

Establishment of National Public Audit Oversight Boards: Descriptive Evidence and Implications for Audit Quality

Carson, Lamoreaux, Simnett, Thuerheimer and Vanstraelen

1) A Description of which author(s) handled the data and conducted the analyses

Lamoreaux, Thuerheimer and Vanstraelen were involved in data collection and Thuerheimer conducted the empirical analyses. We collected data in the following way:

- Financial statement data was extracted from Compustat Global and Compustat North America by Thuerheimer.
- Data for institutional variables were collected from the Worldbank database, the database from the statistics portal of the World Federation of Exchanges and LaPorta et al. (1997; 1998) by Thuerheimer.
- Data on the number of news items about audit quality in each country-year were collected from Nexis Uni by a research assistant and Lamoreaux.
- Data on IFRS adoption were collected from public sources by Thuerheimer.
- Data on PCAOB access to foreign jurisdictions were collected by Lamoreaux and supplemented for years beyond 2012 by research assistants of Lamoreaux.
- Other data for additional analyses (PCAOB cooperative agreements) were collected from prior literature by Thuerheimer.
- Data on public oversight boards, establishment date and their design characteristics were initially collected from public sources. These sources are indicated in Table S1 of the online appendix under ‘Source’ and in footnotes, by research assistants under the supervision of Carson and Simnett. For 32 public oversight boards, information pertaining to 2003-2012 was confirmed through email surveys to the public oversight boards, as indicated under ‘Source’, by Vanstraelen and Thuerheimer. Thuerheimer subsequently updated this information to include all years 2000-2020 using public sources, especially historic IFIAR profiles to track changes in POB design over time. Historic IFIAR profiles were requested directly from IFIAR and are available on request. All other public sources are included in Table S1. The information on public oversight design and establishment date were reviewed by Lamoreaux and Vanstraelen and any coding issues were resolved by Lamoreaux, Thuerheimer and Vanstraelen.

2) A detailed description of how the raw data were obtained or generated, including data sources, the specific date(s) on which data were downloaded or obtained, and the instrument used to generate the data (e.g., for surveys or experiments). We recommend that more than one author is able to vouch for the stated source of the raw data.

- 1) Data on listed firm financial information was obtained from the Compustat Global and Compustat North America in May 2021.

- 2) Data on institutional variables from the Worldbank database (Worldwide Governance Indicators) were accessed via the stata module wbopendata from December 2020 to May 2021.
 - 3) Data from the World Federation of Exchanges statistics portal was downloaded in April 2021.
 - 4) Data from Nexis Uni were manually collected between February and April 2021.
 - 5) Data about PCAOB Access was collected over a long time period: Initial data (up until 2012) were collected in 2013. The data were updated in 2019.
 - 6) Data on public oversight boards and their inspection characteristics were initially collected from public sources for years 2000-2012, as indicated in Table 2 in column 'Source' and in footnotes. To confirm information from these sources, surveys of 32 public oversight bodies were conducted. An initial survey was sent out in the summer of 2015, and a follow-up survey was carried out in spring of 2016. When responses from the public oversight boards were unclear, follow-up questions were asked via email. The information was updated for the years 2013-2020 between January 2019 and December 2020 using publicly available data and historic IFIAR profiles. These historic IFIAR profiles were obtained directly from IFIAR and are available on request. In August 2023, the table was double checked using public sources, which confirmed that a number of countries indeed had not established an independent public oversight board up until 2020.
- 3) *If the data are obtained from an organization on a proprietary basis, the authors should privately provide the editors with contact information for a representative of the organization who can confirm data were obtained by the authors. The editors would not make this information publicly available. The authors should also provide information to the editors about the data sharing agreement with the organization (e.g., non-disclosure agreements, any restrictions imposed by the organization on the authors, such as restrictions to publish certain results).*
- The only data obtained from organizations are survey data from 32 public oversight boards to confirm the information contained in Table 1. This was not proprietary information but confirmation of information that we had obtained from publicly available sources, which we sought to ensure were correctly interpreted. The survey was initially sent out via email by Martijn Duffels (at the time, senior policymaker at The Dutch Authority for the Financial Markets and supporting Jeanine van Diggelen, Chair of IFIAR), and follow-up reminders were conducted by Vanstraelen and Thuerheimer. The email informed the respondents of the research question of the study and provided a pdf attachment with a more detailed description of the study. The email then asked respondents to verify and complete information in a MS Word table on details of inspection regimes for public entities in the period 2003-2012, that was attached to the email. The email further urged respondents to accurately fill in the table. This table is presented below.

