

Compliance with Data and Code Sharing Policy for the *Journal of Accounting Research*

Relative Performance Evaluation and Competitive Aggressiveness

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To be provided upon initial submission on a separate data description sheet:

1. *A description of which author(s) handled the data and conducted the analyses.*

Timmermans handled and analyzed the data.

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.*

We use data from a variety of sources in our primary analysis. First, we follow De Angelis and Grinstein [2020] and Gong, Li and Yin [2019], and obtain data on relative performance plans and the associated peer groups for the largest 750 firms by market capitalization from ISS Incentive Lab. Second, we identify competitive actions using data from RavenPack, following recent studies in realm of competitive aggressiveness (e.g., Connelly, Lee, Tihanyi, Certo and Johnson [2019], Connelly, Tihanyi, Ketchen, Carnes and Ferrier [2017]). Third, we rely on the Hoberg and Phillips [2010, 2016] Data Library to determine each firm's product market peers and similarity scores. Fourth, we obtain data on firm fundamentals from Compustat. Finally, in our robustness tests, we also control for the CEO's equity incentives. We follow Core and Guay [2002] and Guay [1999], and obtain

data on executive compensation and equity portfolio holdings from Standard and Poors' ExecuComp, as well as Treasury bond yields from Center for Research in Security Price.

After merging all data, our final sample contains 8,877 observations for all firms in ISS Incentive Lab from 2006 to 2017. We perform one untabulated analysis using this "full sample" (see Table OA1 in the Online Appendix), but focus our primary attention on the sample of firms using RPE with self-selected peer groups. This final sample contains 1,623 firm year observations with non-missing values for all required variables.

We wrote our code that generates this sample over a multi-week period in the first quarter of 2020. Before tabulating our results, we re-ran our complete code in the beginning of June 2020 to ensure our tests incorporate the most recent data.

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).*

All of the source data for this project are available with subscription to Wharton Research Data Services.

To be provided in the paper or the online appendix:

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.*

We describe our data in Section 3 of the paper. For further details, see Table 1 below.

To be provided upon acceptance of the paper and prior to publication:

5. *The computer programs or code used to convert the raw data into the final dataset used in the analysis plus a brief description that enables other researchers to use this program. The purpose of this requirement is to facilitate replication and to help other researchers understand in detail how the raw data were processed, the final sample was formed, variables were defined, outliers were treated, etc. This code or programming is in most circumstances not proprietary. However, we recognize that some parts of the code or data generation process may be proprietary, including from the authors' perspective. Therefore, instead of the code or program, researchers can provide a detailed step-by-step description of the code or the relevant parts of the code such that it enables other researchers to arrive at the same final dataset used in the analysis. In such cases, the authors should inform the editors upon initial submission, so that the editors can consider an exemption from the code sharing requirement. Whenever feasible, authors should also provide the identifiers (e.g., CIK, CUSIP) for their final sample. Authors should consult our FAQ Sheet on the JAR website for further details.*

Step #1: Construct competitive aggressiveness data. We use RavenPack (ISIN) and Compustat identifier (GVKEY).

Step #2: Construct relative performance plans and peer-related data. We use ISS Incentive Lab data and SEC identifier (CIK).

Step #3: Construct relevant firm-level and industry-level fundamentals. We use Compustat and Compustat identifier (GVKEY).

Step #4: Construct competitive environment variable. We use Hoberg-Phillips Library and Compustat identifier (GVKEY)

Step #5: Merge all datasets for primary data analysis.

Step #6: Begin analysis using final dataset.

The accompanying “FMT-firm-identifiers” file contains the firm-year identifiers of all observations in our sample—Compustat identifier (GVKEY), SEC identifier (CIK) and fiscal year (FYEAR). The accompanying “FMT-create-data” and “FMT-log-file-tables” files contain R code to generate the variables and sample and tables, respectively. Please cite the paper if you use any of the code or data.

6. *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.*

Timmermans will retain all original data and programs for the required six years.

