Has Dodd–Frank affected bank expenses?

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Abstract

This paper examines the potential effects of the Dodd–Frank Act of 2010 on banks' noninterest expenses. Using data on U.S. bank holding companies from 1995 through 2016, we test whether noninterest expenses increase following the passage of the Dodd–Frank Act or in relation to the number of banking regulations implemented after Dodd–Frank. We analyze subsamples of banks above and below $10 billion in total assets and consider total noninterest expenses, salaries, non-salary expenses, and specific subcategories of non-salary expenses: legal, consulting, auditing, and data processing. Non-salary expenses for both large and small banks show a one-time increase after Dodd–Frank, while salary expenses tend to increase with regulations. The results indicate that total noninterest expenses for the banking system are higher on average by more than $50 billion per year compared to before the Dodd–Frank Act.

1 Introduction

The regulation of U.S. commercial banks has been a central topic in the debate surrounding the 2008 financial crisis. Since the crisis, the banking system has experienced a substantial increase in the scale and scope of regulations. The landmark

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legislation on financial regulation during this period has been the Dodd–Frank Wall Street Reform and Consumer Protection Act of 2010 (the Dodd–Frank Act), "the most comprehensive set of reforms to our financial system since the Great Depression" (U.S. Department of the Treasury 2017). Now a decade since the financial crisis, regulatory reforms remain a topic of controversy, due in part to the lack of quantitative studies of the effects of the Dodd–Frank Act.

While the size and scope of regulatory expansion are beyond dispute, the question of whether the act has imposed significant costs on banks remains controversial. In a 2012 survey, the American Bankers Association (ABA) concluded that the act imposed "daunting new compliance, operational, and recordkeeping burdens on all banks" (ABA 2012, p. 4). In his 2012 congressional testimony, chairman of the Community Bankers Council of the ABA William Grant made the "very conservative" estimate that the act raised industry compliance costs by "$50 billion annually, or about 12 percent of total bank operating costs" (Grant 2012, p. 4). Former National Economic Council director Gary Cohn claims that Dodd–Frank costs banks "literally hundreds of billions of dollars of regulatory costs every year" (Bender and Paletta 2017). Another issue is the differential effects of regulation on small and large banks. While the primary rationale for Dodd–Frank was to increase oversight of systemically important financial institutions (SIFIs), critics argue the act has disproportionately affected smaller banks. A survey of more than 200 community banks by Peirce et al. (2014, p. 64) finds "substantially increased compliance costs" due to Dodd–Frank. They report that "more than eighty percent of respondents saw their compliance costs rise by more than five percent since 2010" (p. 3).

Despite the increases cited by commercial bankers, studies by financial regulators find little evidence of cost increases following the implementation of the Dodd–Frank Act. Two leading studies, for instance, find no substantial increase in noninterest expenses. McCord and Prescott (2014, p. 42) find that although there was a slight increase in noninterest expenses after Dodd–Frank, "the increase is relatively small and, more importantly, the size of these expenses is just too small to have a big effect on bank profitability." The Government Accountability Office (GAO 2015, p. 39) similarly finds that "noninterest expenses have decreased or remained flat since the financial crisis." It also disputes the claim that smaller banks have been disproportionately hurt by higher costs, concluding that "noninterest expenses generally have fallen for banks of all sizes since the third quarter of 2010" (p. 42).

What explains this discrepancy between what bankers and regulators believe about the effects of Dodd–Frank? This study attempts to resolve this question by expanding on previous studies in three ways. First, we separate our dataset into large banks with $10 billion or more in total assets and small banks with < $10 billion since banks above and below the $10 billion threshold are subject to different regulations and therefore might be affected differently. Second, we divide total noninterest expenses into two categories: salary and non-salary expenses. We then consider four subcategories of non-salary expenses that might be related to regulatory compliance: legal, data processing, auditing and consulting. Third, we use a measure of

regulatory restrictions on the banking industry to assess how changes in regulation affect bank expenses.

Our results shed light on why bankers and regulators hold such divergent views on how Dodd–Frank has affected bank expenses. Charts in Sect. 3 show increases in non-salary expenses prior to Dodd–Frank, which is consistent with McCord and Prescott (2014) and GAO (2015), while increases in salary expenses do not occur until the later years of our sample, which are beyond the time periods used in other studies. Using regression analysis, we find non-salary, noninterest expenses typically show a one-time increase following Dodd–Frank. Salary expenses are mostly related to increases in regulations, although they also exhibit a one-time increase for small banks after Dodd–Frank. The results imply increases in total noninterest expenses after the passage of Dodd–Frank in the range of $58.7 billion to $86.1 billion per year.

2 Background

At more than 360,000 words and 2300 pages in length, the Dodd–Frank Act represents "the longest and most complex piece of financial legislation in American history" (Peirce and Broughel 2012). The act granted regulators significantly broader authority to create new rules governing the financial system with goals ranging from reducing the risk posed by systemically important firms (Title I) to the creation of a bureau for consumer protection (Title X).

The gray line in Fig. 1 depicts the number of regulatory restrictions from 1995 through 2016 in the Code of Federal Regulations (CFR) Title 12 on "Banks and Banking" based on the RegData database. The black dashed line depicts the number of pages in CFR Title 12, available online from 2000 through 2017, which tracks closely with the number of regulatory restrictions. Aside from a slight decrease in the late 1990s, the chart shows consistent growth in regulations over our sample period.[1] The most striking aspect, however, is the spike in restrictions after the passage of Dodd–Frank. McLaughlin and Sherouse (2015) report that as of 2014, the Dodd–Frank Act created 27,669 new regulatory restrictions—more than every other law passed during the Obama administration combined. Financial regulators added more restrictions to Title 12 between 2010 and 2014 alone than were contained in the entire title before 1980 (*ibid.*).

The Dodd–Frank Act greatly expanded the Fed's regulatory authority. Title I granted the Fed broader authority to regulate large banks and nonbank financial institutions. The Fed added 3186 new regulatory restrictions in the first 5 years of the act alone (McLaughlin et al. 2016). The act also required the Fed to impose heavier reporting requirements and more stringent leverage and risk-based capital standards on U.S. banks. Although these changes in capital standards applied mostly to large banks, the Fed has increased capital requirements for virtually all

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[1] This is consistent with Calabria (2009) who finds that the budgets of U.S. financial regulatory agencies rose by 21% in real terms between 2000 and 2008.

Fig. 1 Regulatory restrictions on U.S. banks. *Source*: McLaughlin and Sherouse (2015), Code of Federal Regulations Title 12
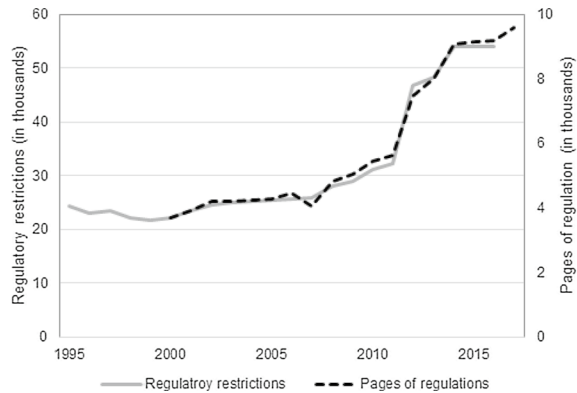
U.S. banks and BHCs. In 2015, it began instituting much stricter compliance and reporting requirements to bring the U.S. closer to compliance with the international capital standards outlined in Basel III.

