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Abstract: We explore the critical question of how executives make strategic decisions. Utilizing a new survey of 262 CEO alumni of Harvard Business School, we gather evidence on four aspects of each executive's business strategy: its overall structure, its formalization, its development, and its implementation. We report three key results. First, different CEOs use markedly different processes to make strategic decisions; some follow highly formalized, rigorous, and deliberate processes, while others rely heavily on instinct and intuition. Second, more structured strategy processes are associated with larger firm size and faster employment growth. Third, using a regression discontinuity centered around a change in the curriculum of Harvard Business School's required strategy course, we trace differences in strategic decision making back to differences in managerial education.

1. Introduction

A fundamental and central premise across economics, strategy, and management is that CEOs shape the outcomes of their companies through the strategic decisions they make (Andrews, 1971; Drucker, 1967; Porter, 1980; Tirole, 1988; Bertrand and Schoar, 2003). Yet we know remarkably little about *how* CEOs actually make those strategic decisions. The strategy literature over the past several decades has revealed much about the consequences of particular strategic decisions and firm strategies but very little about how CEOs and their leadership teams determine those strategies. This knowledge gap is particularly significant in light of longstanding calls to develop a theory of strategy that better accounts for how firms ultimately arrive at their respective strategies (Porter, 1991). Existing qualitative case studies and empirical work on small and selected samples of managers have captured how specific management teams made particular types of choices (e.g., Graebner and Eisenhardt, 2004; Mintzberg, 2008), but systematic, large-sample empirical evidence on this topic is still missing. If the particular strategies CEOs select are some of the most important choices they make, then surely understanding how those choices are made is of similar importance.

Understanding how CEOs make strategic choices within their firms raises a set of additional related and foundational questions for researchers to consider. First, to what extent, if at all, do CEOs vary in terms of their approaches to making strategic decisions? Within the popular press, we see a potential breadth of decision-making approaches among top executives, from those who enact consistent, proactive, and evidence-based decision-making in the spirit of Simon (1947), to executives who rely entirely on intuition or a simple set of heuristics (Davis, Eisenhardt, & Bingham, 2009; Eisenhardt & Sull, 2001), popularized by CEOs like Apple's Steve Jobs. However, it remains to be seen whether these anecdotal examples of CEOs' decision-making processes reflect the broader population of executives. While some empirical work has explored this subject using qualitative case studies, both the small sample sizes and the narrow scope of these studies do not provide us with a broader, more comprehensive view of the subject. Second, given the potential differences in decision processes, to what extent are the process by which CEOs make strategic decisions correlated with firm characteristics and performance? Finally, if CEOs

differ in their processes for making strategic decisions, what particular factors, such as education, might drive these differences?

This paper seeks to address these questions in a new, large-scale data collection effort that aims to measure, and explain differences in, the strategy practices of 262 CEOs of U.S., U.K., and Canadian manufacturing firms. Utilizing a research design modeled on the World Management Survey (Bloom & Van Reenen, 2007; Bloom, et al., 2019), we overcome many of the prior challenges associated with studying CEOs and their strategic decision processes. The design gives us both systematic data that allow us to examine cross-firm differences in their decision processes and detailed information about how particular processes play out within each firm. Core to these efforts is the development of a novel survey instrument that enables us to capture rich and consistent data for large samples of firms.

We report several findings related to the questions raised earlier. First, chief executives vary dramatically in terms of how structured they are as they make strategic decisions. We observe a broad range of structures in firms' processes for making strategic decisions, from firms that typically implement ad hoc processes in response to changes in the external environment to firms that instead follow highly deliberate and proactive practices. Second, we observe that more structured strategy processes tend to occur in firms that are larger and faster growing. Third, we find evidence that CEOs' management education appears to influence their strategy processes, even decades after their training.

This research connects to a long literature on strategy. This literature has focused on two major questions: (1) which strategies do CEOs and their firms employ (e.g. Miles & Snow, 1978; Porter, 1980) and (2) what are the performance consequences of those strategies and actions, such as how firms that pursue joint ventures differ in performance from firms which refrain from doing so. Perhaps surprisingly, little work has been done to understand *how* firms and their CEOs arrive at those strategies and make those decisions. Some work on firms' resource allocation processes (Bower, 1970) explores the internal processes occurring among firm executives, but this work largely captures firms' actions and processes *after* strategies are determined and strategic decisions are made. More recent work has sought to understand how CEOs make specific strategic decisions,

such as selling (Graebner & Eisenhardt, 2004), international expansion (Bingham, Eisenhardt, & Furr, 2007), and strategic business exit (Burgelman, 1996), but the limited and narrow scope of the decisions this work explores does not yet give a more systematic and comprehensive understanding of broader aspects of strategic decision making. We contribute to this literature by identifying and measuring a set of "Strategy Practices"—i.e. specific actions or activities that CEOs and their respective firms might engage for the purpose of making any strategic decision or significant policy change—that can potentially apply to a wide variety of strategic decisions, and to a wide variety of firms. While far from capturing the complete spectrum of activities that feed into the making of a strategic decision, this approach allows us broaden the scope of the analysis to a wider set of managerial activities compared to the earlier literature.

This paper is structured as follows. Following this introduction, we will outline our empirical methodology in Section 2, including a detailed description of the survey instrument central to this study. Section 3 will discuss our empirical findings related to the heterogeneity of strategic decision practices, and Section 4 will discuss the correlations between CEOs' strategic decision practices and a set of performance variables. Then, in Section 5, we will explore one possible factor that may cause some of the variation we observe in how firms make strategic decisions: business education. Finally, we will conclude in Section 6 by both summarizing our findings and identifying potential areas for useful future research.

2. Empirical Methodology

Historically, three main challenges have limited broad, systematic empirical research on CEOs' strategic decisions and Strategy Practices. First, the top executives who usually make these decisions are rarely willing to complete in-depth surveys (Bandiera et al, 2019). The difficulty of securing high numbers of study participants often limits empirical research to mostly qualitative work that focuses on a small selection of case studies and a narrow subset of strategic decision types. Second, differences in how managers make strategic decisions are typically hard to capture systematically in large samples. Frameworks that would make data capture easier—such as a taxonomy of different strategy processes or an agreed-upon way to distinguish between "good" and "bad" ways to make strategic decisions—do not exist to our knowledge. Third, it is difficult

to elicit truthful answers from top managers on how they really make decisions, as CEOs often face strong pressures to give socially desirable responses to external audiences.

We overcome these challenges and explore our central research question by utilizing a novel survey methodology and sampling strategy to gather in-depth data on a large sample of firms within the U.S., Canadian, and U.K. manufacturing sectors. We overcome the first challenge—the reluctance of CEOs to complete surveys—by surveying alumni of a business school, Harvard Business School (HBS), where three authors of the paper are based. We hoped that alumni would respond at a high rate to a survey invitation from HBS faculty, and the hope turned out to be well-founded. While CEOs trained at HBS are by no means a representative sample of CEOs, evidence of heterogeneity in strategy practices within this highly selected set of managers would—if anything—represent a lower bound on the heterogeneity among the broader population of CEOs. We overcome the second challenge—the lack of a systematic way to classify differences in strategy processes—by creating a novel survey instrument that captures differences in the way managers develop, select, and implement new strategic ideas. Finally, we try to minimize biases on the part of both interviewees and interviewers by using several interview tactics that reduce these biases and by employing trained interviewers to double-blind score responses. This approach, modeled on the method of the World Management Survey (Bloom and Van Reenen; 2007; Bloom et al., 2019), helps us gather high-quality and comparable assessments of strategy practices across a wide variety of firms.

2.1 Developing a Strategy Scoring Instrument

To explore systematically how chief executives formalize, develop, and implement strategy, we developed a new semi-structured survey instrument. Prior research has examined how specific executives made particular strategic decisions (e.g., Graebner and Eisenhardt, 2004; Mintzberg, 2008), and many popular articles and books give practitioners advice about how to make better decisions (for which there is little consensus) (Heath and Heath, 2013; Sull and Eisenhardt, 2015; Krogerus and Tschäppeler, 2012). But we know of no prior research to delineate systematically the components of how top managers make a broader set of strategic decisions. Nor is there sound, comprehensive evidence or theory that points conclusively to better or worse ways to make strategic decisions.

To develop the survey instrument, we relied on two inputs. First, we reviewed the management literature—much written for practitioners—that examines how executives do and should make strategic decisions (e.g., Drucker, 1967; Garvin and Roberto, 2001; Mankin and Steele, 2005 and 2006; Lafley et al., 2012; Lafley and Martin, 2013). We synthesized the main descriptions and prescriptions of that literature into a draft instrument.[1] Second, we piloted the draft instrument with a set of former chief executives whom we know well[2] and with dozens of participants in the senior executive education programs at HBS. These experienced "test pilots" helped us refine the instrument. In response to their input, we added questions about critical aspects of decision making that the literature review missed, eliminated questions deemed irrelevant in reality, and reframed questions so that practicing managers would more clearly understand them.[3]

The resulting instrument consists mostly of short, open-ended questions with no finite set of responses—questions like "Tell me about the discussions you have in order to select between strategies?" rather than yes-no questions like "Do you discuss strategy in monthly meetings?" We return below to why we use open-ended questions, what challenges such questions pose, and how we address those challenges.

2.2 Scoring Strategy Practices

This development process yielded a survey instrument that focuses on three different areas of Strategy Practice: Formalization, Development, and Implementation. Within each of these areas, we characterized the approaches that each executive follows and then assessed where those approaches fall on a spectrum that runs from informal, unstructured, reactive, and intuitive on one end to formalized, consistent, proactive, and evidence-based on the other end.

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[1] Notably, while this review allowed us to identify numerous topics, such as information usage, that seemed critical for how executives make strategic decisions, given the noted lack of consensus within the management literature, we remained neutral as to any direction or hypothesis regarding whether any specific practice would have any particular effect on firms.

[2] We thank Kevin Sharer and Dan Simpson for their feedback in the initial stages of the survey development. See Appendix 1 for more details on our cognitive testing procedure.

[3] For example, some of the literature suggested that high-performing executive teams might conduct a "vote" among the team in order to finalize critical strategic decisions, and thus we asked executives during our pilot interviews if they ever voted to make strategic decisions. Virtually none of our pilot interviewees engaged in this practice, and many articulated compelling reasons as to why this was a potentially detrimental practice. In finalizing the survey instrument, we therefore eliminated questions about voting.

To anchor CEO's responses to their actual process for making strategic decisions, at the beginning of the interview we first gave the respondent a brief definition of a "strategic change" as any decision that "significantly impacts your business or changes your strategy." We then gave examples such as "significant investments," "entering a new line of business," or "entering a new geographic area." We abstained from any more specific definitions of "strategic change," both because what constitutes a "strategic decision" can vary significantly between firms (e.g. small vs. large firms make strategy decisions on different scales) and to avoid confusing interviewees with excessively abstract concepts. To ensure comparability of responses and to ensure that interviewees' responses were reflective of their actual strategy practices, we also asked the respondent to give us three different examples of "typical strategic changes" in his or her firm from the previous five years. These examples served to both ground interviewees in their actual process for making strategic decisions (versus a description of what they think they "should" be doing) and kept the conversation from becoming too abstract. We referred back to these examples throughout the interview to keep the conversation grounded. We also classified these decisions independently into potentially overlapping sets of 17 different decision types, including "M&A," "new business," "geographic expansion," and so on. **Appendix Table 1** provides details on the 17 different types of strategic changes into which we categorized the example decisions.