Table 1. Variable description*Panel A. Variables used in main analyses*

Variable	Description	Variable generating process
<i>Action Volume</i>	<i>Action Volume</i> is the total number of competitive actions.	RavenPack develops proprietary algorithms that identify events detected in the unstructured text published by reputable content sources. Publishers include Dow Jones Newswires, the Wall Street Journal and over 19,000 other traditional and social media sites.
<i>Action Complexity</i>	<i>Action Complexity</i> is the variation in competitive actions across seven categories of competitive actions.	<p>RavenPack categorizes each event using broad “group” index, as well as “type” index, which is a subset of the “group” index. In our study, we use the “group” indices that are common in the literature: products-services, marketing, corporate-responsibility, acquisitions-mergers and partnerships (e.g., Connelly et al. [2019], Connelly et al. [2017]). We use the following “type” indices: product-release, product-price, campaign-ad, conference, donation, sponsorship, acquisition, merger, stake, unit-acquisition, joint-venture, partnership and market-entry.</p> <p>We further follow recommendations provided by Wharton Research Data Services and filter events based on the relevance and novelty scores assigned by RavenPack. The relevance score detects the relevance of the focal firm in the event; we limit our analyses to events for which the relevance score is 100 (i.e., the maximum) to ensure we correctly match newspaper headlines to each firm. The novelty score distinguishes duplicate stories; we limit our analyses to events for which the novelty score is 100 (i.e., the maximum) to ensure we do not double-count events. Formally:</p>

$$\text{Action volume} = \sum_{i=1}^7 a_{ij} = V_j$$

$$\text{Action complexity} = 1 - \sum_{i=1}^7 \left(\frac{a_{ij}}{V_j} \right)^2$$

where a_{ij} is the number of firm j 's actions in the i th action type and V_j is the total number of actions carried out by firm j in a given year (i.e., *Action Volume*).

ISS Incentive Lab provides information on the peer groups for all firms that use relative performance plans with self-selected peers. We code the presence of relative performance plans if “relativebenchmark” is “Peer Group.” For these firms, we then count the number of overlapping peer relationships (i.e., firm A selects firm B *and* firm B also selects firm A) and then scale this by the total number of peers. For each firm-peer relationship, we determine whether that relationship is an overlapping relationship in the current and the previous year. If the relationship is overlapping in the current year, but not in the previous year, we then check which firm added which firm first. We code the presence of a new peer overlap for that firm as follows. For example, if firm A selected firm B in 2010, and firm B also selected firm A in 2015, then firm A receives a new treatment in peer group overlap in 2015 triggered by the peer.

We combine the data on peer groups from ISS Incentive Lab with returns data from CRSP. For each RPE firm-year observation, we run a regression of firm monthly returns on peer monthly returns, using three years of data. We use three years of data, because the vast majority of relative performance plans are three-year incentive plans. We compute *Peer Group Synchronicity* as the R^2 of this firm-year specific regression.

Peer Group Overlap

Peer Group Overlap is the number of overlapping peer relationships scaled by the peer group size.

New Overlap

New Overlap is the number of overlapping peer relationships that were not overlapping peer relationships in the previous year, for which the overlap was initiated by the peer.

Peer Group Synchronicity

Peer Group Synchronicity is the firm's stock return synchronicity with its peers.

<i>Market Value (Rank)</i>	<i>Market Value (Rank)</i> is the firm's peer group-rank of <i>Market Value</i> . <i>Market Value</i> is the firm's market value.	We first combine data on peer groups from ISS Incentive Lab with data on "raw" fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the "rank" fundamental as the firm's percentile rank relative to its actual RPE peers. <i>Market Value</i> is $\text{prcc_f} \times \text{csho}$ in Compustat.
<i>Book-to-Market (Rank)</i>	<i>Book-to-Market (Rank)</i> is the firm's peer group-rank of <i>Book-to-Market</i> . <i>Book-to-Market</i> is the firm's ratio of book value of total assets to the firm's market value.	We first combine data on peer groups from ISS Incentive Lab with data on "raw" fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the "rank" fundamental as the firm's percentile rank relative to its actual RPE peers. <i>Book-to-Market</i> is $\text{ceq} / (\text{prcc_f} \times \text{csho})$ in Compustat.
<i>Leverage (Rank)</i>	<i>Leverage (Rank)</i> is the firm's peer group-rank of <i>Leverage</i> . <i>Leverage</i> is the book value of total long-term debt, scaled by total assets.	We first combine data on peer groups from ISS Incentive Lab with data on "raw" fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the "rank" fundamental as the firm's percentile rank relative to its actual RPE peers. <i>Leverage</i> is dltt / at in Compustat.
<i>Sales Growth (Rank)</i>	<i>Sales Growth (Rank)</i> is the firm's peer group-rank of <i>Sales Growth</i> . <i>Sales Growth</i> is the growth in annual revenue over the prior year.	We first combine data on peer groups from ISS Incentive Lab with data on "raw" fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the "rank" fundamental as the firm's percentile rank relative to its actual RPE peers. <i>Sales Growth</i> is $(\text{sale}_t - \text{sale}_{t-1}) / \text{sale}_{t-1}$ in Compustat.
<i>Return (Rank)</i>	<i>Return (Rank)</i> is the firm's peer group-rank of <i>Return</i> . <i>Return</i> is the cumulative stock return.	We first combine data on peer groups from ISS Incentive Lab with data on "raw" fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the "rank" fundamental as the firm's percentile rank relative to its actual RPE peers. <i>Return</i> is $(\text{prcc_f}_t - \text{prcc_f}_{t-1} + \text{dvpsp_f}_t) / \text{prcc_f}_{t-1}$ in Compustat, adjusted for stock splits (<i>ajex</i>).