Since the main goal of Dodd–Frank is to reduce the probability of another financial crisis, much of the Fed's enhanced regulatory authority is concentrated on SIFIs. Under Dodd–Frank, the Fed requires all BHCs with $50 billion or more in total assets to submit detailed resolution plans, or "living wills," that describe how they would swiftly unwind their balance sheet if they were to become insolvent. The act also requires the Fed to conduct annual stress tests on all banks with $10 billion or more in total assets. The Dodd–Frank Act Stress Tests (DFAST) require banks to conduct their own company-run semi-annual stress tests and report their results to the Fed (Board of Governors 2013). Since 2011, the Fed itself has also conducted stress tests on banks with total assets of more than $50 billion known as the Comprehensive Capital Analysis and Review (CCAR). These stress tests require banks to provide a quantitative estimate of how much equity they would lose under a variety of scenarios as well as a qualitative analysis of their capital planning procedures in response to major economic shocks.[2]

Large banks claim that stress tests and new reporting requirements force them to dedicate significantly more resources to regulatory compliance. Sterngold (2015) observed that over time "the tests have morphed into protracted top-to-bottom examinations that have required firms to revamp their balance sheets, hire thousands of staff and spend hundreds of millions of dollars on preparations." In 2013, JPMorgan announced that it would spend an additional $4 billion and hire 5000 employees to address these compliance issues (LaCarpa and Henry 2013). In 2015, it announced that it had dedicated a group of 550 employees to work exclusively on stress test compliance, with more than two thousand additional employees contributing indirectly (LaCarpa 2015; Tracy 2016). Citigroup likewise increased its "compliance staff levels by 33 percent since the end of 2011" (Patel 2014) and "has reportedly

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[2] The Fed, together with the OCC and the FDIC, first implemented stress tests through the Supervisory Capital Assessment Program (SCAP) in 2009. SCAP was designed as a one-time event to ensure that the most systemically important banks had sufficient capital to withstand a significant economic downturn (Rubinstein 2012, p. 6).

added 10,000 employees to ensure compliance with Dodd–Frank regulations in preparation for the annual stress tests" (Hartley 2015). After failing a stress test in March 2014, Citigroup spent $180 million in the second half of 2014 to hire multiple consulting firms to assist with the stress test (Tracy 2016). Large banks spent more than $29 billion in 2015 on consultants to help cope with stress tests, nearly twice the $16.35 billion they spent in 2007 (Tracy 2016).

One of the most controversial sections of the act is Title X, which created the Consumer Financial Protection Bureau (CFPB), an independent regulatory agency with extensive authority over bank and nonbank consumer credit providers.[3] The ABA (2012, p. 4) describes the CFPB as a "massive new agency with unprecedented rulemaking and enforcement power" whose regulations have made it "significantly harder for banks, particularly community banks, to serve their communities and help grow the economy."

One commonly cited example is the CFPB's extensive set of new rules that apply to residential mortgage lending, a staple in the business of many community banks. Since 2011, the CFPB has made extensive changes to Regulation Z to implement the Truth in Lending Act, raising reporting requirements for loan originators and prohibiting certain practices related to payments to mortgage brokers and other loan originators. It also made extensive amendments to Regulation X pertaining to the Real Estate Settlement Procedures Act (RESPA) and Regulation C, which implements the Home Mortgage Disclosure Act (HMDA) requiring banks to comply with numerous new disclosure and data gathering requirements for mortgage lending under the HDMA. The CFPB also presides over the controversial new Qualified Mortgage (QM) rules, which require banks to provide detailed data showing that borrowers met a rigorous "ability to repay" test in order to be exempt from the risk retention requirements included in the law.

Smaller banks claim to face higher compliance costs due to the vast new regulations on services such as small business and commercial loans. In 2011, the CFPB issued revisions to the Equal Credit Opportunity Act (ECOA) that required banks to gather and report extensive data on their lending to small businesses—particularly small, minority-, and women-owned businesses—in order to "facilitate the enforcement of fair lending laws" (Dodd–Frank Act, § 1071(a)). Based on its authority under Regulation B, the Office of Fair Lending requires lenders to gather and report data from a variety of credit markets including auto finance and credit cards. According to Shane (2013), the ultimate effect of the new rules and reporting requirements for small business and commercial loans has been to curtail the very types of loans that smaller banks specialize in. Lux and Greene (2015, p. 1), for example, find that community banks' market share of residential and commercial lending fell by 6% during the financial crisis and "has declined at a rate almost double that" since the passage of Dodd–Frank.

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[3] For details on specific CFPB regulations, see http://www.consumerfinance.gov/regulations/.

Although it is difficult to pinpoint precisely which regulations have affected small banks the most, many small bankers claim that the overall burden of these new rules and reporting requirements has had a significant effect on their expenses. In its 2012 survey of regional and community bankers, the FDIC (2012, p. IV) reported that "[m]ost interview participants stated that no one regulation or practice had a significant effect on their institution. Instead, most stated that the strain on their organization came from the cumulative effects of all the regulatory requirements that have built up over time." A survey of community banks by the Fed and the Conference of State Bank Supervisors (2014, pp. 21–22) likewise found that "Compliance costs increased for 94 percent of the respondents" following the passage of Dodd–Frank.[4] Another recent survey by the Federal Reserve Bank of St. Louis (2018, p. 14) found that compliance expenses as a share of noninterest expenses rose from 5.5% in 2014 to 8.1% in 2015 and 7.7% in 2016 after new mortgage rules included in Dodd–Frank went into effect.

These findings stand in stark contrast to those of many bank regulators, who find that bank expenses have not increased since Dodd–Frank. Two studies, McCord and Prescott (2014) and GAO (2015), measure the effects of the Dodd–Frank Act on banks' noninterest expenses. McCord and Prescott (2014, pp. 39–43) analyze changes in noninterest expenses as percentages of total assets. The authors do find some evidence that lawyer and consultant fees rose immediately after the passage of Dodd–Frank, with particularly large increases for banks with <$1 billion in assets (p. 41). They nevertheless argue that "the increase is relatively small and, more importantly, the size of these expenses is just too small to have a big effect on bank profitability" (p. 42). They conclude that "if compliance costs are really increasing, then they are being swamped by changes in other expenses" (p. 42). A GAO (2015) study also finds no evidence that Dodd–Frank has significantly affected bank employment or noninterest expenses since "noninterest expenses generally have fallen for banks of all sizes since the third quarter of 2010" (p. 42).