After this brief introduction, we proceeded to the first section of the instrument—on strategy formalization (henceforth: Formalization). This section focused on the question, "How deliberate and distinct is the strategy of the interviewee's company?" We considered three factors:

(F1) **Strategy statement:** the ability of the executive to state concisely the goals, scope, and competitive advantage of his or her company (Collis and Ruckstad, 2008);

(F2) **Deliberate scope and advantage:** whether the executive could articulate clearly the markets the companies prioritizes and the way it intends to win in those markets; and

(F3) **Deliberate strategic distinctiveness:** whether the executive could say how the company differs from its main competitors.

The Formalization section therefore allowed us to capture ideas that are related to fundamental concepts of strategy, such as strategy as the deliberate choice of "a different set of activities to

deliver a unique mix of value" (Porter, 1996) or strategy as "key choices that guide other choices" (Van den Steen, 2017).

The second section—on strategy development (henceforth: Development)—focused on the questions, "What prompts executives to come up with ideas for strategic change, and how do they evaluate these potential changes, even among alternative options?" Here we assessed whether the decision-making process at the interviewee's firm included:

(D1) **Proactive scanning:** whether firms actively searched the competitive environment for opportunities or, rather, responded to threats or performance downturns;

(D2) **Evidence-based decisions:** whether firms utilized data to inform their strategic initiatives (and if so, which types of data) and explicitly formulated assumptions if information was missing;

(D3) **Regular strategy meetings:** whether decision-making was embedded in routines and connected strategy with implementation;

(D4) **Effective strategy meetings:** whether decisions were considered in well-prepared, discussion-based strategy meetings;

(D5) **Exploration of alternatives:** whether there was a routinized processes to generate new strategic alternatives and ensure similar information on the feasibility and benefits of each alternative; and

(D6) **Systematic risk evaluation:** whether there were processes for executives to voice potential concerns.

The section on Development therefore measured the degree to which a firm created a structured (or unstructured) context that facilitates decision-making. These practices are related to the rational decision-making requirements that Simon (1947) identifies. Rational decision makers—Simon argues—list all alternatives, determine the consequences of alternative choices, and compare the evaluations of all alternatives.[4] These practices also shed light on the extent to which the executives

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[4] While we do not claim that CEOs are capable of reaching the perfect rationality that Simon (1947) identifies, the practices captured in this section serve to explicitly increase the rationality of the process for the decision-maker beyond where they would be without these practices. Specifically, proactive scanning for opportunities (D1) and the exploration of strategy alternatives (D5) directly expedite listing of all alternatives. Similarly, practices to base decisions on evidence or explicit initial assumptions (D2) as well as regular discussions on operational feasibility (D3)

proactively try to counter psychological and social biases in decision making.[5] Further, this survey section incorporates direct measures of whether firms explicitly formulated initial assumptions when data were lacking (D2) and when new alternatives were explored (D5). These practices are related to the ability to formulate working hypotheses about the effect of strategies, which are especially important in the context of very novel strategies for which data are scarce (Lafley, Martin, Siggelkow and Rivkin, 2012; Zenger, 2013).[6]

The third section of the survey—on strategy implementation (henceforth: Implementation)— aimed to answer the questions, "How are strategies executed, and how do executives learn from strategy outcomes?" In particular, this section assessed the following factors:

(I1) **Implementation planning**: whether executives anticipated potential implementation problems when they made strategic decisions;

(I2) **Effective strategy reviews**: whether the firm conducted regular reviews of their strategic decisions' outcomes and their comparison to initial assumptions;

(I3) **Learning from outcomes**: whether the firm routinized systematic validation of mechanisms and learning in the wake of surprises from strategic decisions;

(I4) **Strategy communication**: whether executives regularly communicated strategies to employees outside top management; and

(I5) **Resistance accommodation**: whether executives anticipated potential resistance to strategic decisions or changes outside of their firms' top management.

These questions allowed us to measure how structured strategy execution is, which in turn is broadly related to two ideas of effective execution from Drucker (1967). In particular, Drucker

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arguably lead to a better understanding of the consequences of different strategic choices. Finally, to promote the objective evaluation of different alternatives, meetings on strategy development should be well-prepared and structured to enhance discussions (D4) and should systematically seek out potential concerns (D6).

[5] Examples of potential biases these practices address are inattention (e.g. through regular strategy meetings, (D6), and well-structured meetings (D7)), overconfidence (e.g. through evidence-based analysis, (D2), exploration of alternatives, (D5), systematic risk evaluation (D6)), narrow framing (through exploration of alternatives, (D5)), myopia or competitor neglect (though proactive scanning of the competitive environment (D1)) and group-think (though exploration of alternatives, (D5) and systematic risk evaluation, (D6)).

[6] This practice can also be considered a necessary step to effectively learn from data and strategy outcomes as will be captured in the section on implementation, which is described below.

argues that an effective decision process requires anticipation of key implementation issues[7] as well as mechanisms to track and learn from outcomes.[8] These questions also captured the extent to which executives formulate and test hypotheses while developing a strategy. Specifically, the data captured in (I2) and (I3) measured the degree to which a firm compared initial assumptions to outcomes and sought to understand the mechanisms through which strategy affects performance, including through targeted key performance indicators (KPIs) or explicit experimentation. In addition, we measured whether executives systematically analyzed the implications of surprising outcomes, by separating design from luck and formulated strategy from implementation issues. This is especially worth emphasizing in light of recent studies on the "scientific approach to learning" as in Lafley, Martin, Siggelkow and Rivkin (2012), Zenger (2013), and Camuffo, Cordova and Gambardella (2017) as well as the increased popularity of A/B testing among companies (Athey, 2018).

Figure 1 shows our detailed scoring grid for strategy formalization, strategy development, and strategy implementation as well as the open-ended questions with which we started each interview. On each item, each interview received a score from 1—reflecting a very informal, unstructured, reactive, and intuitive Strategy Practice—to 5—reflecting a highly formalized, consistent, proactive, and evidence-based Practice.

2.3 Additional survey questions

Strategy decisions: number and speed

In addition to firms' Strategy Practices, as discussed above, the survey captured data on strategic decision and implementation characteristics, as well as on the type of competitive advantage the company pursues. To measure how quickly each firm makes and implements strategic decisions,

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[7] Drucker (1967) summarizes this recommendation for the need to anticipate key implementation issues as follows: "In fact, no decision has been made unless carrying it out in specific steps has become someone's work assignment and responsibility. (...) One has to make sure that their measurements, their standards for accomplishment, and their incentives are changed simultaneously." In our context, anticipation of key implementation issues is captured by the extent of implementation planning (I1) and the degree of proactive strategy communication (I4) as well as proactive defusing of possible resistance to change in (I5). Mechanisms to track and learn from strategy outcomes are captured in the practices of effective strategy reviews (I2) and learning practices (I3).

[8] Drucker (1967) motivates the need for learning within the decision process as follows: "Finally, a feedback has to be built into a decision to provide a continuous testing, against actual events, of the expectations that underlie the decision. (…) One needs organized information for the feedback. One needs reports and figures. But unless one builds one's feedback around direct exposure to reality—unless one disciplines oneself to go out and look—one condemns oneself to a sterile dogmatism and with it to ineffectiveness."

we asked the respondent to estimate the average number of strategic decisions made over the previous five years as well as the time it took to both make and implement strategic decisions for each of the three typical examples of strategic decisions the respondent mentioned.

Firm characteristics

We collected data on several firm important firm characteristics at the end of the interviews. We asked interviewees to describe the ownership structure of their firms and the founding year of the firm, and where possible, we verified this information from third-party sources. Finally, we asked for the number of full-time employees at the respondent company. Importantly, we asked all of these questions at the end of the interview, lest any particular description of CEOs' firm characteristics bias any subsequent responses.

We also merged our data into the Longitudinal Business Database (LBD), maintained by the US Census Bureau. The LBD data offers two particularly attractive features that are helpful in evaluating the analysis of firms, their Strategy Practices, and their potential performance. First, the source of the data are IRS tax files, which are independently gathered from our survey measurement efforts. Associated performance data are therefore plausibly free of any survey bias in the reporting of performance. Second, both the reporting firms and the IRS have strong incentives for truthful reporting, while the Census is strongly investing in maintaining longitudinal links in the data, which enable us to reliably measure firm growth.

CEO characteristics

To help understand how various CEO characteristics might affect their strategic decision-making, we collected three specific measures that capture each CEO's respective level of experience. As our first and second measures of experience, we asked the CEOs for both their tenure at the company and their tenure in their current position as CEO. For our third measure of CEO experience, age, we did not directly ask for the respondent's age during the interview in order to avoid any awkwardness. Instead, we used the following protocol to estimate respondent age from public sources. We searched for the CEO's LinkedIn page, recorded their college graduation year, and estimated age assuming that the CEO graduated at age 21. If there was no information on the college graduation year, we relied on the date of graduation from HBS for MBAs. Since HBS

typically requires work experience before entering the MBA program, we assumed that HBS MBAs are 27 when they graduate. If neither of these steps yielded an approximate age, we reverted to the interviewer's initial guess of the respondent's age.[9]

Noise controls and interviewer effects

We also recorded data that serve as possible interview noise controls, such as the time of day, interview duration, and interviewer scores of respondent expertise about strategy practices and respondent honesty. Since each person conducted multiple interviews, we are able to control for interviewer fixed effects (none of which were significant in our models). Additionally, for a subset of our firms (approximately 23%), we interviewed other C-level executives instead of the CEO (such as the chief operating officer or chief financial officer) or board chairs, so we constructed a non-CEO dummy variable as an additional control variable and also confirmed our main results were robust on the 77% data subset of CEOs.

2.4 Sampling frame

Since we are interested in strategic decision making by the top decision makers within firms, our ideal interviewees are CEOs or equally senior managers. Our sampling frame was drawn from the population of alumni of Harvard Business School. While HBS alumni are not a representative sample of all managers, focusing on HBS alumni presents several benefits. First, the fact that three coauthors are affiliated with HBS helped us better reach and advertise the survey to a type of manager who is notoriously hard to engage in surveys. While response rates of around 10% are not unusual in CEO surveys (Ben-David, Graham and Harvey, 2013), focusing on HBS alumni allowed us to achieve a response rate of over 30%. Second, variation in Strategy Practices among managers who were exposed to a similar educational experience will likely represent a lower bound to the actual variation that exists in the general population of managers. Third, this sample enabled us to match the survey data with detailed information on the respondents' background and education (e.g. graduation year, MBA vs. Executive Education), which allowed us to conduct analyses that would be impossible otherwise. For instance, we can study the relationship between education, Formalization, and Implementation.

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[9] Occasionally during interviews, CEOs would independently mention their own age, in which cases we would replace our age estimate with their own reported age.

For this study, we chose to focus on the U.S., Canadian, and U.K. manufacturing sectors in order to maximize the amount of performance-related data we would be able to obtain from the U.S. Census Bureau LBD, as we anticipated (correctly) that the majority of our CEO interviewees would work for privately-held firms with limited publicly-available performance data. To construct our sample, we started with a sample of 3,100+ HBS MBA and Executive Education alumni who were listed in the HBS alumni database as working in the manufacturing sector in the U.S., U.K., and Canada. From this list, we selected managers with the title of CEO or equivalent (e.g. president, managing director). As the information in the alumni database is self-reported, we took several steps to further vet and verify the data. First, we extensively researched each executive on our list using CapitalIQ, Factset, LinkedIn, and company websites to ensure that each individual was still employed at his or her respective firm, in the target role of CEO or other C-Suite officer (or equivalent). We required each executive to be employed at his or her respective firm for at least a year. Next, we collected information on each of the listed firms in the database in order to confirm that they were active in the manufacturing sector (e.g. a manufacturer of goods, as opposed to a distributor or retailer of manufactured goods). Our research on individual firms also allowed us to collect additional data on these respective firms, including six digits NAICS codes (from CapitalIQ and Orbis), as well as location and contact information. Ultimately, these selection criteria left us with a total of 863 CEOs and equivalent managers for our sampling frame. Of these, 63% were alumni of the HBS MBA program, and 37% were graduates of the handful of HBS executive education programs that grant alumni status.