<i>H&P Number of Competitors (Rank)</i>	<i>H&P Number of Competitors (Rank)</i> is the firm's peer group-rank of <i>H&P Number of Competitors</i> .	We first combine data on peer groups from ISS Incentive Lab with data on “raw” fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the “rank” fundamental as the firm's percentile rank relative to its actual RPE peers. <i>H&P Number of Competitors</i> is the number of product market peers obtained from http://hobergphillips.tuck.dartmouth.edu/industryclass.htm .
<i>H&P Competitor Similarity (Rank)</i>	<i>H&P Competitor Similarity (Rank)</i> is the firm's peer group-rank of <i>H&P Competitor Similarity</i> . <i>H&P Competitor Similarity</i> is the firm's similarity to its product market competitors.	We first combine data on peer groups from ISS Incentive Lab with data on “raw” fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the “rank” fundamental as the firm's percentile rank relative to its actual RPE peers. <i>H&P Competitor Similarity</i> is the peer-firm similarity score obtained from http://hobergphillips.tuck.dartmouth.edu/industryclass.htm .
<i>H&P Number of Competitors</i>	<i>H&P Number of Competitors</i> is the firm's number of product market competitors.	We first combine data on peer groups from ISS Incentive Lab with data on “raw” fundamentals. We then rank the focal firm and all peers based on the variable of interest, and compute the “rank” fundamental as the firm's percentile rank relative to its actual RPE peers. <i>H&P Number of Competitors</i> is the number of product market peers obtained from http://hobergphillips.tuck.dartmouth.edu/industryclass.htm .

Panel B. Variables used in cross-sectional, additional and robustness analyses

Variable	Description	Variable generating process
<i>Grant Size Distance</i>	<i>Grant Size Distance</i> is the Euclidean distance between the “risk-neutral value” of the RPE plan, scaled by the manager's previous year's total compensation (i.e., <i>Grant Size</i>) of the focal firm and each of its overlapping peers.	ISS Incentive Lab provides information on the size of relative performance award. We estimate the level of incentives by measuring the “risk-neutral value” of the RPE plan—i.e., the current dollar amount the manager can maximally receive from his/her RPE plan. For RPE grants with equity awards, the dollar amount equals the maximum number of shares the manager can receive multiplied by the firm's current share price; for RPE grants with cash awards, the dollar amount simply equals the

		maximum cash the manager can receive. We scale this variable by the manager's previous year's total compensation, so it expresses a percentage of total compensation. We then compute the Euclidean distance over this variable.
<i>Criteria Distance</i>	<i>Criteria Distance</i> is the Euclidean distance between the performance criteria of the RPE plan (i.e., RPE-price) of the focal firm and each of its overlapping peers.	ISS Incentive Lab provides information on performance criteria in the relative performance plan. We compute the Euclidean distance over <i>RPE-price</i> , which is an indicator whether the relative performance plan is based on price metrics.
<i>Peer Group Size</i>	<i>Peer Group Size</i> is the total number of firms in the peer group.	ISS Incentive Lab provides information on the peer groups for all firms that use relative performance plans with self-selected peers. We count the number of peers.
<i>Peer Group Overlap in GICS6</i>	<i>Peer Group Overlap in GICS6</i> is the number of overlapping peers that operate in the same six-digit GICS industry as the focal firm, scaled by the peer group size.	We count the number of overlapping peer relationships that are from the same six-digit GICS industry and then scale this by the total number of RPE peers.
<i>Peer Group Overlap not in GICS6</i>	<i>Peer Group Overlap not in GICS6</i> is the number of overlapping peers that operate in a different six-digit GICS industry as the focal firm, scaled by the peer group size.	We count the number of overlapping peer relationships that are not from the same six-digit GICS industry and then scale this by the total number of RPE peers.
<i>New Products</i>	<i>New Products</i> is the total number of competitive actions related to product actions.	RavenPack categorizes each event using broad "group" index, as well as "type" index, which is a subset of the "group" index. <i>New Products</i> measures the total actions in the "group" products-services with "type" product-release.
<i>Pricing</i>	<i>Pricing</i> is the total number of competitive actions related to pricing actions.	<i>Pricing</i> measures the total actions in the "group" products-services with "type" product-price.
<i>Marketing</i>	<i>Marketing</i> is the total number of competitive actions related to marketing actions	<i>Marketing</i> measures the total actions in the "group" marketing with "type" campaign-ad and conference, as well as in the "group" corporate-responsibility with "type" donation and sponsorship.
<i>Acquisitions</i>	<i>Acquisitions</i> is the total number of competitive actions related to acquisitions actions.	<i>Acquisitions</i> measures the