We expand on these studies in three ways. First, we separate small and large banks based on a threshold of $10 billion in total assets since this is level used by regulators. Second, we separate total noninterest expenses into categories of salary and non-salary noninterest expenses. We further consider several subcategories of non-salary expenses: auditing, legal, consulting, and data processing. Third, we compare these categories of noninterest expenses to increases in bank regulatory restrictions in order to gauge the effects of regulations as they are enacted over time. We acknowledge that analysis of noninterest expenses understates the costs of regulation since such analysis cannot detect the costs associated with reallocating labor and resources out of productive business activities and into activities associated with regulatory compliance. "This kind of cost is something we cannot measure" (McCord and Prescott 2014, p. 42).

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[4] As Peirce et al. (2014, p. 63) note, the effects of Dodd–Frank across community banks are not uniform. Community banks with <$200 million in assets were far more likely to reduce or altogether discontinue offering residential mortgages because of the new regulatory requirements. These banks were also far less likely to hire in-house legal counsel or compliance personnel than their larger counterparts. Lux and Greene (2016) argue the cumulative effects of regulation have driven small banks out of business and accelerated consolidation in the financial sector.

3 Data

Our analysis focuses on the effects of regulations pursuant to the Dodd–Frank Act on the noninterest expenses of U.S. commercial banks. We use annual data from U.S. BHCs' year-end *Consolidated Financial Statements for Bank Holding Companies* (Y-9C) reports from 1995 through 2016.[5] From these reports, we gather data on several variables from the income statements and balance sheets of each BHC in each period.

Our main variable *NON-INT-EXP$_{it}$* is calculated as noninterest expenses for each bank *i* in year *t* as a percentage of total assets, adjusted for trend as discussed below. The category of noninterest expenses includes salaries, legal fees, and investments in new technology that might have been increased to comply with the requirements of the act. We also divide noninterest expenses into (trend-adjusted) subcategories of salaries, listed in the Y-9C income statements as "salaries and employee benefits" (*SALARY*), and non-salary noninterest expenses (*NON-SALARY*), which we calculate by subtracting salaries and employee benefits from noninterest expenses.

We also consider a few specific subcategories of non-salary expenses that might be related to compliance. These include data processing, legal, auditing, and consulting expenses. Data on banks' data processing and legal expenses are only available back to 2001, and data on auditing and consulting expenses are available since 2008. Additionally, not all banks report these expenses since they are only required to be reported if they exceed $25,000 per year and make up more than 3% of the bank's income statement line item "other noninterest expenses."[6] Because of this, the number of observations is lower for these variables than for total noninterest expenses.

We use three measures to test whether changes in banks' noninterest expenses are associated with the costs of regulatory compliance. To test whether expenses have generally risen since the passage of Dodd–Frank, we include a dummy variable *DODD–FRANK* set to zero in the years up to 2009 and to one from 2010 onward. We use data from the RegData database to measure the number of regulatory restrictions. RegData estimates the number of legal restrictions applied to each industry in each year based on Al-Ubaydli and McLaughlin (2017). Their algorithm analyzes the text of the Code of Federal Regulations for language that restricts activities such as "shall" or "shall not" and "must" or "must not." We use in our analysis the total number of regulatory restrictions (which we sometimes refer to simply as "regulations") from CFR Title 12 on Banks and Banking as shown by the gray line in Fig. 1. We use variables for both the level of regulations *REG LEVEL* and the percentage growth of regulations in each year *REG GROWTH* as independent variables in our regression analysis. As a robustness check, we use the number of pages in

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[5] Available online at https://cdr.ffiec.gov/public/PWS/DownloadBulkData.aspx.

[6] The category "other noninterest expenses" is calculated as total noninterest expenses less salaries and employee benefits, expenses of premises and fixed assets, and impairments to goodwill and intangible assets.

CFR Title 12 that are available online from 2000 through 2017 shown as the dashed line in Fig. 1.

Our regression analysis in Sect. 4 uses several control variables representing categories from the banks' balance sheets. First, we include categories that might represent expenses not related to Dodd–Frank. For example, DeYoung et al. (2004, p. 122) argue that small banks are unable to compete with big banks in "capital market products" (such as underwriting and securitization) and are therefore likely to specialize in traditional, less efficient business practices that require "personalized service and relationships based on soft information." To account for expenses related to these personalized services, we use *REAL ESTATE* representing residential real estate loans, transaction deposits *TRANSACT DEP*, and non-transaction deposits *NON-TRAN DEP*, each as a percentage of total assets. Although efficient scale is a subject of ongoing debate in the literature, we use the natural log of total assets *LOG ASSETS* to account for potential economies of scale that might occur within our subsamples of large and small banks.

We also include control variables representing the state of the economy using data gathered from the Federal Reserve Economic Database (FRED) at the Federal Reserve Bank of St. Louis.[7] The variable *GDP* is the annual rate of real GDP growth; *CPI* is the rate of inflation measured as the annual rate of growth in the Consumer Price Index (CPI). The variable *JOBS* is the growth rate in nonfarm payrolls. These variables indicate the relative strength of the economy in each year, which may be related to changes in banks' businesses activities and operating expenses.

Table 1 summarizes the variables used in our analysis. Total assets have a mean of $9.3 billion and range from $26.6 million to $2.57 trillion. Real estate loans have a mean of $2.4 billion, about 25.8% of average total assets, with a minimum of zero and a maximum of $543 billion. Transaction deposits have a mean of $738 million and a range from zero to $444 billion, while non-transaction deposits average $223 million, ranging from zero to $148 billion.

Noninterest expenses average 3.06% of total assets. This is consistent with McCord and Prescott (2014) and GAO (2015) which find noninterest expenses of around 3% of total assets. Noninterest expenses show a minimum of 0.88% and a maximum of 15.51%. Salaries and benefits average 1.61% of total assets, and non-salary, noninterest expenses average 1.43% of total assets. The subcategories of data processing and legal expenses, which are only available since 2001, have respective means of 0.04 and 0.06% of total assets. Since 2008, the mean of auditing expenses is 0.14%, and the mean of consulting expenses is 0.06% of total assets.

Two of our main independent variables are the number and growth rate of regulatory restrictions as measured by RegData. There is an average of 28,911 regulations in each year of our sample, ranging from a low of 21,675 in 1999 to a high of 54,098 in 2017. The average annual growth rate of regulations is 3.62%, with a low of − 5.50% in 1998 and a high of 44.89% in 2014. Aside from a slight negative

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[7] Available online at https://research.stlouisfed.org/fred2/.

in 2016, the years 1996, 1998, and 1999 are the only years in our sample that show declines in the number of regulatory restrictions.[8]

Table 1 also summarizes our control variables for bank balance sheets and states of the economy. Annual GDP growth averages 2.68% and ranges from -2.75 to 4.88%. Inflation averages 2.35%, ranging from a minimum of 0.09 to a maximum of 4.08 over the period. Net growth in nonfarm payrolls averages 1.02% and ranges from a minimum of -4.10% to a maximum of 2.75%.

Since much of our analysis compares the effects on small verses large banks, Table 2 shows the summary statistics for these subsamples. Noninterest expenses for small banks average 3.05%, which is close to the mean for the full sample, while the average for large banks is higher at 3.25%. For salary and benefit expenses, the average for small banks of 1.62% is higher than the average of 1.56% for large banks. Non-salary expenses average 1.64% for large banks and 1.42% for small banks. The differences in means are not statistically significant due to the high standard deviations in each subsample.