2.5 Collecting accurate responses

We followed a simple protocol to recruit executives to participate in our telephone-based interviews. We first sent each executive in our sampling frame a brief email message explaining the purpose of our research and inviting him or her to participate in an hour-long interview. Individuals who did not respond to our initial email received a follow-up request a week later. Next, we telephoned the remaining executives in our frame to invite them to participate in our study, following up again a week later if we did not receive a response. Executives who did not respond to our two rounds of emails and telephone calls were not contacted further. Ultimately,

we were able to conduct interviews with 262 executives from our sample frame (a response rate of 30%).[10]

The survey was administered from Harvard Business School by a team of 6 interviewers and scorers, mostly Harvard MBA graduates, in late 2017 and through 2018. Interviewers received a total of 5 days of training, including several one-on-one practice sessions and mock interviews.

To ensure accurate responses, we explained to interviewees that we did not know what a "best practice" is and were interested in understanding the strategy process of different companies. In particular, to avoid leading respondents and to reduce social desirability bias, we used almost exclusively open-ended questions throughout the survey. We took great care in balancing the scope and wording of the question to, on the one hand, be specific enough that we would be able to get clear, accurate responses, but also, on the other hand, not be so specific to risk "leading" interviewees to provide responses that were not reflective of their actual Strategy Practices.

We took several additional steps to further reduce any pressure to provide socially desirable answers. First, we assured interviewees that our conversations would be completely anonymous. Second, we informed interviewees that we would not ask for any performance-related information (to reduce any sense that interviewees might be assessed or judged according to their firms' performance during the interviews)[11] and that they were free to decline to answer any questions they deemed too sensitive. Third, to further reduce any sense of assessment or judgment, the interviewees were not told that they were being scored during the interview. Additionally, we instructed the interviewers to be supportive and positive about any answers provided by interviewees, irrespective of the nature of those responses or what they might reflect about a firm's performance. Finally, to allow us to review the content of the interviews at a later date, we asked

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[10] Within our sampling frame, interviewed firms were slightly more likely to be based in the US (using a linear probability model in which the dependent variable is a dummy taking value=1 if the firm was ultimately interviewed, the coefficient on the US dummy is 0.085 with the base being firms based in the UK and Canada, standard error 0.045). We were able to gather employment data for 522 firms in the sampling frame, of which 170 were interviewed. In this subsample, we find that interviewed firms are smaller relative to non-interviewed firms (coefficient on log employment controlling for country of location and SIC2 dummies is -0.024, standard error 0.008).
[11] This tactic provided the added benefit of reducing potential bias in the scoring of our interviews, as interviewers and scorers were "blind" as to any potential connection between Strategy Practices and Firm Performance.

the interviewees for permission to record our conversations. The vast majority of our executives agreed.

To minimize the risk that subjective interpretations of the interviewer were driving the scoring, two people—a main interviewer and a second listener—scored each interview independently. While a potential drawback of open-ended questions is that individual interviewers must use judgment in scoring answers to such questions, having a second listener present in every interview helped to reduce any errors in judgement or scoring. Throughout each interview, the interviewer and the second listener were connected through a chat program so the second listener could suggest clarification or follow-up questions in case a respondent's answers were vague or not sufficiently clear.[12] To minimize any potential biases or errors resulting from incorrect information recall if interviews were scored following the interview, answers to each question were scored "live" throughout the interview by both the interviewers and second listeners. After each interview, the interviewer and second listener compared their scoring, discussed and reconciled any differences, and recorded consensus scores which were used in our final analysis.

To gain additional information and accuracy of scoring during our interviews, we also used software-supported funneling of responses: responses that suggested structured strategy process automatically triggered follow-up questions on details of practices or specific examples. Appendix 2 discusses this practice in more detail.

2.6 Final sample

Some features of our 262 interviewees and their firms are summarized in **Table 1, Panel A**. First, the average firm in our sample reports around 2,000 employees, and the average firm is more than 47 years old, which highlights that our sample is dominated by very large and successful firms. However, the large reported standard deviations show that our sample exhibits a high degree of heterogeneity across firms, from large multi-national enterprises to entrepreneurial start-ups. Second, ownership patterns are evenly distributed, with the largest fraction of firms owned by

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[12] As with the main questions in the interview, we instructed interviewers to word their follow-up carefully to prevent the asking of "leading" questions that might inadvertently pressure interviewees to provide a socially desirable response.

private companies.[13] Publicly listed companies constitute around 11% of the sample and are therefore strongly overrepresented compared to the U.S. economy.[14] None of the CEOs we interviewed work for a government-owned company, and 20% work in a family-owned firm. Third, most firms in our sample sell at least some of their products or services to other businesses, while a large portion sell at least some of their products to consumers.

Among the executives we surveyed, 91 percent were male. The average respondent was 57 years old, had been with the same company for 17 years, and had been in his or her current position for nearly 14 years. Around 30 percent our interviewees reported having an undergraduate degree in either business, economics, finance, or accounting. Over 70 percent of respondents held an MBA from HBS, while the rest attended executive education courses at HBS.[15]

3. Heterogeneity of Structured Strategy Process

We now move to the first of our three sets of findings: a description of how much strategy processes vary across firms. We approach this question in two steps. First, we characterize the overall distribution of strategy processes. Second, we contrast within-industry heterogeneity in the degree of structured strategy process versus across-industry heterogeneity.

3.1 Overall distribution of strategy practices

We utilize a simple procedure to aggregate the answers from each interviewee into a single metric—the Strategy Practices score. We first standardize the score on each of the 14 items shown in Figure 1 and then take the average of scores across all items. Finally, these constructed z-scores are standardized again for ease of interpretation. To ensure the robustness of this method, we experimented with different ways to aggregate the data, such as principal component analysis and

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[13] The five main types of ownership we observe are founder ownership, family ownership, other private ownership, ownership by other companies (such as venture capital or private equity firms), and the distributed ownership of a publicly traded company.
[14] There are over 7 million employee firms in the US and 4,000 publicly listed companies, so public companies represent less than 0.1% of all US employee firms.
[15] Executive education participants at HBS can attain alumni status only if they have attended one of the so-called "comprehensive leadership programs". These are long programs, typically 8-12 weeks in duration.

clustering and found that our pre-specified way to group the questions was very similar to these alternatives. We follow a similar procedure to construct individual metrics for each of the three sections within the interview: Formalization, Development, and Implementation.

Table 1, Panel B provides the summary statistics for the strategy scores, which we compute based on the full range of possible responses. We use the 1-to-5 scale from Figure 1 and display the average across questions in each section for each CEO. We observe a minimum average score of 1.56 and a maximum of 3.89 for the overall Structured Strategy Process score. Even in our very selected sample of HBS alumni, Strategy Practices range from highly gut-driven to very structured. The table also provides breakdowns into subcategories of Formalization, Development, and Implementation, as well as even more detailed breakdowns by question. Overall, Development scores display the greatest dispersion, followed by Implementation and Formalization. All questions display the full range of possible values, highlighting that our survey instrument captures a realistic range of practices and that no practice had entries so very high that no company attained them. For additional clarity, **Figure 2** displays a histogram of the Strategy Practice score as well as histograms for the sub-scores, showing that the overall distribution of our Strategy Practice scores are continuously distributed along our scoring grid. This further suggests that our measures capture more than just the extreme differences between purely intuitive and highly structured decision-making. If this were the case, one would have expected bunching at the extremes in the histograms.

To understand the potential relationships between different areas of Strategy Practice, we also analyze correlations among the strategy sub-scores. Development is strongly correlated with both Formalization and Implementation, while Formalization and Implementation are negatively and insignificantly correlated. This same pattern can be found at the level of individual questions: companies that are strongly structured on some dimensions can be relatively unstructured on other dimensions. This is in contrast to prior surveys (Bloom and Van Reenen, 2007), where different dimensions of management practices (e.g., operations and HR) tended to be highly correlated with each other. Our findings of differing correlations has at least two different interpretations. First, in contrast to the operational practices measured in the World Management Survey, there may be less complementarity between different dimensions of strategic decision making. Alternatively,

different aspects of strategic decision making may actually be complementary in principle (e.g., having a more systematic way to choose among alternative strategies may provide more benefit to firms that are also more systematic in strategy implementation), but executives might not have acted on these complementarities in practice. Our data does not currently allow us to distinguish fully between these two possible explanations.

3.2 Within- vs. across-industry variation

A natural question to ask is how important industry differences are for understanding differences in Strategy Practices. It is well known that firms in the same narrow industry can deliver very different economic performance and that industry effects often play only a limited role in explaining performance differences (McGahan and Porter, 1997; Ruefli and Wiggins, 2003; Syverson, 2011; Gibbons and Henderson, 2012). One reason to think that industry effects might be rather limited in our current data is our targeted sample includes only manufacturing firms. On the other hand, the range of manufacturing sectors in our sample includes data-driven and IP-intensive industries such as pharmaceuticals and biotechnology as well as more traditional capital-intensive manufacturing industries such as industrial machinery and textile mills.

In practice, industry effects appear to have little explanatory power for the strategy scores. When we regress the strategy scores on three-digit NAICS industry fixed effects, industry effects have very low adjusted R^2s, such as -0.02 for the overall structured strategy score, -0.04 for the strategy formalization score, -0.01 for the strategy development score, and -0.00 for the strategy formalization score. Even at finer industry aggregations, such as 6-digit NAICS, the adjusted R^2 for the overall structured strategy score is only 0.0457, which is very low considering that we use 132 industry categories for a sample of over 260 firms.[16] Overall, a CEO's specific industry environment appears to offer little explanatory power for the differences we observe in how much firms structure their strategic decision-making process.

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[16] Generally, F-tests of the joint significance of industry dummies hovers around a value of 1 across specification, i.e. industry fixed effects are jointly insignificant.

4. Structured Strategy Process and Firm Performance

In our second set of findings, we examine the degree to which Strategy Practices correlate with firm performance, using as proxies firm size (measured in terms of number of employees), growth, and the number and speed of strategic decisions made in the firm.

4.1 Firm size

We start with an analysis of the relation between Strategy Practices and firm size. The basic measure of firm size we utilize here comes from the end of our survey, where we ask about the number of full-time employees at the respondent company. Firm size as measured by employment is informative about the underlying productivity of firms, as it is well-documented that larger firms tend to have higher productivity (Bartelsman and Doms, 2000). Our baseline regression analysis of size controls for 3-digit NAICS industry effects.

Figure 3 shows the unconditional correlation between firm employment and our Strategy Practices score, and **Table 2**, column (1) provides statistical evidence that larger firms exhibit systematically higher levels of Strategy Practices.[17] Column (2) shows the robustness of the relationship to the inclusion of log firm age, and column (3) to other controls that are correlated with the adoption of different Strategy Practices, and may at the same time correlate with firm size, such as CEO age, CEO tenure in the firm, whether the firm is publicly listed, and whether the firm is family-owned.[18]

The table also shows the breakdown of Strategy Practices into its components of Formalization, Development, and Implementation and their respective correlations with firm size. As columns (4)-(6) show, all subcomponents are positively and significantly correlated with firm size. Furthermore, the results in column (7) indicate that the sub-components—with the exception of Implementation—capture at least some variation that is independent of each other.

