.118)	(0.007)	(0.234)	(0.211)
*Supervisory judgment*Dodd-Frank*	0.209*	0.207*	0.006	-0.262***	0.059
	(0.115)	(0.114)	(0.005)	(0.007)	(0.109)
Bank size(LAG)	-0.808***	-0.408***	0.011	-0.172	0.592**
	(0.259)	(0.116)	(0.007)	(0.356)	(0.234)
Leverage ratio(LAG)	0.203	0.004	0.000	-0.002	0.016
	(0.195)	(0.002)	(0.000)	(0.003)	(0.106)
Loan loss provision(LAG)	2.467	-2.834	-0.039	-0.335	-37.175***
	(3.923)	(2.850)	(0.284)	(3.793)	(12.435)
Diver liabilities(LAG)	-0.129	-0.167	-0.171***	0.037	-0.149
	(0.143)	(0.129)	(0.038)	(0.519)	(0.375)
GDP	-1.228*	-1.570***	-0.046	-1.121	-3.830***
	(0.645)	(0.549)	(0.078)	(1.189)	(0.488)
TARP	0.092	0.087	0.023*	-0.137	-0.276
	(0.148)	(0.133)	(0.012)	(0.341)	(0.263)
Constant	9.989***	5.014***	0.045	2.878	-8.568**
	(2.998)	(1.379)	(0.096)	(6.203)	(3.684)
Bank FE	Yes	Yes	Yes	Yes	Yes
State FE	Yes	Yes	Yes	Yes	Yes
Observations	4571	4756	4708	658	2024
R-squared	0.113	0.103	0.162	0.205	0.075
Number of Banks	693	703	694	116	373

Note: This table presents the results of difference-in-difference regressions examining the effect of Dodd-Frank Act. for large complex BHCs without entities located in California, Illinois, New York, and Texas, on their stability in columns 1 and 2 and on their non-bank activities in columns 3 to 5. We estimate $\Delta\ ln(y_{it}) = \alpha + \beta_1 Complex + \beta_2 \sum_{j=1}^{j=6} Complex\ indicator_i * Post_i + \beta_3 X_{i,t-1} + \delta + \varepsilon_{it}$ where $\Delta\ ln(y_{it})$ denotes the dependent variable of bank i at time t. In column 1 the dependent variable that represents bank's stability is the Δ(Z-score(ln)) and for column 2 is the volatility of ROA ($-\ln(\sigma_{roa})$). The proxies for non-bank activities in columns 3 to 5 are Δ(balances held with non-bank subsidiaries to total liabilities ratio), Δ(non-bank investments from non-bank subsidiaries(ln)) and Δ(non-bank income derived from non-bank subsidiaries(ln)). The vector of lagged control variables $X_{i,t-1}$ include bank size (total assets (ln)), leverage ratio (total liabilities to total equity), LLP ratio (loan loss provision to total assets) and diversification of liabilities calculated as the HHI of their liabilities, GDP and the dummy variable TARP that takes value 1 if the bank is still receiving support from TARP program, 0 otherwise. $Complex$ is a dummy variable equal to 1 for all the complex BHCs, and 0 otherwise. The $Complex\ indicator_i$ is a dummy variable that takes value 1 for one of the six complexity indicators of bank i, and 0 otherwise. $Post_i$ is a dummy variable equal to 1 for all the quarters following the enactment of this law, and 0 otherwise. The main explanatory variable is the interaction between the $Post_i$ and the $Complex\ indicator_i$ dummy variables. The coefficient β_2 represents the effect of the re-regulatory change on the risk to default for the variety of complex institutions. The regressions include state-fixed effects and bank fixed effect and standard errors are clustered on bank level. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9LP. Coverage: 2009Q4 to 2011Q2.