Because our dependent variables are expenses as percentages of bank assets, one might wonder whether the fluctuations are driven by changes in expenses or changes in asset values. Figure 2 shows the sums of all BHCs' total assets and noninterest expenses in billions of dollars. The solid line of noninterest expenses fluctuates around the dotted line of total assets, which grow continuously through the sample. Noninterest expenses slow around the 2008 financial crisis but show large increases in 2009 and 2012. The coefficient of variation in the growth rate of assets is only 1.09 relative to 1.56 for growth in noninterest expenses, which confirms that variation is mostly in expenses rather than assets.[9]

Figure 3 shows the total noninterest expenses for all banks in our sample as percentages of total assets in each year. There appears to be a strong downward trend over the sample period, which we control for in order to test whether Dodd–Frank has affected expenses. We test for structural breaks using quantitative likelihood ration (QLR) analysis. The results show statistically significant breaks in several years around the financial crisis, but by far the largest p-values are in 2005, 2009, and 2011. Given these breakpoints, we use the pre-2009 trend, shown in Fig. 3 as the dashed gray line, as the baseline to test for significant increases after Dodd–Frank. As discussed in Sect. 4, the dating of the trend has only minor effects on our results.[10]

Figure 4 shows the averages for three categories of noninterest expenses as percentages of total assets in each quarter for large banks with $10 billion or more in

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[8] McLaughlin and Greene (2013) argue that the declines in the late 1990s are only decreases in the measured number of regulations due to consolidation of the text of the regulations and do not represent actual decreases in the number of restrictions applied to US banks. "Without this consolidation, Title 12 pages would have increased."

[9] Because a 2006 change in the Y-9C reports altered the number of reporting banks, the figure includes only banks with data before and after the change. As discussed in Sect. 4, this reporting change does not affect our results.

[10] One might argue that the pre-2005 trend would be a more appropriate baseline since it would exclude the years of the financial crisis. Our robustness analysis considers several trends. All results are similar to the base case.

Table 1 Summary statistics

	Mean	SD	Min.	Max.	Obs.
Balance sheet totals (in millions of dollars)					
Total assets	9268	89,713	27	2572,773	26,090
Real estate loans	2421	18,572	1	542,939	26,090
Transaction deposits	738	9044	0	443,508	26,090
Non-transaction deposits	223	2106	0	148,229	26,090
Expenses (as percentages of total assets)					
Noninterest expenses	3.06%	0.97%	0.88%	15.51%	26,090
Salaries and benefits	1.61%	0.48%	0.46%	6.75%	26,092
Non-salary expenses	1.43%	0.56%	0.41%	8.12%	26,088
Subcategories of non-salary expenses (as percentages of total assets)					
Data processing	0.04%	0.03%	0.00%	0.41%	4143
Legal	0.06%	0.07%	0.00%	2.32%	3910
Auditing	0.14%	0.09%	0.00%	1.90%	12,087
Consulting	0.06%	0.07%	0.00%	1.87%	7529
Regulatory restrictions					
Number (in thousands)	28.41	9.11	21.68	54.10	26,090
Growth rate (in percent)	3.60%	8.85%	− 5.50%	44.89%	26,090
Economic indicators (in percent)					
GDP growth	2.68%	1.68%	− 2.75%	4.88%	26,090
CPI growth	2.35%	0.93%	0.09%	4.08%	26,090
Payroll growth	1.02%	1.55%	− 4.10%	2.75%	26,090

Bank asset and expense data from year-end *Consolidated Financial Statements for Bank Companies* (Y-9C) reports, 1995 through 2016. Data processing and legal expenses data are only available since 2001 and audit and consulting data since 2008. Number and growth of regulatory restrictions from RegData based on Al-Ubaydli and McLaughlin (2017). Economic data from the Federal Reserve Economic Data (FRED) database from the Federal Reserve Bank of St. Louis

total assets and small banks with $<$\$10 billion.[11] Figure 4a, b show average total noninterest expenses, which fall prior to the financial crisis before rising to peaks in 2009 and 2012 respectively. The dashed lines show the downward trajectories over the course of the sample based their pre-2009 trends. Figure 4c, d show salaries and employee benefits, and Fig. 4e, f show non-salary, noninterest expenses. For large banks, average salaries decline consistently from 2000 onward with a dip from 2006 to 2009. Small banks' salaries, by contrast, are mostly flat with a drop from 2007 to 2009 and then a major increase after 2011. Large banks' non-salary expenses are generally falling until 2008 but show a major spike in 2009 and 2010 and remain above trend thereafter. Small banks' non-salary expenses decline consistently in the first half of the sample, then spike in 2009 and decline thereafter.

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[11] For our quantitative analysis, we categorize a bank as "large" if total assets is $\geq$ \$10 billion. In practice, however, the "or equal to" phrase is irrelevant since there are no observations in our sample with total assets exactly equal to \$10 billion. We therefore commonly describe these categories as large banks with total assets $>$ \$10 billion and small banks with total assets $<$ \$10 billion.

4 Analysis

We use regression analysis to test for statistically significant increases in banks' non-interest expenses after the passage of Dodd–Frank. First, we test if total noninterest expenses increase relative to the pre-2009 baseline and if noninterest expenses are related to the levels or growth rates of bank regulations. Second, we separate total noninterest expenses into salary and non-salary expenses. Finally, we test specific subcategories of non-salary expenses: data processing, legal, auditing, and consulting. In each case, we consider separate subsamples of large and small banks.

Equation 1 shows our regression equation with the dependent variable *NON-INT-EXP*$_{it}$ of noninterest expenses as percentages of total assets for each BHC i in year t. The primary independent variable is the dummy *DODD–FRANK*, which is set to 0 up to 2009 and to 1 starting in 2010 and thereafter. The variable *REG LEVEL*$_t$ represents the number of regulatory restrictions in year t, and *REG GROWTH*$_t$ represents the change of regulations in year t relative to the previous year. Let Ω_{it} represent the set of bank-specific control variables for BHC i in time t. Let Φ_t represent the set of variables representing the state of the economy in time period t. We include a constant term β_6, a bank-level constant α_i, and ε_{it} as an error term. We use OLS regressions with bank-fixed effects and bank-clustered standard errors.

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\begin{aligned}
NON\text{-}INT\text{-}EXP_{it} = {}& \beta_1 DODD{-}FRANK + \beta_2 REG\,LEVEL_t \\
& + \beta_3 REG\,GROWTH_t + \beta_4 \Omega_{it} + \beta_5 \Phi_t + \beta_6 + \alpha_i + \varepsilon_{it}
\end{aligned}
\tag{1}
$$

Table 3 shows the results of regression Eq. 1. The first three columns separately test the dependent variables *DODD–FRANK*, *REG LEVEL*, and *REG GROWTH*. We see that each of these variables on its own is positive and statistically significant, indicating banks' noninterest expenses did increase in the Dodd–Frank period, but that the increases may have been related to the level or growth rate of regulations. Column 4 show the regression including all three of these variables. In this case we see that the coefficient estimates for the Dodd–Frank dummy variable and the level of regulations are both positive and statistically significant, indicating that noninterest expenses increased as both a one-time event after the passage of the Dodd–Frank Act and also relative to increases in regulation.