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[17] All specifications include noise controls (interviewer fixed effects, time of day, interview duration, ratings of interviewee expertise and interviewee reliability and non-CEO dummy) and industry fixed effects (3 digit NAICS dummies).

[18] We examine the correlation between Strategy Practices and these variables in Appendix Table 2. We find that the Strategy Practices score is significantly higher in publicly owned firms and significantly lower for older CEOs and CEOs who have been in their position for a longer time period.

The quantitative implications of the correlation between firm size and Strategy Practices are substantial. To interpret the coefficients, remember that the measures we used are standardized z-scores, which implies that the coefficients capture a one standard deviation association of the independent variable to the Strategy Practice score. Specifically, a one standard deviation increase in Strategy Practices is associated with a 1.92-fold $(= \exp(0.655))$ increase in firm size (using the coefficient from column 3). Of course, we cannot interpret this as a causal relationship. More formalized strategy processes may help firms expand, or larger firms may formalize their strategy processes, or some other factor may drive both.

4.2 Firm size/growth in administrative data

To strengthen the external validity of our Strategy Practices measures and obtain additional measures of firm performance, we next merged our data into the US Census Bureau's Longitudinal Business Database (LBD). Unfortunately, confidentiality considerations force us to drop some of the largest firms, and the current vintage of LBD data (which ends in 2016), limits our ability to match the very small and young (typically entrepreneurial) firms in our main sample in the Census data. Both of these factors are likely to reduce the overall variation in our data and might therefore plausibly attenuate our baseline results.

The first two columns of **Table 3** report the correlation results for firm size which correspond to similar regressions in **Table 2**. Compared to results using our survey-internal measures of firm size, effects remain significant but are somewhat smaller in magnitude, yet still economically important. According to column (2), a one-standard deviation increase in Strategy Practices is associated with a 1.58-fold $(= \exp(0.464))$ increase in firm size, which is only slightly smaller than the relationship we find in Table 2.

We also investigate the relationship between the structured strategy process score and firm growth and find that more structured Strategy Practices are positively correlated with a variety of growth measures. We measure firm growth in the LBD by using symmetric firm growth measures proposed by Davis, Haltiwanger and Schuh (1996), $g_t = 2 \cdot \left(\frac{x_t - x_{t-k}}{x_t + x_{t-k}}\right)$ for $k = \{1, 5\}$. Additionally, we control for initial firm size, to capture any mean-reversion effects in firm growth patterns (Dunne, Roberts and Samuelson, 1987; 1989) and use firm-level clustering for standard

errors. The last four columns of **Table 3** report the results. Columns (3) and (4) display short-run correlations of Strategy Practices and firm growth as measured in annual growth rates. These results are quantitatively and statistically significant. According to column (4), a one standard deviation increase in the Strategy Practices score is associated with an increase in the annual growth rates by an average of 4.7%. These results continue to hold for long-run growth rates, as measured by overlapping 5-year growth rate measures in columns (5) and (6). In the long-run growth analysis, a one standard deviation increase in the Strategy Practices score is associated with a 9.5% increase in the firm growth rate over a 5-year horizon, which remains an economically important effect.

4.3 The number and speed of strategic decisions

We next analyze the extent to which more structured Strategy Practices are related to the number of strategic changes a firm undertakes or the speed of its decision-making and implementation.

The outcome we examine here is, in essence, a management team's capacity to make and execute decisions. On a conceptual level, the idea that "getting things done" is a key task for effective executives can be traced back at least to Drucker (1967) and continues to be popular (Gibbons, Matoushek and Roberts, 2012). Indeed, authors such as Mankins and Steele (2006) have argued that the number of decisions made by an organization is a natural metric to evaluate the quality of any strategic decision-making process. The speed of decision-making and implementation matters for almost any context but is especially valuable in very competitive and fast-changing environments (D'Aveni, Dagnino and Smith, 2010).

This section sheds light on whether a more structured strategy process is positively or negatively correlated with executives' capacity to make and execute decisions. Either is possible in theory. On the one hand, a management team with structured processes may possess well-honed routines (Nelson and Winter, 1982) that allow them to work through a large number of decisions effectively and quickly. On the other hand, structured processes may cause "paralysis by analysis" and delay strategic change (Peters, Waterman, and Jones, 1982; Lentz and Lyles, 1989). This is a major criticism of the traditional long-range strategic planning systems of the 1970s (Mintzberg, 1994). Intuitive decision-making, in contrast, may lead to almost immediate and surprisingly accurate

decisions, as cognitive psychologists such as Klein (2004) and other researchers (Eisenhardt & Bingham, 2017) have argued.

Our analysis here reveals that more structured Strategy Practices have both a positive and a negative effect on firms' ability to make decisions. In **Table 4**, we report that more structured Strategy Practices are significantly and positively associated with the number of decisions made, but a higher score is also associated with a longer time spent in decision-making. (All regressions include the basic firm, CEO, and noise controls included in Table 2.) A one standard deviation increase in the overall structured strategy processes score is associated with a 13% increase in the number of decisions made (with the results driven by the Implementation score) and 28% longer time required to reach a decision (driven by the Development score). Interestingly, we find that implementation speed is not significantly different for firms with highly structured decision processes.

These results suggest that firms with higher Strategy Practice scores experience countervailing effects. On the one hand, they are able to multi-task and pursue several strategic initiatives at the same time, but on the other hand, their deliberations are slower and take extra time. Once a decision is made, however, structured processes do not appear to delay implementation.

5. The Impact of Business Education on Strategic Decision Making

The vast heterogeneity in the Strategy Practices that CEOs employ raises an important question: What accounts for these large differences? In this section, we examine one mechanism that may have contributed to this heterogeneity: the CEOs' exposure to different business curricula. To do so, we take advantage of the fact that our interviewees who obtained their MBA at HBS collectively experienced a sharp discontinuous change in the MBA strategy curriculum: the 1983 appointment of Michael Porter—a leading strategy academic —as head of the required HBS MBA strategy course.

We examine whether this change (or "shock") – which is plausibly exogenous to cohorts that joined HBS just before and just after Porter was appointed head of the strategy course – alters parts of the WSS score for which the curriculum change is likely to have been most consequential: Formalization and Implementation. In particular, we argue that Porter and the HBS instructors who followed his lead gave students a framework to analyze the external competitive environment systematically as they crafted strategy. As the curriculum shifted to focus on analyzing the external environment and formulating more structured strategies, it paid less attention to strategy implementation. Therefore, we would expect interviewees trained after Porter's appointment to rely more on deliberate considerations as they make strategic scope choices in the formulation of their strategies; the curriculum changes should particularly influence answers to question F2 of our survey. We would also expect interviewees trained after Porter's overhaul of the strategy course to have less structured implementation practices (I1-I5), due to the topic's de-emphasis in the curriculum.

5.1 Institutional history

Some history of Harvard Business School is necessary to motivate our analysis. A longtime hallmark of the HBS MBA curriculum was the Business Policy course. Launched in 1912, only four years after the school's founding, the course emphasized from its earliest days features that would become central concepts in business strategy, such as a focus on "the intimate connection of [functional] groups" and "the substitution of careful, conscious analysis of managerial problems for unconscious analysis" (Harvard University, 1915: 35-36). Business Policy became a required course in 1920-21 and soon stretched across the entire second year of the MBA curriculum. In the 1950s and 1960s, professors such as C. Roland Christensen, Kenneth Andrews, and Edmund Learned used Business Policy to implant the term "strategy" in management education (Andrews, 1971). As Kiechel (2010) writes, the Business Policy course through the 1970s emphasized general managerial skills instead of analytic frameworks to understand the situation of a company.[19]

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[19] Kiechel (2010) summarizes the philosophy behind the pre-Porter HBS "Business Policy" education as follows: "What Andrews and his colleagues in the Business Policy course resolutely refused to do—and the main reason his ideas largely disappear from the subsequent history of strategy—was to agree that there were standard frameworks or constructs that could be applied to analyzing a business and its competitive situation. Oh, they might allow one, perhaps because they had helped develop it: so-called SWOT analysis, which called for looking at the strengths, weaknesses, opportunities, and threats besetting an enterprise. But nothing more schematic and hard-edged than that.

Analysis in the course was careful and conscious, but it was hardly structured or systematic. Moreover, analysis focused more on the inside of a company than on its external environment.

While the course evolved gradually and incrementally over the decades, more fundamental changes happened to the course and its content in the late 1970 and early 1980s. In 1979, a desire to have an integrative course earlier in the MBA curriculum caused HBS faculty to split Business Policy into two separate courses (Porter and Siggelkow, 1999). Business Policy I would be taught in the second term of the MBA's first year and would emphasize the formulation of formal strategy. Business Policy II would remain in the second year and focus on strategy implementation.

In 1983, Michael Porter became the head of Business Policy I in what traditionalists at HBS saw as a Dean-mandated takeover. He completely overhauled the curriculum and introduced new course content built upon his recent research in Industrial Organization, captured in his first book, Competitive Strategy (1980). Porter, a young upstart economist, had used deep contact with managers when teaching executive education courses, as well as an MBA elective, to pioneer insights on industry analysis (Porter, 1979) and to define the elements of strategic choice (Porter, 1985). In sharp contrast to the "fuzzier" notions of strategy historically taught in Business Policy, Porter offered a discrete, holistic framework to evaluate the attractiveness of an industry, drawing on insights from the literature on Structure-Conduct-Performance in Industrial Organization. A key innovation of this framework was that it took a broad view of potential sources of competition. Porter's course encouraged students to go beyond incumbent rivals and take into account firms that might not yet exist (potential entrants) or firms that offer different products but satisfy similar underlying needs (substitutes). Furthermore, while firms cooperate with upstream suppliers and downstream customers to create value, they also compete with suppliers and customers to claim value in the form of profits. Porter's version of Business Policy I, soon renamed Competition & Strategy, would go on to become one of the most influential courses at HBS and to be formative for an entire generation of CEOs.

Individual companies and industries were just too idiosyncratic, and the ambitions and values of their managers too rich and varied to be mapped on any single template."

Using material from the HBS archives, we sought to examine and confirm the nature of Porter's changes to the Business Policy I course curriculum over the full timespan when our MBA alumni interviewees attended HBS. **Appendix 4** compares the course description for the year prior to Porter's restructuring (1982) to the course description for his first year (1983). The contrast is striking. While the 1982 course pays little attention to a firm's external context ("competition or adverse circumstances"), the overhauled 1983 course devotes substantial attention to analyzing and understanding a firm's competitive environment as a determinant of its success and performance. While the 1982 course description places heavy emphasis on the importance of general management of the entire enterprise (i.e. "what needs to be done"), the 1983 course description clearly moves away from any deep focus on issues related to management, execution, and implementation.[20]

5.2 Econometric specifications

We use this sudden, radical, and exogenous (to the students) change in the core strategy curriculum in 1983 at HBS as the source of a regression discontinuity that allows us to quantify the causal impact of MBA education on Formalization and Implementation. We use HBS MBA cohort years as the running variable for a regression discontinuity design (RDD). To fix ideas, let C_i be the MBA cohort year of CEO i and X_i different outcomes, such as strategic choices or a measure of strategy formalization. Using the potential outcomes framework, the econometric specification can be written as

$$X_i = f(C_i) + \beta_1 \cdot 1_{\{C_i \geq 1983\}} + \epsilon_i \qquad (2)$$

where ϵ_i is a random error and $f()$ is a continuous function. The key identification assumption in this approach is that unobserved characteristics of MBAs entering HBS are continuous, while only the change in the HBS strategy curriculum is discontinuous. We use a step function $1_{\{C_i \geq 1983\}}$ to estimate the effect, both because it is less problematic in terms of potential model misspecification and because data requirements for estimation are less demanding, which is important for our

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[20] In order to confirm this de-emphasis of implementation topics in the curriculum, we also interviewed veteran faculty at HBS who confirmed that following Porter's changes to the course, discussions of implementation faded from the curriculum.

application given our limited sample. Our baseline specification uses a local, non-parametric RDD using the optimal bandwidth selection procedure of Imbens and Kalyanaraman (2012), which in our case is 3 years before and after 1983. Additionally, we use a global or parametric approach to equation (2), which uses all 185 observations and specifies the functional form of $f(C_i)$ either as second order polynomial $f(C_i) = f_1 \cdot C_i + f_2 \cdot C_i^2$ or third order polynomial $f(C_i) = f_1 \cdot C_i + f_2 \cdot C_i^2 + f_3 \cdot C_i^3$. This increases the precision of our estimates at the expense of potential bias from the misspecification of the functional form for $f(C_i)$. Furthermore, more complex and flexible functional forms for $f(C_i)$ will lead to overfitting, thereby eventually rendering the estimates less precise again. In **Appendix 5**, we use different optimal bandwidth approaches as well as the global parametric approaches to show estimates for all sub-questions.