The contact persons and corresponding email addresses are available for communication to the editors on request. It was clearly communicated to the respondents that the responses would be used in an academic study. No restrictions were imposed on the authors about using or sharing this information.

MS Word Table on details of Inspections (note that information was pre-filled for each country based on public sources)

				<i>Inspections</i>					<i>Sanctions</i>						
Country	Year of joining IFIAR	Is there an independent national inspection regime?	Oversight system	Year inspections commence	Frequency of inspections	Inspection reports publicly available?	If inspections are publicly available, is this at an aggregated level or are inspection reports for individually identified firms available?	Year in which the first inspection report(s) is (are) available to audit firms and/or the public?	Can sanctions be imposed for deficient inspections, by the national oversight body or through oversight by other institution?	Can sanctions be imposed on audit firms, individual auditors, or both?	What are examples of sanctions that can be imposed? (e.g. censuring audit firms/ auditors, monetary penalties, termination of bars, revoking of firm registration)	Are sanctions publicly disclosed and are they disclosed on an aggregated level or individual level?	Are there examples of these sanctions being applied to audit firms/ auditors? What is the proportion of deficient firms being sanctioned? From which date do these sanctions apply?	Major events from 2003 to 2012	Sources

- 4) *A complete description of the steps necessary to collect and process the data used in the final analyses reported in the paper. For experimental and survey papers, we require information about the instructions and instruments used to generate the data, subject eligibility and/or selection, as well as any exclusion criteria. The full set of instructions and instruments can be provided in the online appendix.*

In the following paragraphs, we describe the necessary steps to collect and process data used in this study. The data sources include: Compustat Global and Compustat North America (for financial data); the World Bank database (for institutional variables); manually collected data on news about audit quality in each country-year; and manually collected and survey information on public oversight boards. Stata, version 18, and excel were used to undertake all steps mentioned below.

Procedures for the Descriptive and Hazard Analyses

Do files: Prep Hazard analysis.do and Hazard analysis.do

Step 1: Obtain data from Nexis Uni, the Worldbank database, the World Federation of Exchanges statistics portal, and merge datasets

1. From Nexis Uni, we manually collect data on number of news items on audit quality for each of the 49 countries in our sample and years 2000-2020. We search Nexis Uni on “audit quality or fraud or misreporting or audit failure” and narrow the search result by country and by year. We subsequently create an excel file which tabulated the number of news items per country-year, and transform into a .dta file. We bring the file into long form and create an indicator variable to identify whether countries are in the sample based on data availability constraints (we exclude Indonesia, Norway, Sri Lanka and Taiwan). The news data can be obtained by request from the authors.
2. We upload an excel file containing information on establishment dates and inspection characteristics at the time of establishment to stata, and save the file as a .dta file. We merge this file with the news data from Step 1.
3. We then code country variables. First, we manually code variable LegalTradition based on La Porta et al. [1997, 1998]. We then access Worldbank data through the stata module wbopendata for each of the 49 countries for years 2000-2020 for relevant variables:
 - a. GDP annual growth (%) (data item NY.GDP.MKTP.KD.ZG)
 - b. Rule of Law (data item RL.EST)
 - c. Regulatory Quality (for sensitivity; data item RQ.EST)

We note that data are not available for Taiwan. Where Rule of Law is missing for a specific year (e.g. year 2001), we impute data from the prior year of the same country. The methodology used by the World Bank to generate the Rule of Law variable changed over the time period 2000-2020. We do not adjust for this change.

The original download was completed on April 14, 2021, and we continue using these original files where monetary variables are stated in 2010 USD equivalents. Please note that our data is not reflecting that the WorldBank has updated the data since then (reference date April 2025) and states monetary values in 2015 USD equivalents, and the Rule of Law methodology is changed over time.