The coefficient estimate of 0.385 indicates that noninterest expenses in the Dodd–Frank period were 0.385% higher as a percentage of total assets. Since the total assets of all BHCs in our sample averaged $17.6 trillion over the Dodd–Frank period, this coefficient estimate indicates that noninterest expenses were higher by $67.8 billion per year after Dodd–Frank. The coefficient estimate for regulations is 0.005. Regulatory restrictions increased from an average 24,373 before Dodd–Frank to 45,153 after, a difference of 20,780. Multiplying this difference by the coefficient of 0.005 and by assets of $17.6 trillion gives an increase of $18.29 billion. Adding these increases together, we get a total increase in noninterest expenses of $86.1 billion per year. This estimate is higher than Grant's (2012) estimate of $50 billion per year but lower than Cohn's claim of "hundreds of billions of dollars of regulatory costs every year" (Bender and Paletta 2017).

Table 2 Summary statistics for large and small banks. *Source*: *Consolidated Financial Statements for Bank Holding Companies* (Y-9C) reports, 1995 through 2016. Data processing and legal expense data are only available since 2001 and audit and consulting data since 2008

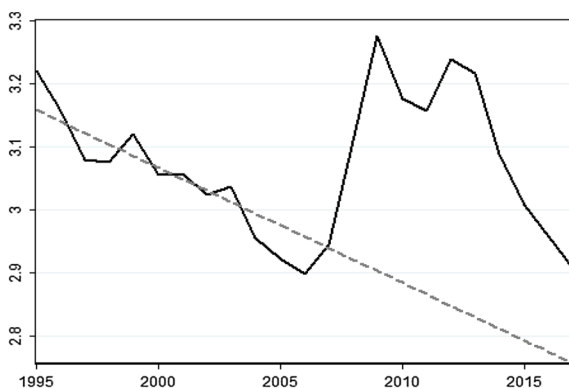|	Large banks (≥ $10B)		Small banks (< $10B)	
	Mean	SD	Mean	SD
Balance sheet totals (in millions of dollars)				
Total assets	138,947	341,693	1021	1475
Real estate loans	33,052	69,035	473	682
Transaction deposits	10,690	35,534	105	196
Non-transaction deposits	2729	8204	64	123
Expenses (as percentages of total assets)				
Noninterest expenses	3.25%	1.24%	3.05%	0.95%
Salaries and benefits	1.56%	0.53%	1.62%	0.48%
Non-salary expenses	1.64%	0.70%	1.42%	0.53%
Subcategories of non-salary expenses (as percentages of total assets)				
Data processing	0.14%	0.10%	0.14%	0.09%
Legal	0.07%	0.10%	0.06%	0.07%
Auditing	0.03%	0.03%	0.04%	0.03%
Consulting	0.09%	0.09%	0.06%	0.07%

Fig. 2 Total assets and noninterest expenses for all BHCs. *Source: Consolidated Financial Statements for Bank Holding Companies* (Y-9C) reports
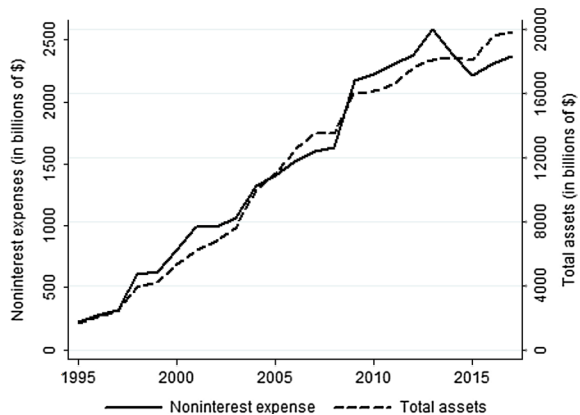
The final two columns of Table 3 show the results from regressions on the subsamples of large and small banks. The coefficient estimates of *DODD–FRANK* in these regressions are similar in magnitude to that of the full sample. In addition, we see in the final column that the coefficient estimate of *REG LEVEL* is positive and statistically significant, indicating that small banks' noninterest expenses were also related to the number of regulatory restrictions in each period. Given the average annual total assets of $16.3 trillion for large banks and $1.5 trillion

Fig. 3 Total noninterest
expenses as percentage of bank
assets and pre-2009 trend.
Source: *Consolidated Financial
Statements for Bank Holding
Companies* (Y-9C) reports

for small banks, the respective *DODD–FRANK* coefficient estimates of 0.349 and
0.380 imply that total noninterest expenses increased by $56.9 billion per year for
large banks and by $5.7 billion per year for small banks. Multiplying the increase
in regulations of 20,780 by small banks' coefficient of 0.006 for the level of regu-
lations indicates an increase in small banks' expenses of $1.9 billion per year
from regulations. In total, these results imply an increase for the banking system
of $64.5 billion per year in the Dodd–Frank period, which is lower than but con-
sistent with the estimate of $86.1 billion per year based on column 4.

Several of the control variables in Table 3 have statistically significant coeffi-
cient estimates with the expected signs. The coefficient estimates for real estate as
well as transaction and non-transaction deposits are mostly positive and statisti-
cally significant, indicating as expected that banks with higher real estate lending
and deposits have higher noninterest expenses per dollar of total assets. The coef-
ficient for the log of bank assets is negatively significant, indicating that larger
banks have lower noninterest expenses as percentages of total assets. The coef-
ficient of job growth is negative and statistically significant, probably since banks
tended to become more efficient during periods of positive job growth, but their
expenses increased following the financial crisis when job growth was low. The
R-squared statistics range from 3.3 to 7.1%.

Next, we divide banks' total noninterest expenses into categories of salary and
non-salary expenses as discussed in Sect. 3. Table 4 shows the results of regres-
sions on salary expenses in the first three columns and non-salary expenses in
columns 4 through 6. For salary expenses, the coefficient estimates for *REG
LEVEL* are positively significant in all columns, while the *DODD–FRANK* coef-
ficient is positive and statistically significant for the full sample and for small
banks. For non-salary expenses, the coefficient estimates for *DODD–FRANK* are
positive and statistically significant in columns 4 through 6, while the coefficients
for regulations are not significant.