<i>Joint Ventures</i>	<i>Joint Ventures</i> is the total number of competitive actions related to joint ventures actions.	total actions in the “group” acquisitions-mergers with “type” acquisition, merger, stake and unit-acquisition. <i>Joint Ventures</i> measures the total actions in the “group” partnerships with “type” joint-venture.
<i>Strategic Alliances</i>	<i>Strategic Alliances</i> is the total number of competitive actions related to strategic alliances actions.	<i>Strategic Alliances</i> measures the total actions in the “group” partnerships with “type” partnerships.
<i>Market Expansions</i>	<i>Market Expansions</i> is the total number of competitive actions related to market expansions actions.	<i>Market Expansions</i> measures the total actions in the “group” products-services with “type” market-entry.
<i>RPE</i>	<i>RPE</i> is an indicator variable equal to one if the firm’s proxy statement explicitly states that executive compensation is determined based on the firm’s performance relative to the performance of other self-selected firms, zero otherwise	ISS Incentive Lab provides data on incentive awards, including performance metrics, performance goals and payout structures on all incentive awards for the largest 750 firms by market capitalization. We code the presence of relative performance plans if "relativebenchmark" is "Peer Group."
<i>Share in H&P</i>	<i>Share in H&P</i> is the firm’s sales market share in the product market identified by Hoberg and Phillips [2010, 2016].	We first combine the peer group data from ISS Incentive Lab and the Hoberg-Phillips Library. We then divide the firm's sales by the total sales of the Hoberg-Phillips' peers.
<i>Herfindahl-Hirschman Index</i>	<i>Herfindahl-Hirschman Index</i> is the industry’s Herfindahl-Hirschman Index.	The industry’s sales-based Herfindahl-Hirschman Index.
<i>Advertisement</i>	<i>Advertisement</i> is the firm’s advertisement expenditures, scaled by average total assets.	xad / at^* in Compustat, where $at^* = (at_t + at_{t-1}) / 2$
<i>Operating Margin</i>	<i>Operating Margin</i> is the firm’s average revenue minus cost of goods sold and selling, general and administrative expenditures, scaled by average revenue.	$(sale^* - cogs - xsga) / sale^*$ in Compustat, where $sale^* = (sale_t + sale_{t-1}) / 2$
<i>Delta and Vega</i>	<i>Delta</i> is the sensitivity of the risk-neutral value of the CEO’s portfolio of stock and stock options to a 1% change in the price of the underlying stock. <i>Vega</i> is the sensitivity of the risk-neutral value of the CEO’s	For each CEO, we obtain data on his/her portfolio of stock and stock options from ExecuComp. We generate parameters of stock prices, stock volatility, exercise prices, time-to-maturity and risk-free rates, following Core and Guay [2002] and Guay [1999]. We estimate the risk-neutral value of the CEO’s option portfolio using the Black and Scholes [1973] model, as

portfolio of stock options to a 1% change in the volatility of the underlying stock. modified by Merton [1973] to account for dividend payouts. Finally, we compute *Delta* as the sensitivity of the risk-neutral value of the CEO's portfolio of stock and stock options to a 1% change in the price of the underlying stock, and *Vega* as the sensitivity of the risk-neutral value of the CEO's portfolio of stock options to a 1% change in the volatility of the underlying stock.

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