5.3 Results

We start our results by reporting the distribution of the MBA subsample of CEOs across graduation years.[21] **Figure 4** shows the number of potential and realized MBA interviewees (within our target set of manufacturing industries) in the HBS alumni database by graduation year. Importantly, the response rates do not seem to differ significantly for the cohorts immediately before 1983 compared to the cohorts following 1983. This is reassuring, as it is consistent with the view that selection implies only continuous changes along unobservable dimensions.

We then estimate the effect of the HBS strategy curriculum restructuring on two subsets of the Strategy Practices included in our survey that are more likely to have been affected by the curriculum change: strategy Formalization and Implementation. Specifically, given the curriculum changes, one would expect Porter's influence to make aspects of strategy related to the scope of the firm, competitive advantage, and strategic distinctiveness (captured in questions F2 and F3) to be more salient to managers, and implementation practices (captured in questions I1 to I5) to be less relevant to them.

The main results of this analysis are shown in **Table 5**, Panels A and B, which presents the RDD results. Starting with the top left of Panel A, we show that CEOs who were exposed to the

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[21] We restrict our sample for this analysis to only the MBA graduates in our sample because we are unable to collect data on and therefore observe and specify which, if any, comparable changes may have occurred in HBS's executive education programs.

restructured HBS MBA core curriculum were more likely to make deliberate, structured strategy scope choices and therefore had higher degrees of Formalization. This result is shown for two common non-parametric regression discontinuity estimators, plus a parametric estimator with quadratic and cubic controls.

In Panel B we investigate how Porter's changes to the curriculum affect implementation-related Strategy Practices, represented in questions I1-I5, as our observation of curriculum changes suggested the possibility of additional effects. In line with the changes to the course curriculum described above, we find that the cohort of students first exposed to Porter's courses appear to have lower Implementation scores, which is significant for the non-parametric estimators but not for the parametric estimators. In other words, the apparent de-emphasis of implementation-related topics which we observe from the Business Policy/Strategy course descriptions appears to have had the effect of de-emphasizing these practices among the firms in our sample.[22]

The combined evidence of the "Porter Effect" on CEO's Strategy Practices presents an interesting picture of countervailing effects with potentially substantial consequences for firms' executives. On the one hand, exposure to Porter's work appears to have caused a positive increase in the structure of firms' Formalization Practices, but on the other hand, that same exposure appears to have reduced the structure of firms' Implementation Practices.

6. Conclusion

A fundamental task of managers is to make decisions, and no decisions of top executives are more consequential than the decisions that set a firm's strategic direction. Yet prior empirical literature in strategy is largely silent on the question of how chief executives make strategic decisions, despite long-standing calls to answer it (Porter, 1991). In this paper, we have aimed to begin answering that question.

In seeking to answer this critical question, our paper makes several contributions. Our first contribution is to develop techniques to collect data systematically on the strategy-making

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[22] We show the results for all the individual questions included in the survey in Appendix Table 2.

processes of chief executives. Toward this end, we devised a novel survey instrument that examines the formalization, development, and implementation of strategy. We used open-ended questions and highly trained interviewers to gather data on how 262 HBS-educated chief executives make choices. In particular, we assessed the degree to which they use structured Strategy Practices that promote consistent, proactive, and evidence-based decision making.

Our second contribution is to demonstrate that these CEOs display profound heterogeneity in their Strategy Practices. The utilization of these Strategy Practices varied both between and within industries. Even though the CEOs share a similar educational background, their processes span the spectrum from highly gut-driven and intuitive to highly structured.

Our third contribution is to show that, along this spectrum of decision-making processes, the CEOs who use more structured processes tend to share certain characteristics. Compared to their gut-driven counterparts, they lead firms that are larger and faster growing. They make more strategic decisions in total, but also take more time to make each decision. Once again, however, we note that these findings are correlative, not causal, relationships.

Our fourth contribution is to suggest one possible source for the variation among executives' processes for making strategic decisions. Thanks to a unique aspect of our sample—its focus on Harvard Business School alumni—we have some causal evidence that management education matters. In particular, CEOs exposed to a curriculum that emphasized systematic analysis of the external environment utilize a different set of Strategy Practices, making their strategy scope decisions more deliberately than do their predecessors who received a less analytical education. The data also show that the more intense focus on scope might have crowded out attention to practices related to strategy implementation. Remarkably, the impact of this sudden change in HBS's curriculum on how CEOs make decisions can be discerned decades after the shift occurred.

Much remains to be learned about how chief executives make strategic decisions. Further investigation of executives' processes for making strategic decisions in other geographies, in other sectors of the economy, or among non-HBS graduates, for instance, will likely reveal additional insights on this important topic. Subsequent studies might aim for more causal evidence, of either

the antecedents or the consequences of differences in decision-making processes. We hope that this paper makes the case that follow-up work is worthwhile and clarifies how such work might be conducted.

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Appendix 1: Cognitive Testing and Piloting

This section describes the process we used to validate the survey questions as well as the scoring grid. We started with an early version of the survey in 2014, but for the first versions it was unclear whether executives would correctly interpret our questions and whether as a consequence, their answers would be too vague and unrelated to reliably classify the responses. We used a three-stage process to conduct cognitive testing of respondents or interviewers and to refine our survey instrument and interview process.

In the first stage of cognitive testing, we started by sharing the earliest versions of the survey instrument with a small number of retired executives at HBS and Berkeley-Haas to elicit feedback.

In the second stage of cognitive testing, we started a process of running approximately 20 pilot interviews with alumni of HBS executive education programs. These pilot interviews, conducted during 2014-2015 academic year, had several objectives. First, we wanted ensure that despite the use of open-ended questions, these questions were specific enough that executives would not talk about unrelated topics. Second, we used the pilots to make sure that the way we classified responses was realistic and that our classification captured the full range of executives' responses to our questions. Third, to make sure that the coverage of topics in the survey was comprehensive, we asked every pilot interviewee after the completion of their interview, whether they could think of any major issue for strategic decision making, that we might have missed. Fourth, the pilots allowed us to quantify the total interview length as well as the time taken for each question, which we then used to remove confusing or less important questions. During this second stage of cognitive testing, we also used a focus group of current executives in HBS executive education programs in Spring 2015 to address two potential issues. First, we gathered information about which topics these executives thought are important when thinking about how they make strategic decisions. Second, for a few questions for which either the question phrasing or the scoring grid was unclear, we asked for responses to the open-ended questions to learn how executives interpreted the questions and compare their answers to our scoring grid.

We then conducted the third stage of cognitive testing in 2016, which allowed us to test whether the survey instrument could be used to gather reliable information on strategic decision making during large scale data collection efforts. A key question in this context was whether we would be able to train interviewers with limited knowledge about business strategy to correctly score

executives' responses. We recruited five HBS second-year MBA students and generated training material describing the overall goals of our research, as well as mock interview scripts that we used to simulate the interview process. We also developed survey software that automated interview funneling, which we developed to systematically validate high interview scores as well as ease the cognitive burden for interviewers and double scorers. During this third cognitive testing phase, we conducted a larger pilot with 92 executives from two different HBS executive education programs. This pilot sample included CEOs or Presidents of small or medium-sized companies, as well as senior executives at large, publicly traded companies and had wide sectoral as well as international variation. During this large-scale pilot, we conducted additional cognitive testing to ensure that the MBA student interviewers understood the scoring grid and could easily and reliably use the survey software. We also gathered additional feedback on the questions, the scoring grid and the survey software in weekly meetings with the MBA student interviewers.

We used the data from this pilot to write a summary of some findings for Harvard Business Review (HBR) online, in Teti et al. (2017). The patterns reported in this summary are only tangentially related to our final scoring of the Strategy Practices grid. Beyond this HBR online piece, the data from the large-scale pilot have not be used.

Appendix 2: Software-supported Funneling of Responses

We extended the Bloom and Van Reenen methodology by introducing software-supported funneling of responses: responses that suggested structured strategy process automatically triggered follow-up questions on details of practices or specific examples. This interview practice was introduced to achieve two specific goals. First, to counter the tendency of respondents to let their Strategy Practices be more structured than they actually are (social desirability bias), we deliberately asked follow-ups on details or examples of practices, to ensure that more structured practices are indeed used. Second, the use of software-supported funneling also reduced the cognitive burden on interviewers, since it automatically displayed follow-up questions and specific responses to be recorded when needed, but hid those same questions when they were unnecessary.

We illustrate this interview practice in the **Figure A2**, which shows the beginning of funneling of responses for the first question of the strategy development section or (D1). The questions asks "What TYPICALLY prompts you to think about a strategic change?" As the figure shows, low scoring responses such as "Go with gut" or "React to performance drops", do not trigger any follow up questions. However, responses higher than "Look for widely reported, imminent shifts", will trigger the follow up question "What type of information do you use to inspire thinking about strategic changes?", which will be followed again by follow-ups about the detailed nature of information used, if and only if the respondent gives any response other than "Just intuition". As a result of this funneling practice, high scores for structured strategy process are less likely to be driven by respondents' desire to be perceived as rational decision makers but instead are more likely to capture an actual structured strategy process.

Appendix 3: Additional results

A3.1 Relationship Between Strategy Practices and CEO Tenure and Age

Executives can learn though trial and error and form adaptive expectations, as more experience increases the potential sample size of subjective data. As a result, very experienced CEOs might more reliably use their intuition or heuristics developed through experience instead of a structured strategy process. This section therefore explores whether reliance on structured strategy processes is systematically correlated with CEO (lack of) experience.

Appendix Table 2 reports our results from regressing our strategy scores on logged executive age as well as logged measures of tenure in the executive's current position or company. To reduce collinearity across measures, we compute relative position tenure as tenure at the current position divided by tenure at the current company. Similarly, we define relative company tenure as tenure in the current company divided by executive age.

Columns (1) to (4) show that CEOs with more experience report systematically lower levels of structured strategy process. We find a negative association for both relative tenure in the CEO position and executive age, which is likely to proxy for overall work experience. This is consistent with the view that more experience might lead to more intuition or heuristics-based decision-

making. Correspondingly, we find that the negative correlations between CEO position tenure and structured strategy process are strongest for the strategy development part of our survey, which focuses on decision-making practices.