The results in Table 4 add context to the findings in Table 3. For large banks,
increases in noninterest expenses are mostly driven by non-salary expenses. Mul-
tiplying the *DODD–FRANK* coefficient of 0.232 by the average post-Dodd–Frank
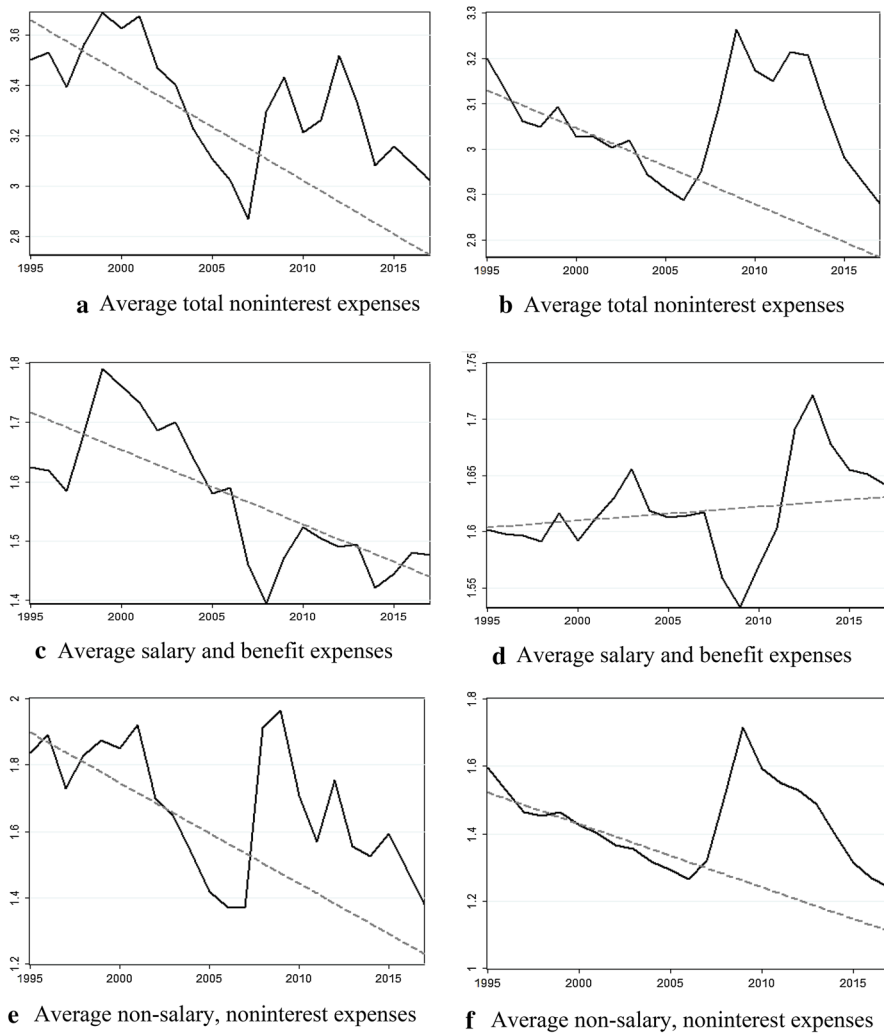
Fig. 4 Types of noninterest expenses as percentages of total assets and pre-2009 trends. *Source: Consolidated Financial Statements for Bank Holding Companies* (Y-9C) reports

total of large banks' assets of $16.3 trillion indicates an increase of $37.8 billion. Salary expenses for large banks show a coefficient for the level of regulations of 0.004, indicating an increase of $13.5 billion. The total of these is $51.4 billion, which is smaller than but similar in magnitude to the $56.9 billion for large banks calculated from Table 3.

Small banks have statistically significant coefficients for both salary and non-salary expenses. For salary expenses, the coefficient estimate is 0.022 for the Dodd–Frank period dummy and 0.009 for the level of regulations. The growth rate of regulations is statistically significant with a coefficient of 0.001, and regulations grew at an average rate of 11.8% per year in the Dodd–Frank period. These indicate an increase in small banks' salary expenses of $2.1 billion per year in the Dodd–Frank period. For non-salary expenses, the *DODD FRANK* coefficient estimate is 0.354, indicating an increase of $5.3 billion per year. The total increase in salary and non-salary expenses for all banks based on Table 4 is $58.7 billion per year, which is similar in magnitude to the estimates of $64.5 billion and $86.1 billion calculated from Table 3.

Finally, we analyze a few specific subcategories of non-salary expenses that might be related to compliance costs. We drop the economy-level variables from the regressions in order to maintain the appropriate degrees of freedom for the *DODD–FRANK* dummy variable since there are so few years of data available for these variables. The results of these regressions on large banks are shown in Table 5. We see that the coefficient estimate for *DODD–FRANK* is statistically significant for data processing and legal expenses. For data processing, the coefficient estimate for the level of regulations is positively significant, while the coefficient estimate for growth in regulations is negatively significant. The magnitudes of these coefficients indicate a total increase of $19.5 billion per year in legal expenses for large banks in the Dodd–Frank period, which is more than half of the $37.8 billion increase in large banks' non-salary expenses calculated from Table 4.

Table 6 shows the results of these regressions for small banks. In contrast to Table 5, we see that the coefficient estimates for *DODD–FRANK* are statistically significant for every variable. *REG LEVEL* is also positively significant for data processing. Together, the coefficient estimates imply an increase in expenses of $1.5 billion per year for small banks, which is about 28.3% of the previously estimated $5.3 billion increase in small banks' non-salary expenses.

We use a variety of methods to test the robustness of our base case analysis.[12] First, we conduct panel cointegration tests to confirm that the results from our regression analysis represent true relationships between variables rather than spurious correlations. Since these tests require strongly balances datasets, we drop any BHCs that were not active throughout the period of our sample from 1995 through 2016. We run Kao, Pedroni, and Westerlund tests on our dependent variables and main independent variables. The results show that the variables are cointegrated, indicating that the variable relationships are valid and not spurious correlations.

Some of the expenses charted in Fig. 3 show major declines during the financial crisis. To control for this, we add to our regression analysis a dummy variable *CRISIS* that is equal to 1 from 2007 through 2009. The results are similar to the base case. The coefficient for the *DODD–FRANK* dummy is positively statistically significant for large and small banks' non-salary expenses, while the level of regulations

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[12] Results from these regressions are available from the authors upon request or online at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2832288.

Table 3 Regressions on noninterest expenses

	All banks	All banks	All banks	All banks	Large banks (≥ $10B)	Small banks (< $10B)
DODD–FRANK	0.452***			0.385***	0.349**	0.380***
	(0.030)			(0.026)	(0.137)	(0.026)
REG LEVEL		0.017***		0.005***	-0.001	0.006***
		(0.002)		(0.002)	(0.006)	(0.002)
REG GROWTH			0.005***	0.001	0.001	0.000
			(0.001)	(0.001)	(0.002)	(0.001)
REAL ESTATE	0.010***	0.008***	0.009***	0.009***	0.011	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.007)	(0.001)
TRANSACT DEP	0.005*	0.006**	0.013***	0.004	−0.004	0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.012)	(0.003)
NON-TRAN DEP	0.003	0.005**	0.008***	0.002	−0.006	0.005**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.012)	(0.002)
LOG ASSETS	− 0.248***	− 0.218***	− 0.048**	− 0.272***	− 0.190*	− 0.272***
	(0.027)	(0.029)	(0.023)	(0.031)	(0.105)	(0.033)
GDP	0.002	0.003	0.005	0.005	0.008	0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.019)	(0.004)
JOBS	− 0.074***	− 0.058***	− 0.036***	− 0.076***	− 0.084***	− 0.076***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.025)	(0.005)
CPI	0.024***	0.021***	− 0.015***	0.031***	− 0.022	0.035***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.025)	(0.005)
Constant	2.651***	1.714***	− 0.398	2.872***	3.418	2.583***
	(0.465)	(0.472)	(0.396)	(0.496)	(2.288)	(0.500)
Number of obs.	26,090	26,090	26,090	26,090	1560	24,530
R-squared	0.066	0.050	0.033	0.068	0.046	0.071
Number of BHCs	3436	3436	3436	3436	230	3292

OLS regressions with bank-level fixed effects. Dependent variables measured as percentages of total assets, calculated relative to pre-2009 trends. Bank-clustered standard errors shown in parentheses

Statistical significance indicated by *for 10%, **for 5%, and ***for 1%

is positive and statistically significant for large and small banks, all with magnitudes similar to Table 4. Unlike Table 4, the *DODD–FRANK* dummy variable is not statistically significant for small banks' salary expenses.