4. After downloading all relevant variables, we merge these together into one file, and then prepare that file for merging with the final file from Step 2. We then calculate the relevant news variables (lnScaledNews), order the data and subsequently drop year 2020, to correspond to our sample period 2000-2019.
5. Download data on annual market capitalization of stock exchanges for 2000-2020 and all regions and exchanges from the statistics portal of the World Federation of Exchanges website (<https://www.world-exchanges.org/our-work/statistics>). Restrict the download to asset class equity, and select data for the total equity market. Upload excel file to stata and manually identify the country in which the stock exchange is located and collapse the dataset to country-year level (see Prep Hazard analysis.do) Transform this file into a .dta file and merge with the file from Step 1.4 above. We do not use the World Bank database to retrieve data on market capitalization because it is incomplete for a large number of countries.

Step 2: Calculate all variables used in the hazard model and descriptive analysis

1. Calculate the natural logarithm of market capitalization per country-year, divided by GDP in each country-year.
2. Calculate the natural logarithm of the number of news items per country-year, divided by market capitalization in each country-year. Calculate the same variable for a one year and two-year lag.
3. In Step 1.4, we had calculated lnScaledNews: Calculate the natural logarithm of total news items in a country-year, divided by total news items in a year for all countries. Calculate the same variable for a one year and two-year lag.
4. Variable GDP Growth is not manipulated.

Step 3: Dataset for Hazard analysis

1. For the Hazard model, we then drop observations of countries due to data availability, establishment of POBs before 2001, or where we only have observations in the post-Establishment period: Indonesia, Norway, Sri Lanka, Taiwan, Sweden, Russia, China and Brazil. We also drop observations pertaining to the U.S. as this is not the focus of our analysis. We subsequently run the hazard analysis. The resulting number of observations are 317 pertaining to 41 countries in the full sample, and 208 pertaining to 32 countries in the establisher sample.

Step 4: Dataset for the analysis of combinations of POB design features

1. Using the final file from Step 2, we remove the U.S., and construct an indicator variable for countries for which we cannot identify POB characteristics: the Philippines, Russia, Ukraine, Vietnam and India.

2. We then code the relevant inspection characteristics: DirectOversight, DirectEnf, HighFreq, Disclosure, DisclosureType. For countries without POBs and countries for which we cannot identify POB characteristics mentioned in Step 4.1. above, these datapoints are coded as missing. In total, this dataset pertains to 35 countries.
3. We then create 10 groups from the 35 countries based on initial POB characteristics (variables DirectOversight, DirectEnf, HighFreq, DisclosureType). This is the country grouping shown in the left panel of Table 3.
4. For the cluster analysis based on country characteristics, we first drop the country-year observations with data limitations on the audit quality news (see Step 1.1), and we drop observations with missing values for any of the country or inspection characteristics. We then restrict the sample to the year of Establishment. This results in 24 observations.
5. We then standardize the country characteristics and conduct a cluster analysis with the 24 observations. We then calculate averages of country variables by country cluster (upper panel of Table 3).
6. We then manually cross-map the countries from Step 4. 3. and Step 4.5.

Step 5: Correlation analysis

1. Using the final file from Step 2, we remove the U.S., and construct an indicator variable for countries for which we cannot identify POB characteristics: the Philippines, Russia, Ukraine, Vietnam and India.
2. We then code the relevant inspection characteristics: DirectOversight, Enforcement, DirectEnf, HighFreq, Disclosure. For countries without POBs and countries mentioned in Step 5.1., these datapoints are coded as missing.
3. We run the correlation analysis only for the year of POB establishment and for the countries for which we can identify POB characteristics (Step 5.1.). This results in 32 observations.

Procedures for the Audit Quality Analyses

Do file: CSTV_Final.do

Step 1: Obtain and Clean Compustat Global and Compustat North America data

The financial data on listed firms for the years 2000-2019 were obtained from the Compustat Global and Compustat North America from those 49 countries identified in Table 1 (which excludes the U.S.). For certain variables data were needed for 1998-1999 because some variable calculations require three years of data. The Compustat database was accessed via <https://wrds-www.wharton.upenn.edu/login/> available from the UNSW library in 2021.