A3.2 Firm ownership

We also considered the difference between public and private firms. Publicly traded companies are subject to a host of regulatory requirements and investor demands about transparency and comprehensibility of strategic choices. Consequently, public firms might adopt more consistent and formalized strategy processes in order to legitimize their strategic choices in the eyes of investors. Since we are most interested in public firms, we use all private firms as a baseline and only contrast public firms with family firms.

Column (5) of **Appendix Table 2** displays the results of our analysis of the relationship between Strategy Practices and firm ownership. Publicly traded firms adopt more Strategy Practices than private firms, even when we include of number of employees as measure of firm size. One way to understand this correlation is that public firms are subject to a high demand for comprehensibility by professional investors and monitoring pressures which encourage firms to develop and demonstrate rational strategic decision-making processes. In contrast, we find no significant difference between family firms and other privately owned organizations and firm age (unconditional on size).

Appendix 4: Changes in the HBS Strategy Curriculum*

Business Policy I Course Description (1982)	Business Policy I Course Description (1983)
Business Policy is the study of the **functions and responsibilities of general management** and the problems which affect the character and success of the total enterprise. The problems of policy in business have to do with the **choice of purposes**, the molding of **organizational character**, the definition of what needs to be done, and the **mobilization of resources** for the attainment of goals in the face of competition or adverse circumstances. In Business Policy, the problems considered and the point of view assumed in analyzing and dealing with them are those of the **chief executive officer or general manager** whose primary responsibility is the **enterprise as a whole**. Cases are drawn from companies of various sizes and industries. The purpose of instruction is to develop in students a **general management point of view** rather than a specialist or departmental orientation. Business Policy builds upon and integrates the total work of the school.	Business Policy I is a course about competition. It examines the **competitive forces in industries**, and the way in which companies can **create and sustain competitive advantage** through strategy. Reflecting a company's competencies, competitive strategy is a set of goals and integrated policies in each functional area that define how the company will compete in an industry, taking the point of view of the enterprise as a whole. A major theme of the Business Policy I is than **an acute understanding of competitive forces** will allow companies to shape competition in their favor. The primary focus of Business Policy I is on **competitive strategy in the industry environment, the primary arena in which competitive advantage is either won or lost**. Government's effect on competition is examined both domestically and internationally. The course also considers how competitive advantage may be enhanced through the combination of business units in a multibusiness company, an important task in corporate strategy. Cases are drawn from a wide variety of U.S. and global industries illustrating the range of competitive situations companies face. In its concern with how a **total enterprise can be related to its environment**, Business Policy I aims to integrate the work of other functional courses. …

*Emphasis Added

Note: Following Porter's overhaul of the Business Policy I course in 1983, it was renamed "Competition and Strategy" in 1986.

Appendix 5: Different RDD Specifications for the Porter-RDD estimation

This appendix gives an overview of different approaches we used to estimate the regression discontinuity associated with MBA cohort years at HBS.

$$X_i = f(C_i) + \beta_1 \cdot 1_{\{C_i \geq 1983\}} + \epsilon_i$$

In all of these cases, the cutoff year chosen was 1983, none of the specifications use any additional control variables and we report all specifications for the strategy practice variables X_i.

Non-parametric or "local regression" estimates

In non-parametric approaches, the estimation strategy focuses on choosing a neighborhood of observations around the discontinuity point, where it is more plausible that the functional form is linear. The length of this neighborhood is also called the bandwidth. Once the bandwidth is chosen, the algorithm will estimate a local regression, which in our case will be a dummy regression.

There are two important steps in the implementation of this empirical strategy. First, the bandwidth choice matters, since smaller bandwidths will include less observations and will therefore produce noisier estimates, but also will be less biased as observations are closer to the discontinuity. (Imbens and Kalyanaraman, 2012) propose a procedure to optimally select bandwidths for local regressions of RDs based on MSE minimization and all of the algorithms we use, follow some implementation of their ideas.

Second, once the optimal bandwidth has been chosen, the estimation algorithm requires variance estimates to calculate standard errors. The first algorithm we use, follows (Calonico, Cattaneo and Titiunuk, 2017) (henceforth CCT) and offers two choices of the variance estimations. The first uses a k-Nearest Neighbor algorithm to estimate the variance of the estimators following (Abadie and Imbens, 2006). The second uses a "plug-in" or analytic formula for the variance estimation that is based on similar formulas for heteroscedasticity-robust least squares standard errors, see (MacKinnon, 2013). The first two columns of the Appendix table 3 below show the results, which are broadly consistent with each other.

Within the class of non-parametric local regressions, we also utilize an alternative algorithm by (Nichols, 2011), which is based on code by (Fuji, Imbens, and Kalyanaraman, 2009) and implements another version of the optimal bandwith selection procedure by (Imbens and

Kalyanaraman, 2012). The results of this are displayed in the third column of the table and are broadly consistent with the code by (Calonico, Cattaneo and Titiunuk, 2017).

Parametric or "global regression" estimates

This approach uses the entire sample instead of only focusing on a neighborhood around the discontinuity, but also assumes that the functional form for the regression is known. In particular, starting with the following regression:

$$X_i = f(C_i) + \beta_1 \cdot 1_{\{C_i \geq 1983\}} + \epsilon_i$$

the parametric approach specifies the function $f(C_i)$ as different continuous functions. This approach has the advantage of being more precise, as the whole data is used, but that comes at the cost of increased bias in the estimates, as observations that are far away from the discontinuity can still influence the estimates. Furthermore, the more complex and flexible the functional form of $f(C_i)$ is chosen, the more the noise in the data will influence the estimates, thereby eventually rendering the estimates less precise again and increasing the standard errors.

The last two columns of the Appendix table 3 report the results using the parametric specifications using robust standard errors. Generally, the signs of estimates are consistent with our baseline results, although some of the results are much weaker in the parametric specifications. An exception are the results on Formalization (F2+F3), which tend to be slightly stronger in the parametric specifications.

Strategy Formalization

|		1	3	5
1	**Strategy Statement:** What is your company's strategy?	Respondent is unable to summarize	There is an informal statement, covering scope and possibly goals.	A formalized, concise statement exists, that summarizes: goals, scope and (competitive) advantage.
2	**Strategy scope and advantage:** What is your most important choice of "where to compete" in terms of products, geography or customers?	No priorities are set, regarding scope.	There are clear priorities, but reasons for these priorities are vague.	Clear priorities are related to internal advantage and external market opportunities.
3	**Mode of Competing:** If I asked your customers, how your company differs from the competition, either in the products/services you offer or in the way you provide them, what would they say?	The company is neither different in terms of products, nor in terms of business process or price, relative to the competition.	The company is different, in terms of products, processes or prices, relative to the competition. But information that ensures uniqueness is mostly informal (e.g. customer feedback).	The company is unique either in terms of in terms of products, processes or prices, relative to the competition. Data on customer feedback, and competitors is utilized to track how unique the company is.

Strategy Development

		1	3	5
4	**Proactivity and External focus:** How do you typically first come to consider changes to strategy?	We go with our gut to decide whether change is needed.	Change strategy before imminent performance changes. Qualitative and quantitative info from internal and external sources used, but no details are mentioned.	Proactively seek opportunities based on subtle shifts, using a broad range of quantitative and qualitative information on current and future external conditions to determine the need for change. Regular information updates combine internal and external sources.
5	**Strategy selection-relevant information:** What type of information do you use to select a strategic change rather than its alternatives?	To decide on a strategic change, we don't use any information beyond our own intuition.	To select among alternatives, we use quantitative information on external conditions. But no details are provided. When we lack data, we make our best guess.	To select among alternatives, we use a broad range of quantitative and qualitative information on current and future external conditions. Regular information updates combine internal and external sources. When we lack data, we articulate ``what would have to be true" for an alternative to be optimal.
6	**Strategy Development— frequency:** How often do strategy development meetings take place? And why? Are there recurring themes across strategy development meetings?	We do not have regular meetings dedicated to strategy development.	Most strategic decisions are made in annual strategy exercises (strategy retreats, annual planning cycle of functional staff). Budgeting and compensation questions dominate.	Strategy development is embedded in regular formal and informal meetings, as strategy and implementation go together. Strategy discussions take priority.
7	**Strategy Development— involvement:** How are strategy development meetings prepared? What is the typical structure? Who participates? What is the role of the different participants?	We do not have regular meetings dedicated to strategy development.	Recurring meeting structure is dominated by presentations. Process is led by functional staff (strategy, finance..)	Recurring meeting structure is dominated by discussions, with detailed advance preparation. CEO and operating managers jointly lead the process.

Figure 1: Strategy Practices scoring grid

Figure 1 (continued): Strategy Practices scoring grid

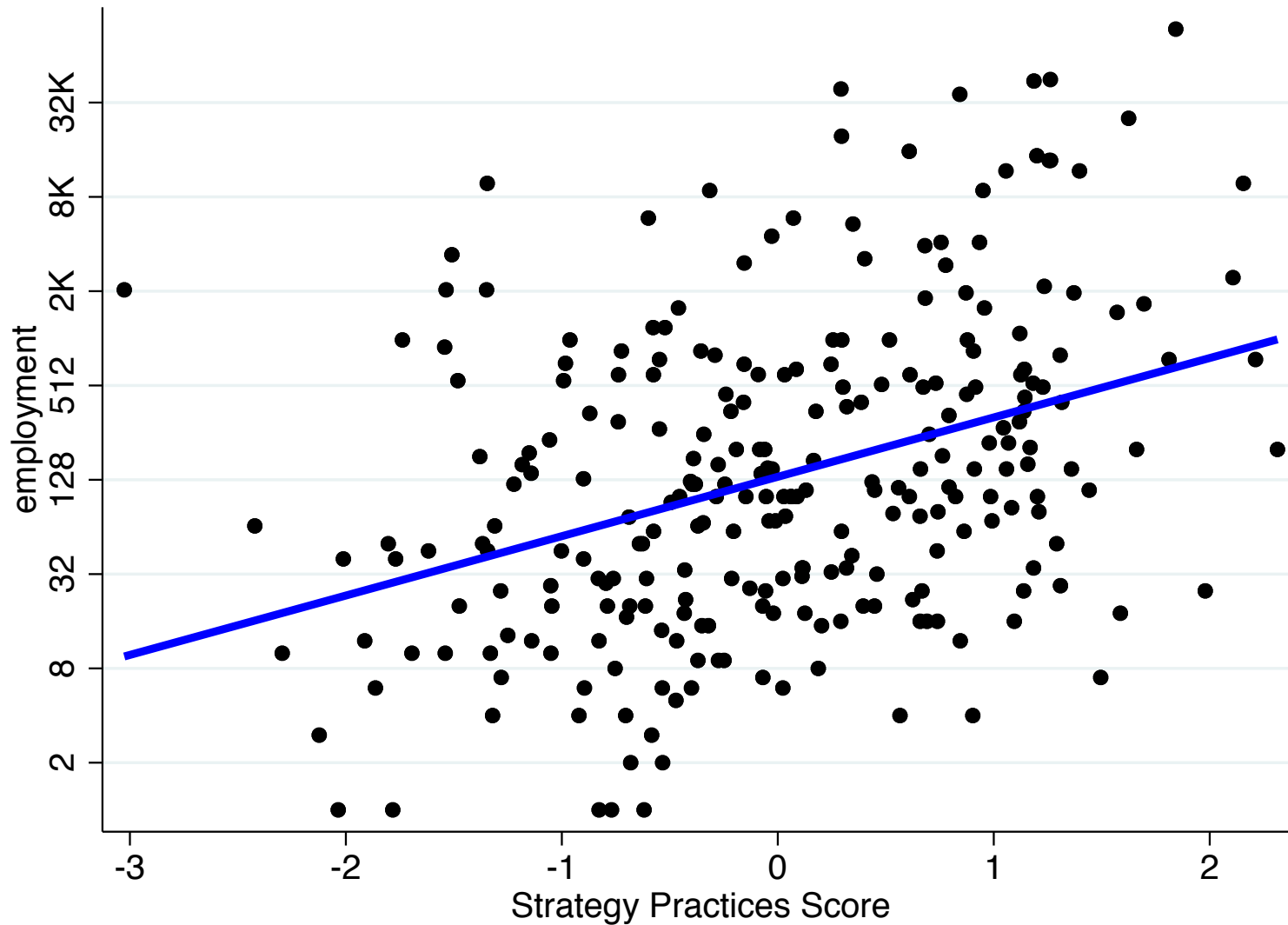| #	Question	1	3	5
8	**Exploration of Alternatives:** Do you typically consider alternatives to given possible strategic change? How much information on these alternatives is there? How do you typically first come to consider these alternatives?	We know what we have to do and do it.	We consider mostly 1 alternative. But, alternatives are not regularly generated and there might be no vetting of alternatives.	We usually consider at least two realistic and feasible alternatives. We have a routinized process in place to explore feasible alternatives, even without immediate need.
9	**Structured Criticism:** When you are considering a strategic change, when and how do people express potential concerns?	Concerns are expressed irregularly.	We have public discussions, but managers also express concerns in private. Public discussions are mostly done for ``important'' decisions only.	All concerns were voiced and debated, using a systematic process of criticism, risk evaluation and open discussion. All strategic changes and possible alternatives are vetted through the same process.