As discussed in Sect. 2, some large banks with over $50 billion in total asset were subject to stress tests, the SCAP in 2009 and CCAR from 2011 onward. To test whether the stress tests had particular effects on bank expenses, we include a dummy variable *STRESS TEST* in our regressions on large banks. The years are very similar to the *DODD FRANK* dummy, which is set to 1 in years 2010 onward, so the *STRESS TEST* variable might be thought of as testing whether expenses for banks with more than $50 billion in assets are different from banks with total assets of more than $10 billion but < $50 billion. Our results show that the coefficient

Table 4 Regressions on salary and non-salary, noninterest expenses

	Salary expenses			Non-salary expenses		
	All banks	Large banks ($\geq$ $10B)	Small banks (< $10B)	All banks	Large banks ($\geq$ $10B)	Small banks (< $10B)
DODD–FRANK	0.026**	0.059	0.022*	0.351***	0.232***	0.354***
	(0.011)	(0.051)	(0.011)	(0.018)	(0.073)	(0.018)
REG LEVEL	0.005***	0.004**	0.005***	0.000	−0.003	0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.004)	(0.001)
REG GROWTH	0.001**	0.001	0.001**	0.000	0.001	−0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)	(0.000)
REAL ESTATE	0.006***	0.004	0.006***	0.003***	0.006	0.003***
	(0.001)	(0.003)	(0.001)	(0.001)	(0.005)	(0.001)
TRANSACT DEP	−0.001	−0.007	0.000	0.005***	0.004	0.006***
	(0.001)	(0.005)	(0.001)	(0.002)	(0.008)	(0.001)
NON-TRAN DEP	−0.002**	−0.006	−0.001	0.005***	0.002	0.006***
	(0.001)	(0.005)	(0.001)	(0.001)	(0.007)	(0.001)
LOG ASSETS	−0.167***	−0.119***	−0.172***	−0.101***	−0.072	−0.094***
	(0.015)	(0.045)	(0.016)	(0.018)	(0.067)	(0.020)
GDP	0.008***	0.018***	0.007***	−0.003	−0.006	−0.003
	(0.002)	(0.007)	(0.002)	(0.003)	(0.016)	(0.003)
JOBS	−0.012***	−0.019**	−0.012***	−0.062***	−0.064***	−0.062***
	(0.002)	(0.008)	(0.002)	(0.004)	(0.022)	(0.004)
CPI	0.012***	0.014	0.012***	0.019***	−0.042**	0.024***
	(0.002)	(0.009)	(0.002)	(0.004)	(0.020)	(0.004)
Constant	1.953***	2.162**	1.893***	0.864***	1.160	0.631**
	(0.239)	(0.991)	(0.243)	(0.301)	(1.421)	(0.307)
Number of obs.	26,092	1560	24,532	26,088	1555	24,533
R-squared	0.055	0.045	0.055	0.101	0.069	0.108
Number of BHCs	3435	229	3290	3435	228	3293

OLS regressions with bank-level fixed effects. Dependent variables measured as percentages of total assets, calculated relative to pre-2009 trends. Bank-clustered standard errors shown in parentheses

Statistical significance indicated by *for 10%, **for 5%, and ***for 1%

estimates for the stress test dummy are not statistically significant. With the stress test dummy included, the Dodd–Frank dummy remains positively significant for non-salary expenses, but for salaries, the coefficient for the level of regulations is no longer significant.

Our base case analysis calculates expenses relative to their pre-2009 trends, but it may be possible that these trends do not accurately represent the long-term pattern that would have existed absent the financial crisis and Dodd–Frank. As an alternative, we use the trend up to 2005, the year identified as a break point by our QLR test. Results using this trend are mostly similar to Table 4 except that for small banks' salaries,

Table 5 Regressions on subcategories of non-salary expenses of large banks (total assets ≥ $10 billion)

	Data processing	Legal	Auditing	Consulting
DODD–FRANK	0.020**	0.040***	0.007	0.008
	(0.008)	(0.005)	(0.007)	(0.009)
REG LEVEL	0.003***	0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
REG GROWTH	−0.001***	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
REAL ESTATE	0.001**	0.002**	0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
TRANSACT DEP	0.001	0.002	0.000	−0.000
	(0.001)	(0.002)	(0.002)	(0.001)
NON-TRAN DEP	0.000	0.001	0.003**	−0.000
	(0.001)	(0.001)	(0.001)	(0.001)
LOG ASSETS	−0.017	−0.009	0.036	−0.019
	(0.018)	(0.043)	(0.039)	(0.024)
Constant	0.155	−0.041	−0.878	0.316
	(0.309)	(0.822)	(0.730)	(0.433)
Number of obs.	672	421	61	373
R-squared	0.351	0.135	0.331	0.023
Number of BHCs	125	109	30	94

OLS regressions with bank-level fixed effects. Dependent variables measured as percentages of total assets, calculated relative to pre-2009 trends. Data processing and legal expense data are only available since 2001 and audit and consulting data since 2008. Dependent variables measured as percentages of total assets. Bank-clustered standard errors shown in parentheses

Statistical significance indicated by *for 10%, **for 5%, and ***for 1%

the *DODD–FRANK* coefficient estimate is not significant. For large banks' salaries, the *REG LEVEL* coefficient is not significant, but the *REG GROWTH* coefficient is. For small banks' non-salary expenses, coefficient estimate for *REG LEVEL* becomes statistically significant. Baseline trends through 2006 or 2007 show similar results. As another alternative, we consider the trend over the full sample but excluding the years 2006 to 2014 which includes the down years preceding the financial crisis until total noninterest expenses return to their pre-crisis levels around 2015. In this case, the coefficient estimates are similar to the base case, in their signs, magnitudes, and statistical significance. These variations demonstrate that estimating the downward trend using a variety of time periods all lead to similar results. As an additional test, we conduct our regressions with no adjustment for the downward trend over the sample. Even in this case, the signs and significance of the coefficient estimates are mostly similar to the base case except that the *REG LEVEL* coefficients are negatively significant for non-salary expenses, reflecting the downward trend over the sample as seen in Fig. 4.