1. Open Compustat global dataset (full download of all data for years 1998-2020) and append Compustat North America dataset (full download of all data for years 1998-2020).
2. Destring all variables
3. Add nation identifier based on country of incorporation (data item fic in Compustat) for the 49 countries in our sample. Delete all firm-years that without data on country of incorporation (fic), that are not incorporated in one of the 49 countries in our sample, including the U.S.
4. Delete data for the financial year (fyear) 2020 (sample period: 2000-2019).
5. Delete observations from the financial services industries (SIC Codes between 6000 and 6999) and utility industry (SIC Codes between 4400-4999).
6. Merge currency conversion data obtained from WRDS based on fiscal year end date and financial statement currency. Generate variables for total assets and sales in USD by multiplying assets (at) and sales (sale) with the currency conversion rate between local currency (curcd) and USD at the date of the fiscal year end (datadate) for each company-year. We only convert total assets and sales into USD since all other variables are calculated as ratios.
7. Drop duplicate values for all firm-years.

Step 2: Define and calculate all dependent and independent variables based on Worldscope information

A. Define and calculate control and additional variables

1. Calculate all dependent and independent financial variables of equation [1] and [2], as defined in Appendix B of the paper. Specifically,
 - a. Total accruals are calculated as income before extraordinary items (ib), less cash flow from operations (oancf), and subsequently scaled by lagged total assets. Calculate the absolute value of this variable.
 - b. Size2 is calculated as the natural logarithm of total assets in USD.
 - c. CFO is calculated as operating cash flows (oancf), divided by lagged total assets (at).
 - d. Growth is calculated as the change in sales (sale) from t-1 to t, divided by lagged sales (sale).
 - e. Loss is calculated as an indicator variable if income before extraordinary (ib) items is smaller than 0. We use income before extraordinary items (ib), because net income (ni) is not consistently defined in Compustat Global.
 - f. PPE Growth is calculated as the change in gross PPE (ppegt) from t-1 to t, divided by lagged gross PPE.
 - g. Leverage is calculated as long term debt (dltt), scaled by lagged total assets (at).
 - h. Sales_Vol is calculated as the three-year rolling annualized volatility of sales over t-2 to t.
 - i. CFO_Vol is calculated as the three-year rolling annualized volatility of operating cash flows over t-2 to t.
2. Calculate all Jones model regressors, specifically,

- a. The inverse of assets is 1 divided by total assets (at).
- b. The Change in sales (sale) from t-1 to t, scaled by lagged total assets (at), less the change in accounts receivable (rect) from t-1 to t, scaled by lagged total assets (at).
- c. Net property plant and equipment (ppent), scaled by lagged total assets (at).
- d. ROA is net income before extraordinary items (ib), scaled by lagged total assets (at).

B. Drop observations with missing variables and where unaudited

- a. Drop observations for which any of the dependent/independent variables or Jones model regressors (as defined in A.) are missing. Winsorize all independent and dependent variables at the 1st and 99th percentile. Then calculate the absolute value of the total accruals as defined in A.1.a.
- b. Drop observations where financial statements are unaudited (au=0), and code auditor identity (Big 4/Big 6).

Step 3: Code variables of interest (POB establishment, POB design characteristics) and variables for alternative explanations and sensitivity

1. Identify US cross-listed firms by creating an excel help file with a list of stock exchange codes (Compustat item exchg) and identifying manually the stock exchanges that are located in the U.S. Convert this help file to a .dta file and merge with the final dataset from Step 2 of the audit quality analyses based on stock exchange codes. Identify those firms as cross-listed that are listed on a U.S. stock exchange, but incorporated in another country.
2. Create an excel file of Table 1 including year of establishment, all POB design characteristics, and effective year of mandatory IFRS adoption. From this file, create a .dta file and merge this .dta file based on country name with the final file from Step 2 of the audit quality analyses.
3. Calculate the variable Establishment equal to 1 for all firms incorporated in a country-year that has established a POB, else 0, based on establishment year. Year is defined consistent with Compustat year (fyear).
4. Calculate each POB characteristic as indicated in Appendix B based on establishment year and POB characteristic as disclosed in Table 1. For example, Indirect_Oversight is equal to 1 when a company is incorporated in a country-year that has established a POB which conducts inspections through oversight of the audit profession, else 0. Direct_Oversight is equal to 1 when a company is incorporated in a country-year that has established a POB which conducts inspections directly through their own employees or use a combination of a direct and through oversight approach, else 0.
5. Create an excel file and subsequently convert to a .dta file with information for each country on
 - a. Mandatory IFRS adoption year (based on IFRS website (<https://www.ifrs.org/use-around-the-world/use-of-ifrs-standards-by-jurisdiction/>), and Song & Trimble [2022] for confirmation).