Strategy Implementation

#	Question	1	3	5
10	**Implementation planning:** When you make a strategic decision, which implementation details are clear and what remains to be figured out?	Steps to implement a strategy are typically not articulated at the time of the decision.	The most important steps for implementation are clearly defined for directly involved department heads Department targets reflect these steps. But no details on performance targets or incentives are clear.	Detailed steps and intermediate targets for all directly and indirectly involved departments and individuals are defined. Performance and compensation were tied to the completion of these steps at the individual and team level.
11	**Strategy review and follow-ups:** How do you review the progress of a strategic change?	No or irregular review.	Reviews discuss successes/failures and follow-up goals are usually stated. But either discussion minutes or follow-ups do not regularly exist.	Strategy review discussions discuss successes/failures, risks/opportunities and review of initial assumptions. Minutes document discussion and follow up plans with clear goals.
12	**Learning from strategy outcomes:** How would you typically know whether a strategic change has succeeded or failed? What happens if a strategic change does not meet your expectations, either	We typically do not know whether a strategy succeeded or not.	We use performance in a targeted area to measure success but often do not know how strategy worked. Large surprises are reviewed but often no adjustment steps are taken or lessons for strategy discussed.	We judge success/failure relative to targeted effects using customized measures informative about the way strategy works and try to separate luck from design. We investigate why outcome was surprising and have an ongoing detailed dialogue on surprise outcomes and their implications for operations and strategy.
13	**Strategy Communication:** When and how are employees outside top management typically informed about strategic changes?	As changes take place, ``word trickles out''.	Official (CEO) memos go out in advance and announce the change. Employees mostly do not interact with superiors during communications.	Official statements go out in advance and inform employees through a variety of channels such as CEO statements, town-hall type Q&As, personal meetings throughout the organization. Communications include: what is done, why change was needed, how it affects employees.
14	**Resistance to change:** There might sometimes be individuals opposed to a strategic change? How do find out about them? Are you usually able to overcome their resistance? If so, how?	We do not identify resisters.	Before the decision, we identify resisters, as they voice opposition. Resisters are sidelined, neutralized or compliance is bought.	When preparing strategy considerations, we proactively identify influential individuals or groups, who might oppose the change. There is a routinized process to increase support for changes, elicit constructive criticism and keep management informed about potential implementation-issues from resistance.

Figure 2 Distribution of Strategy Practices
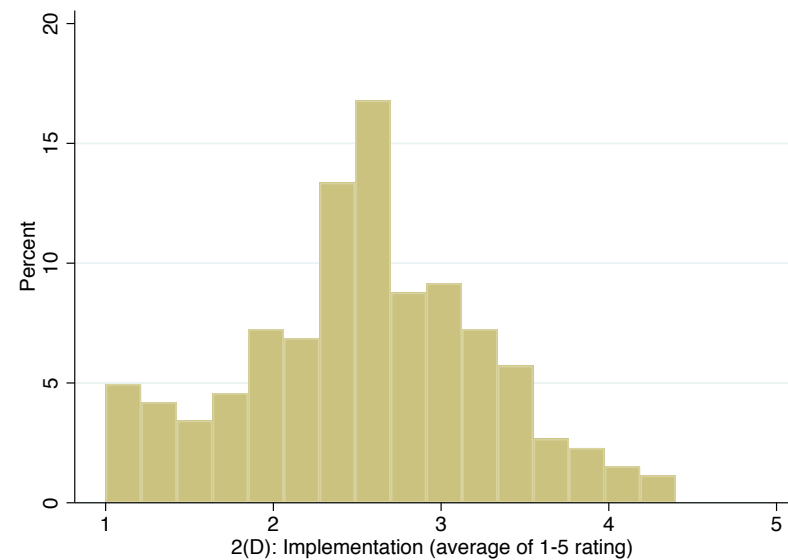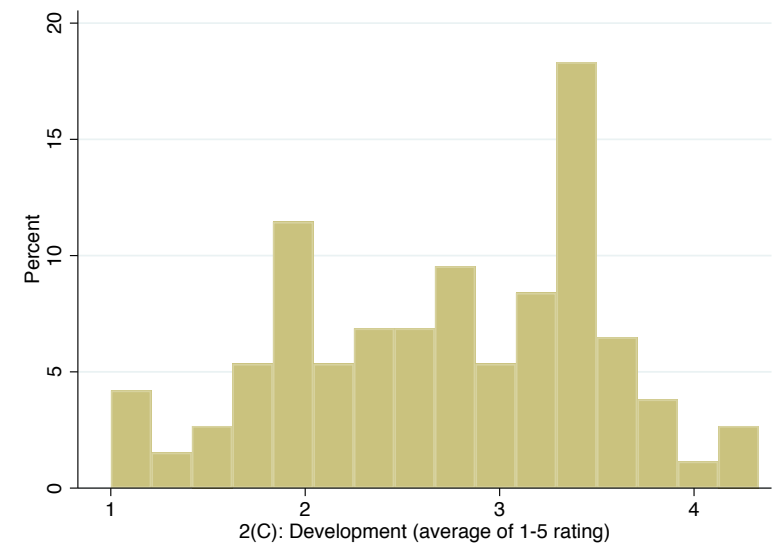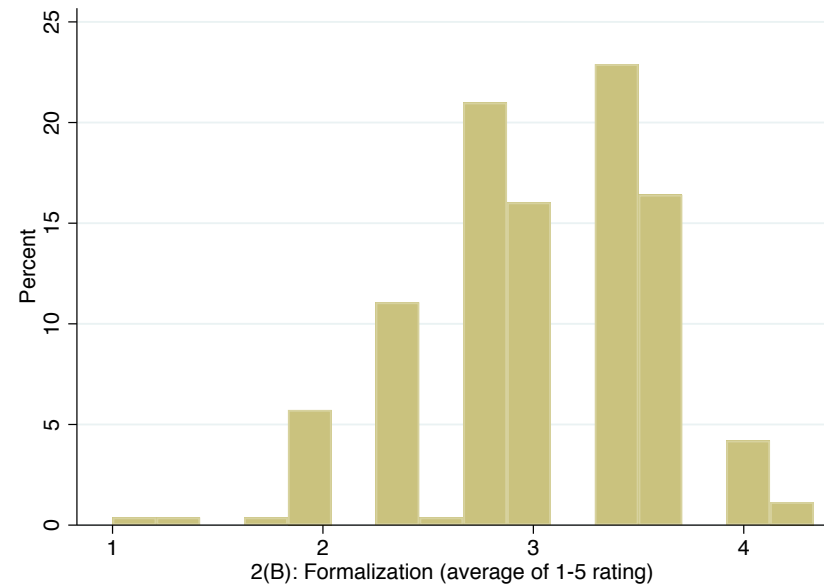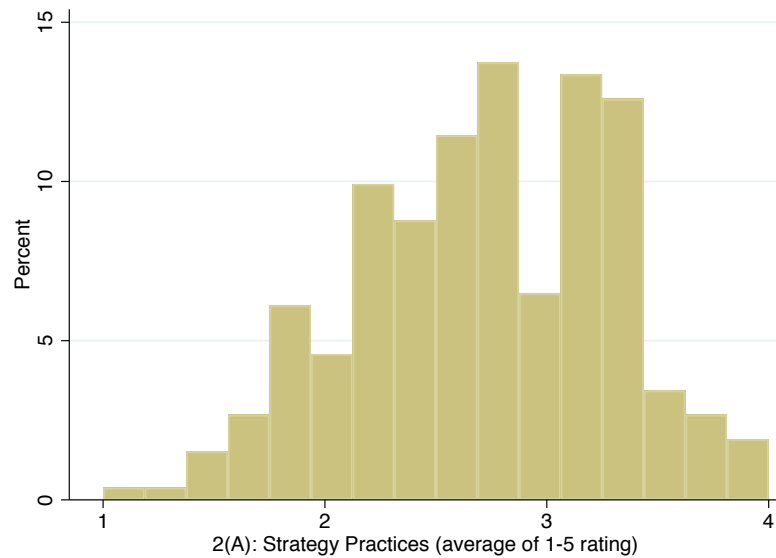
Note: The Strategy Practices score is an unweighted average of the score for each of the 14 strategy questions, where each question is normalized to have zero mean and standard deviation of one. The sub-scores consist of standardized, unweighted sums for questions (F1)-(F3) for Formalization, (D1)-(D6) for Development and (I1)-(I5) for Implementation.

Figure 3: Unconditional correlation of Strategy Practices and Firm Size

Note: The Structured Strategy Process score is an unweighted average of the score for each of the 14 strategy questions, where each question is normalized to have zero mean and standard deviation of one. Employment is measured as the number of full-time employees at the company.