Table 11. Main model for consolidated balance sheets BHCs

	(1) ΔZ-score(ln)	(2) ΔVolatility ROA	(3) ΔNon-bank balances	(4) ΔZ-score(ln)	(5) ΔVolatility ROA	(6) ΔNon-bank balances
Complex	0.637***	-0.352***	0.000	3.714**	-2.531***	-0.000
	(0.019)	(0.040)	(0.000)	(1.647)	(0.836)	(0.000)
*Complex*Dodd-Frank*	0.078*	0.069	-0.000	0.126**	0.102**	0.000
	(0.044)	(0.043)	(0.000)	(0.050)	(0.046)	(0.000)
Bank size(LAG)				-0.392*	-0.397***	-0.003
				(0.211)	(0.142)	(0.003)
Leverage ratio(LAG)				8.430***	3.935***	-0.000
				(2.669)	(1.399)	(0.002)
Loan loss provision(LAG)				9.876***	-1.766**	0.003
				(2.158)	(0.899)	(0.002)
Diver liabilities(LAG)				0.155	0.179	0.000
				(0.306)	(0.277)	(0.000)
GDP				-0.927*	-1.830***	-0.005
				(0.505)	(0.420)	(0.005)
TARP				0.094	0.113	-0.000
				(0.105)	(0.100)	(0.000)
Constant	0.068***	-0.050***	0.000	-5.393***	5.862**	0.041
	(0.025)	(0.000)	(0.000)	(1.867)	(2.673)	(0.045)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
State*quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5987	6177	5787	5941	6130	5783
R-squared	0.084	0.074	0.007	0.115	0.091	0.008
Number of Banks	877	884	863	877	884	863

Note: This table presents the results of difference-in-difference regressions examining the effect of Dodd-Frank Act. for complex consolidated BHCs. For columns 1 to 3 we estimate $\Delta\, ln(\mathrm{y}_{it}) = \alpha + \beta_1 Complex + \beta_2\, Complex_i * Post_i + \delta + \varepsilon_{it}$ and for columns 5 to 6 we estimate $\Delta\, ln(\mathrm{y}_{it}) = \alpha + \beta_1 Complex + \beta_2\, Complex_i * Post_i + \beta_3 X_{i,t-1} + \delta + \varepsilon_{it}$ where $\Delta\, ln(\mathrm{y}_{it})$ denotes the dependent variable of bank i at time t. In column 1 the dependent variable that represents bank's stability is the Δ(Z-score(ln)) and for column 2 is the volatility of ROA ($-\ln(\sigma_{roa})$). The proxy for non-bank activities is Δ(balances held with non-bank subsidiaries to total liabilities ratio). $X_{i,t-1}$ represents the vector for the control variables. The main explanatory variable is the interaction between the Dodd-Frank and the complex dummy variables. $Post_i$ is a dummy variable equal to 1 for all the quarters following the enactment of this law, and 0 otherwise; $Complex_i$ is a dummy variable equal to 1 for all the complex BHCs, and 0 otherwise. The coefficient β_2 represents the effect of the re-regulatory change on the complex institutions. The regressions include state-fixed effects and bank fixed effect and standard errors are clustered on bank level. *p<0.1, **p<0.05, ***p<0.01. Data source: Call Reports reporting forms FR Y-9C. Coverage: 2009Q4 to 2011Q2.

APPENDIX A. Description of the BHC's complexity indicator code (RSSD9057)

1 Complex institutions with material credit-extending activities either of the parent bank holding company or its nonbank subsidiaries or debt outstanding to the general public.

2 Non-complex BHCs

3 Complex: Nonbank Financial Factors. Nature and scale of nonbank activities warrant designation as complex for supervisory purposes.

4 Complex: High Risk Activities. Company engages, either directly or through its subsidiaries, in significant non-banking activity having an inherently high risk profile. Examples include securities broker/dealer activities, insurance underwriting, and merchant banking; other activities may also trigger this designation if identified by the supervisory Reserve Bank as high-

5 Complex: Public Debt. Company issues significant debt to the general public such that unsophisticated investors may be at risk of loss.

6 Complex: Management Factors. Management practices such as the nature of inter-company transactions or centralized risk management policies and procedures warrant designation as complex for supervisory purposes.

7 Complex: Multiple Factors. Company meets two or more criteria for the complex designation, more than one of which are material in the judgment of the supervisory Reserve Bank. While the intensity of the supervisory approach may not differ from other complex companies, this designation alerts examiners to the presence of more than one factor.

8 Complex: Supervisory Judgment. Company does not appear to be complex, however, at the discretion of the supervisory Reserve Bank, it is designated a complex organization for supervisory purposes.

9 Non-complex: Supervisory Judgment appear to be complex, however at the discretion of the supervisory Reserve Bank, it is designated a non-complex organization for supervisory purposes.