- b. PCAOB access year (hand collected from the PCAOB website and based on Lamoreaux [2016])
- c. Whether the PCAOB conducts joint inspections with national POBs (the indicator variable is coded 1 for Australia, Canada, South Korea, Norway, Singapore, and the U.K, zero otherwise, based on Krishnan et al. [2017])
- d. Merge this .dta file based on country name with the file created containing the financial variables from Step 1, 2 and 3.
- e. Use the merged file to create indicator variables for mandatory IFRS adoption, PCAOB access, PCAOB joint inspection. Calculate the variable IFRS equal to 1 for all firms incorporated in a country-year that has mandated IFRS, else 0, based on the effective IFRS date as disclosed in the online appendix, Table S1.

Step 4: Create additional variables used in the modified audit opinion analysis

1. Define and calculate additional variables used in the audit opinion analysis (Section VI.), as defined in Appendix B of the paper
 - a. Opinion is defined as an indicator variable equal to 1 if the audit opinion contained in Compustat Global (auop) in a firm-year is qualified (auop=2), adverse (auop=5), or a disclaimer (auop=3), and zero for firm-years with unqualified audit opinions without explanatory language (auop=1).
 - b. Lag_Op is the one-year lag of Opinion, defined above.
 - c. Big4 is an indicator variable taking value 1 when a company has a Big 4 auditor and 0 otherwise.
 - d. Inv is the inventory (inv), scaled by total assets (at).
 - e. Rec is receivables (rect), scaled by total assets (at).
 - f. Current is total current assets (act), scaled by total current liabilities (lct)
2. Drop observations for which no audit opinion is reported and drop observations with unqualified audit opinion with explanatory language
 - a. Drop observations for which auop=0 (unaudited; this is defined differently than au=0 see Step 2.B.b)
 - b. Drop observations for which auop=4 (unqualified with explanatory language)
3. Create additional variables to define the sample for the audit opinion analysis:
 - a. For the short window analysis, create an indicator variable defined as 1 for firm-year observations 3 years prior to a POB Establishment and 4 years after POB Establishment for each country.
 - b. Create an indicator variable defined as 1 for each firm with at least one observation before and one observation after POB establishment.

Step 5: Datasets used for analyzing the audit quality models

1. The full sample created from Steps 1-4 above includes the full sample of 49 countries. We delete singleton groups in terms of fixed effects required to run the reghdfe model. (N=239,569).

Note: we provide a list of gvkey-years corresponding to the 239,569 observations.

2. For the establisher sample, we retain the firm-years incorporated in countries that establish a POB between years 2001-2018. This results in the sample of 36 countries. We delete singleton groups in terms of fixed effects required to run the reghdfe model. (N=198,357).
 3. To arrive at the POB Characteristics sample, we delete from the establisher sample firm-years from those countries for which we cannot confirm data through either public sources or the survey, or for which we were unable to collect data from public sources. These countries are India, the Philippines, Russia, Ukraine and Vietnam. This results in a dataset of 31 countries. We delete singleton groups in terms of fixed effects required to run the reghdfe model (N=171,388).
 4. To arrive at the audit opinion sample, we restrict the establisher sample to observations for which we observe all additional variables required for the opinion model (see Step 4 above), less US cross-listed firms, Canadian firms, and deleting any singleton groups in terms of fixed effects (N=124,871). For the short-window analysis, we further restrict the sample to observations three years prior and 4 years post establishment, deleting any singleton groups in terms of fixed effects (N=34,826). The number of countries in the sample is 35, corresponding to the establisher sample, less Canada. The stacked regression samples are created from the datasets described in 5.1-5.4, stacking the datasets based on number of cohorts in the different samples.
 5. The samples for the CS estimator are created from the datasets described in 5.1-5.4, and restricted to pair balanced observations.
- 5) *After downloading or obtaining the raw data, all manipulations of the data should be done via computer programs. The code for these manipulations should be included in the code submitted upon acceptance (see below). No manipulations of raw data can take place manually or outside the computer code provided. If compliance with this requirement is not feasible, the authors need to explain and disclose any manipulations of the raw data (e.g., manually created variables or file conversions). When feasible, we also encourage the authors to share the code that downloads the data.*

All raw data have been manipulated in stata and are shown in the relevant do files and log files.