We also test the sensitivity of our results to changes in our definition of the Dodd–Frank dummy by starting the Dodd–Frank time period in 2009 or 2011. Using 2009 as the starting year, the coefficient estimates are similar to Table 4

Table 6 Regressions on subcategories of non-salary expenses of small banks (total assets < $10 billion)

	Data processing	Legal	Auditing	Consulting
DODD–FRANK	0.023***	0.021***	0.005***	0.007***
	(0.003)	(0.003)	(0.001)	(0.002)
REG LEVEL	0.002***	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
REG GROWTH	− 0.000***	0.000	− 0.000	− 0.000
	(0.000)	(0.000)	(0.000)	(0.000)
REAL ESTATE	0.000	− 0.001***	− 0.000	− 0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
TRANSACT DEP	0.001***	0.000	− 0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
NON − TRAN DEP	0.001***	0.001*	− 0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
LOG ASSETS	− 0.023***	− 0.009*	− 0.017***	− 0.019***
	(0.005)	(0.005)	(0.003)	(0.006)
Constant	0.171**	0.112	0.237***	0.278***
	(0.071)	(0.077)	(0.040)	(0.102)
Number of obs.	11,503	7160	4108	3562
R-squared	0.133	0.018	0.043	0.031
Number of BHCs	2190	1745	1024	929

OLS regressions with bank-level fixed effects. Dependent variables measured as percentages of total assets, calculated relative to pre-2009 trends. Data processing and legal expense data are only available since 2001 and audit and consulting data since 2008. Dependent variables measured as percentages of total assets. Bank-clustered standard errors shown in parentheses

Statistical significance indicated by *for 10%, **for 5%, and ***for 1%

except that small banks' salary expenses have negatively significant coefficients for the Dodd–Frank dummy, and their non-salary expenses have negative coefficients for the level of regulations. These results seem consistent with Fig. 4 which shows a trough for small banks' salaries in 2009 and an upward trend in small banks' salaries over the sample. Starting the Dodd–Frank period in 2011, we find that the Dodd–Frank dummy is positively significant in every column and that coefficients for the level and growth rates of regulation are statistically significant for small banks' salary and non-salary expenses.

Next, we test two changes to the variables in our analysis. First, we exclude outliers based on Cook's D statistic rather than the top and bottom 1% of observations as used in our base case analysis. For each regression, we calculate the Cook distances and exclude observations with D statistics of 4/N or more. The coefficient estimates from this analysis have the same signs and statistical significance as our base case with almost the same magnitude. Second, we use as an alternative measure of regulations the number of pages from CFR Title 12 on Banks and Banking. As shown in Fig. 1, these data are only available since 2000 and match closely to our base

case variable of regulatory restrictions. The results are very similar to the base case. For salary expenses, the coefficient estimates for the level of regulations are positively statistically significant in all cases. For non-salary expenses, the Dodd–Frank dummy coefficient is statistically significant in all cases, and the coefficient for the level of regulations is positively significant for all banks and small banks but not for large banks. Magnitude are similar to the base case analysis.

We also vary our regressions by adding additional control variables. It might be argued that banks more affected by the financial crisis would require greater increases in compliance related expenses after Dodd–Frank. To control for this possibility, we include three variables that might be related to bank risk: the equity capital ratio, nonperforming loans, and holdings of mortgage-backed securities (MBSs). The results show that equity is positively related to salaries but negatively related to non-salary expenses. MBSs are negatively related to both types of expenses, and coefficients for nonperforming loans are very close to zero. Regarding the coefficient estimates for the Dodd–Frank dummy and measures of regulation, results again are similar to the base case in signs, magnitudes, and statistical significance.

We consider two alternative measures of salary expenses. First, we use the number of employees per billion dollars in each bank's total assets, which averages 324 and is falling over the sample. Our regression results show that small banks have positive and statistically significant coefficient estimates for the Dodd–Frank dummy and for the level of regulations, indicating that small banks increased their employee per dollar of total assets while large banks did not. The coefficient estimates for the growth in regulations is negative for both large and small banks, but the magnitudes are small relative to the other coefficients. As a second measure, we look at salary expenses per employee, which averages $56,846 and is increasing over the sample. Again, the coefficient estimates for the growth in regulations are negative for all banks, but the magnitudes are relatively small. The coefficients for the Dodd–Frank dummy and the level of regulations are positively significant for large and small banks, indicating that the average salary per employee increased for all banks in the Dodd–Frank period.

Finally, we control for potential changes in the sample due to changes in bank reporting requirements. As previously discussed regarding Fig. 2, the number of banks that submit Y-9C reports was reduced in 2006 and then again in 2015 because the asset size at which banks are required to submit Y-9C reports was raised from $150 million to $500 million in 2006 and then to $1 billion in 2015, which reduced the number of banks reporting after each change. To ensure that these changes do not affect our results, we redo our analysis excluding the years 2015 and 2016 and include only banks that are active after 2006. The coefficient estimates for the *DODD–FRANK* dummy variable and the number of regulations for total noninterest expenses, salaries, and non-salary expenses all have the same signs and magnitudes as our base-case results. Considering these many variations on our base-case analysis, we conclude that our findings are indeed robust in showing statistically significant expense increases after the passage of the Dodd–Frank Act.

5 Conclusions

Effective financial regulation requires that regulators understand both the benefits and the costs of the regulations. We follow previous studies that attempt to gauge the costs imposed by the Dodd–Frank Act on U.S. commercial banks and extend those studies in three ways. First, we test whether changes in bank expenses are associated with a one-time increase after the passage of Dodd–Frank and, additionally, if they are related to the increases in banking regulations implemented pursuant to the act. Second, we compare the potential effects of regulation on banks of different sizes. Third, we consider the differences between expenses directly related to employees' salaries and benefits as compared to other types of noninterest expenses that might be more directly connected to changes in regulation.

We find that both large and small banks have significantly higher noninterest expenses in the Dodd–Frank period. Non-salary expenses generally show a one-time increase after Dodd–Frank, while salary expenses are mostly related to increases in regulations. Small banks' non-salary expenses increase for all subcategories of legal, auditing, consulting, and data processing. For large banks, non-salary expenses increase for legal expenses and data processing. Our base case results imply an increase in total noninterest expenses in the banking system of $64.5 billion per year relative to the period before the Dodd–Frank Act, with estimates ranging from $58.7 billion to $86.1 billion.

This evidence can help resolve the disparate findings of previous studies. Although the visual evidence in Fig. 3 is consistent with McCord and Prescott (2014), the results of our regression analysis are more similar to results from Peirce et al. (2014) and others who find significant increases in compliance costs since the passage of Dodd–Frank, especially for small and community banks. In addition, our measures of expenses are likely to understate the true costs of regulatory compliance since they do not account for internal reallocation of resources such as moving personnel out of productive business activities and into compliance, a practice that is especially common at smaller banks.

We confine our analysis to banks' noninterest expenses since these costs are widely discussed by bank managers and are easier to analyze than interest revenues and expenses. We do not consider the potentially significant costs to banks' interest expenses from higher funding costs or potential losses in revenue caused by regulations on capital allocation and investment activities. We hope further studies will continue this work in greater detail and consider the other effects of regulations pursuant to the Dodd–Frank Act.

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