Source: MDRM data dictionary search from the Federal Reserve Board website:
http://www.federalreserve.gov/apps/mdrm/data-dictionary

APPENDIX B. Sample selection (period 2009Q4 –2011Q2)

Panel A. Sample selection for main regressions –BHCs Unconsolidated Balance Sheet

	BHCs	Observations
Total number of entities	5,560	25,070
1 Drop banks that do not have total assets over all the periods	-4,458	-17,356
2 Delete non-domestic entities	-1	-7
3 No BHCs located in US territories	-16	-112
4 Remove BHCs that do not maintain the same complexity indicator	-18	-126
Total	1,067	7,469

Panel B. Sample selection for main regression - BHCs Consolidated Balance Sheet

	BHCs	Observations
Total number of entities	5,560	25,070
1 Drop banks that do not appear all the periods and non-consolidated BHCs	-4,648	-18,686
2 Delete non-domestic entities	-1	-7
3 No BHCs located in US territories	-12	-84
4 Remove BHCs that do not maintain the same complexity indicator	-15	-105
Total	884	6,188

APPENDIX C. Definition of the variables

Variable name	Definition	Mapping to Call Reports line items	
		Large BHCs (reporting forms FR Y-9LP)	**Consolidated BHCs (reporting forms FR Y-9C)**
Z-score	The sum of CAR and ROA divided by standard deviation of ROA; this last one is calculated over a four-quarter rolling time window.	$\frac{(\frac{\text{BHCP4340}}{\text{BHCP3210}} + (\frac{\text{BHCP4340}}{\text{BHCP2170}})}{\sigma_{roa}}$	$\frac{(\frac{\text{BHCK4340}}{\text{BHCK3210}} + (\frac{\text{BHCK4340}}{\text{BHCK2170}})}{\sigma_{roa}}$
Volatility of ROA	The negative of the natural logarithm of the standard deviation of ROA over a four-quarter rolling time window.	$-\ln(\sigma_{roa})$	$-\ln(\sigma_{roa})$
Non-bank balances to total liabilities	Balances held with non-bank subsidiaries to total liabilities (LIAB). This latter is the sum of deposits, securities sold under agreement to repurchase, borrowings with a remaining maturity of more than 1 year, other borrowed money with a remaining maturity of more than 1 year, subordinated notes and debentures, other liabilities, and balances due to subsidiaries and related institutions.	BHCP3606/ Sum (BHCP2200, BHCP0279, BHCP2309, BHCP2332, BHCP0368, BHCP4062, BHCP2930, BHCP3605, BHCP3606, BHCP3607)	BHCK5045/BHCK2948
Non-bank investments	Natural logarithm of the sum of non-equity investments and other receivables due from non-bank subsidiaries).	ln(BHCP0537+BHCP0538)	N/A
Non-bank income	Natural logarithm of the sum of operating income and equity income (losses) derived from non-bank subsidiaries.	ln(BHCP1279+BHCP3147)	N/A
Bank size	Natural logarithm of total assets).	ln(BHCP2170)	ln(BHCK2170)
Leverage financial ratio	Total liabilities divided by total equity capital.	(Sum (BHCP2200, BHCP0279, BHCP2309, BHCP2332, BHCP0368, BHCP4062, BHCP2930, BHCP3605, BHCP3606, BHCP3607))/BHCP3210	BHDM6631+BHDM6636+BHFN6631+BHFN6636+ BHDMB993+BHCKB995+BHCK3548+BHCK3190+ BHCK4062+BHCKC699+BHCK2750)/ BHCK3300
Loan loss provision ratio	Loan loss provision divided by total assets.	BHCP4230/BHCP2170	BHCK4230/BHCK2170
Liabilities diversification	The HHI of their following liabilities: deposits, securities sold under agreement to repurchase, borrowings with a remaining maturity of more than 1 year, other borrowed money with a remaining maturity of more than 1 year, subordinated notes and debentures, other liabilities and balances due to subsidiaries and related institutions.	((BHCP2200/LIAB)^2)+ ((BHCP0279/LIAB)^2)+ (((BHCP2309+BHCP2332)/LIAB)^2)+ ((BHCP0368/LIAB)^2)+ ((BHCP4062/LIAB)^2)+ ((BHCP2930/LIAB)^2)+ (((BHCP3605+BHCP3606+BHCP3607)/LIAB)^2)	((BHDM6631/BHCK2948)^2)+ (BHDM6636/BHCK2948)^2)+ ((BHFN6631/BHCK2948)^2)+ ((BHFN6636/BHCK2948)^2)+ ((BHDMB993/BHCK2948)^2)+ ((BHCKB995/BHCK2948)^2)+ ((BHCK3548/BHCK2948)^2)+ ((BHCK3190/BHCK2948)^2)+ ((BHCK4062/BHCK2948)^2)+ ((BHCKC699/BHCK2948)^2)+ ((BHCK2750/BHCK2948)^2)

Data source: Call Reports reporting forms FR Y-9LP and FR Y-9C