- 6) *The computer programs (i.e., code) used to (1) convert the raw data into the final dataset used in the analysis, (2) to execute the statistical or econometric analysis, and (3) to generate the tables or to produce the output used in constructing tables of the manuscript. A brief description that enables other researchers to understand and run the code should be provided.*

For each of the analyses, we provide the relevant stata do files, and relevant non-proprietary data files based on Table 1 of the paper. For the audit quality analysis, we also provide a list of identifier (gvkey)-years for the full sample. See also 'READ ME.txt' as part of the shared code and data.

- 1) Hazard and correlation analyses (Section III.)

- Do files:
 - Prep Hazard analysis.do. This file contains the code to clean the World Federation of Exchange data to obtain country-level market capitalization.
 - Hazard analysis.do. This file contains the code to generate the dataset for the hazard and correlation analyses and contains the code for the analysis itself.
- Input files:
 - Contains the input files for the hand collected data (Inspection Characteristics - Table 2), as well as a report which shows how the World Federation of Exchange data were downloaded. This file is not shared since user registration is required. Other data (e.g., country characteristics) are downloaded or coded directly in stata. News data were hand-collected from Nexis Uni based on the methodology disclosed in the accompanying Data and Code Sharing file (see Procedures for the Descriptive and Hazard Model Analyses, Step 1.1).

2) Audit quality analyses (Research Design in Section IV. and Results in Section V.)

- Do file: Audit quality analyses.do
- Input file: Contains the input file for the hand collected data (Inspection Characteristics - Table 2). Other data are proprietary (Compustat), or hand-collected and can be obtained from the stated sources (e.g., PCAOB access, PCAOB joint inspection, IFRS adoption).
- List of gvkey-years in full sample: (.xlsx and .dta version) This file contains a list of all gvkey-years in the full sample.

7) *A comprehensive log file that shows the execution of the entire code. This log file should cover all the steps that convert the raw data into a final dataset and the execution of all statistical and econometric analyses presented in the tables of the manuscript. The portion of the log file that shows proprietary code or data may be masked. In this case, the reader should be referred to the step-by-step description provided as per the requirements in Item 6.*

For each of the analyses, we provide the log files (in stata SMCL format) corresponding to the do files described in section 6 above. See also 'READ ME.txt' as part of the shared code and data.

1) Hazard and correlation analyses (Section III.)

- Log files (Stata SMCL files):
 - PrepHazardAnalysis.smcl Contains the log file for the corresponding do file (Prep Hazard analysis.do)
 - HazardAnalysis.smcl Contains the log file for the corresponding do file (Hazard analysis.do)

2) Audit quality analyses (Research Design in Section IV. and Results in Section V.)

- Log file (Stata SMCL files): AQAnalysis.smcl Contains the log file for the corresponding do file (Audit quality analysis.do).

8) *An assurance that the data and programs will be maintained by at least one author (usually the corresponding author) for at least six years, consistent with National Science Foundation guidelines.*

At least one author will maintain all data and programs for at least six years.

References:

- KRISHNAN, J., J. KRISHNAN, and H. SONG. 'PCAOB international inspections and audit quality.' *The Accounting Review* 92 (2017): 117-142.
- LAMOREAUX, P. T. 'Does PCAOB inspection access improve audit quality? An examination of foreign firms listed in the United States.' *Journal of Accounting and Economics* 61 (2016): 313–337.
- SONG, X. and M. TRIMBLE. 'The Historical and Current Status of Global IFRS Adoption: Obstacles and Opportunities for Researchers.' *The International Journal of Accounting* 57 (2022): 2250001.