Figure 4: Distribution of observations across graduation years

Full Potential Sample Pool vs. Interviewees, by Graduation Year
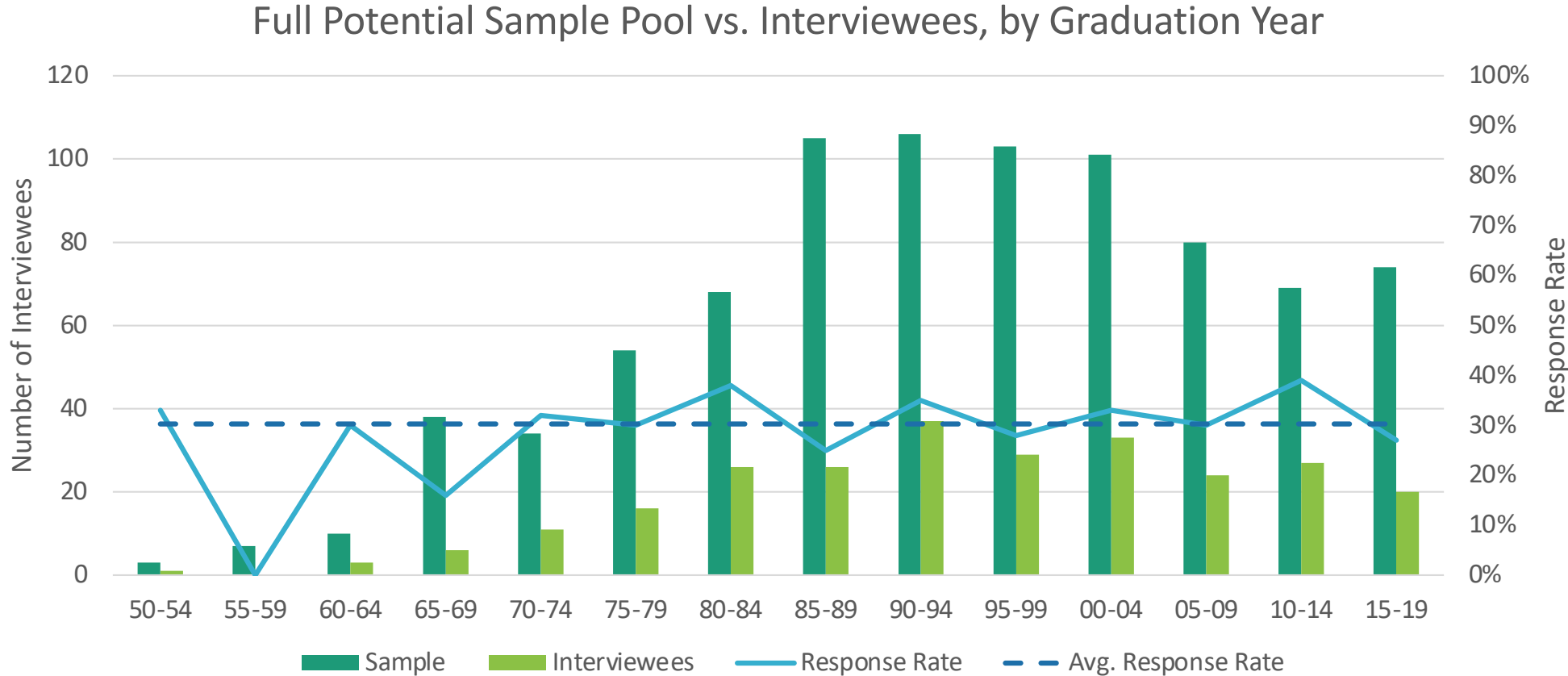
Note: The overall number of potential interviewees per year is measured by the number of alumni in the HBS alumni database with a degree from HBS, including MBA and executive education programs. The response rate has been calculated as ratio of number of executives who agreed to participate, relative to the number of executives that could successfully be contacted.

Table 1: Descriptive Statistics

	Obs	Mean	Standard Deviation	min	max
Panel A: Firm and Executive Characteristics					
Firm characteristics					
Number of employees	262	2088.62	8343.00	1.00	96500.00
Firm age	262	47.96	46.30	1.00	395.00
Public ownership	262	0.11	0.31	0.00	1.00
Family ownership	262	0.20	0.40	0.00	1.00
Executive characteristics					
Female	262	0.09	0.28	0.00	1.00
Age of executive	262	57.34	12.14	24.00	95.00
Tenure in position	262	13.86	11.31	0.00	51.00
Tenture in company	262	17.31	14.23	0.00	69.00
Bachelor degree in Business, Econ, Finance or Accounting	262	0.31	0.34	0.00	1.00
Bachelor degree in Engineering	262	0.04	0.15	0.00	1.00
MBA dfrom HBS	262	0.71	0.45	0.00	1.00
Panel B: Strategy Practices	262	2.78	0.48	1.56	3.89
Formalization	262	3.04	0.54	1.33	4.33
F1: Strategy Statement	262	2.51	0.71	1.00	5.00
F2: Strategy Scope	262	2.89	0.94	1.00	5.00
F3: Strategic Differentiation	262	3.68	0.95	1.00	5.00
Development	262	2.72	0.81	1.00	4.33
D1: Proactivity and External Focus	262	2.63	0.86	1.00	5.00
D2: Information for Strategy Selection	262	2.74	0.81	1.00	5.00
D3: Strategy Meetings: Frequency	262	2.60	1.33	1.00	5.00
D4: Strategy Meetings: Involvement	262	2.51	1.32	1.00	5.00
D5: Consideration of Alternatives	262	2.98	1.34	1.00	5.00
D6: Structured Criticism	262	2.85	1.23	1.00	5.00
Implementation	262	2.54	0.69	1.00	4.40
I1: Implementation Planning	262	2.09	0.94	1.00	5.00
I2: Strategy review and Follow-ups	262	3.02	1.20	1.00	5.00
I3: Learning from Strategy Outcomes	262	2.81	1.02	1.00	5.00
I4: Strategy Communication	262	2.83	1.21	1.00	5.00
I5: Resistance to Change	262	1.94	0.86	1.00	5.00

Notes: Strategy questions are scored with values between 1-5. Strategy practices (all questions), Formalization (F1-F3), Development (D1-D6) and the Implementation (I1-I5) are averages of the underlying questions. Missing observations are imputed at sample mean.

Table 2: Strategy and firm size

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				log employees			
Strategy Practices	0.923***	0.841***	0.655***				
	(0.142)	(0.123)	(0.121)				
Formalization				0.307***			0.235**
				(0.114)			(0.107)
Development					0.610***		0.494***
					(0.127)		(0.142)
Implementation						0.397***	0.182
						(0.135)	(0.147)
log firm age		1.144***	1.058***	1.133***	1.011***	1.101***	1.066***
		(0.115)	(0.142)	(0.151)	(0.147)	(0.147)	(0.146)
Noise controls	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES
Additional Firm and CEO controls	NO	NO	YES	YES	YES	YES	YES
Obs	262	262	262	262	262	262	262

Notes: Strategy Practices score is a normalized z-score with unit variance which is the sum of all 14 normalized strategy questions with mean zero and unit variance. Formalization (F1-F3), Development (D1-D6) and Implementation (I1-I5) are also z-scores with unit variance. Noise controls include interviewer fixed effects, time of day, interview duration, ratings of interviewee expertise and interviewee honesty and non-CEO dummy. Industry fixed effects are 3 digit NAICS dummies. Additional firm and CEO controls include: family ownership dummy, public ownership dummy, CEO age, CEO tenure in company, CEO tenure in position. Missing observations are imputed at sample means with imputation dummies included whenever observations are imputed. Significance levels are: *: 10%, **: 5%, ***: 1% and robust standard errors are reported in parentheses.

Table 3: Strategy practices and firm size / firm growth in Census data (LBD)

Dependent variable	(1) log employees	(2) log employees	(3) 1-year firm growth	(4) 1-year firm growth	(5) 5-year firm growth	(6) 5-year firm growth
Strategy Practices	0.476**	0.464**	0.046***	0.047***	0.096***	0.095**
	(0.190)	(0.198)	(0.012)	(0.012)	(0.035)	(0.037)
log firm age	1.076***	1.145***				
	(0.138)	(0.155)				
log initial employees			-0.048***	-0.049***	-0.096***	-0.095***
			(0.007)	(0.007)	(0.018)	(0.019)
Noise controls	YES	YES	YES	YES	YES	YES
Industry FE	NO	YES	NO	YES	NO	YES
Obs (rounded)	200	200	2000	2000	1300	1300
No of firms (rounded)	200	200	200	200	150	150

Notes: Results are based on merging the strategy practice data into the Longitudinal Business Database (LBD) and aggregating the data to the firm level. Strategy Practices score is a normalized z-score with unit variance which is the sum of all 14 normalized strategy questions with mean zero and unit variance. Growth rates are based Davis, Haltiwanger and Schuh (1996) formula. Industry fixed effects are 2 digit NAICS dummies. Additional firm and CEO controls include: family ownership dummy, public ownership dummy, CEO age, CEO tenure in company, CEO tenure in position. Missing observations are imputed at sample means with imputation dummies included whenever observations are imputed. Significance levels are: *: 10%, **: 5%, ***: 1%. Robust standard errors are used for columns (1) and (2), while all other columns have standard errors clustered at the firm-level. Standard errors are reported in parentheses.

Table 4: Strategy Practice Scores and strategic changes

	(1) log number of strategic changes	(2) log decision time (weeks)	(3) log implementation time (weeks)
Strategy Practices	0.189*** (0.069)	0.213** (0.102)	0.092 (0.082)
Formalization	0.019 (0.068)	0.082 (0.092)	0.027 (0.080)
Development	0.062 (0.065)	0.270** (0.107)	0.106 (0.078)
Implementation	0.191*** (0.059)	0.118 (0.096)	0.046 (0.069)

Notes: Each coefficient corresponds to a different regression. Number of strategic changes is the estimated number of changes over a 5 year horizon. Strategy Practices score is a normalized z-score with unit variance which is the sum of all 14 normalized strategy questions with mean zero and unit variance. All columns include controls for noise controls (interviewer fixed effects, time of day, interview duration, ratings of interviewee expertise and interviewee honesty and non-CEO dummy), and firm and CEO controls (firm age, family ownership dummy, public ownership dummy, CEO age, CEO tenure in company, CEO tenure in position). All columns include controls for decision type fixed effects include dummies for 17 non-exclusive types of strategic changes pursued. All columns include controls for industry fixed effects, which are 3 digit NAICS dummies. Missing observations are imputed at sample means with imputation dummies included whenever observations are imputed. Significance levels are: *: 10%, **: 5%, ***: 1% and robust standard errors are reported in parentheses.

Table 5: Porter RDD Effects on Strategy Practices

Panel A: Dependent Variable: Formalization

Estimator	Non-parametric: IK-NN	Non-parametric: IK-PI	Parametric: cubic control	Parametric: quadratic control
	(1)	(2)	(3)	(4)
Baseline	0.845**	0.832**	0.583*	0.582**
	(0.424)	(0.373)	(0.307)	(0.245)
Sample obs	185	185	185	185
Estimation obs	36	36	185	185

Panel B: Dependent Variable: Implementation

Estimator	Non-parametric: IK-NN	Non-parametric: IK-PI	Parametric: cubic control	Parametric: quadratic control
	(1)	(2)	(3)	(4)
Baseline	-1.216***	-1.270***	-0.601**	-0.126
	(0.312)	(0.332)	(0.279)	(0.229)
Sample obs	185	185	185	185
Estimation obs	36	36	185	185

Notes: Effects show the impact of MBA cohort year after the cutoff date shown on top. Formalization (F2-F3), Development (D1-D6) and the Implementation (I1-I5) are averages of the underlying questions, normalized to zero mean and unit variance. Columns (1) and (2) use non-parametric local regressions with optimal bandwidth selections and constant effect only. The baseline uses bandwidth selection by (Imbens, and Kalyanaraman, 2012) using a nearest-neighbor variance estimation, denoted by IK-NN and is implemented by (Calonico, Cattaneo and Titiunuk, 2017). IK-PI uses the same bandtwidth selection procedure with analytic heteroscedasticity-robust "plug-in" variance estimates as discussed by (MacKinnon , 2013) is implemented by (Calonico, Cattaneo and Titiunuk, 2017). Columns (3) and (4) use parametric approaches and assume different functional forms for the continuous function f(.). It is assumed to be either quadratic or cubic. Sample includes only HBS MBA alumni. Significance levels are: *: 10%, **: 5%, ***: 1% and robust standard errors are reported in parentheses.

Appendix Table 1: Frequency of different Strategic Decisions

Type of Strategic Decision	Count	Mean	SD
New product or business	262	0.85	0.77
Large capital expenditure	262	0.60	0.76
New technology (incl. IT)	262	0.50	0.73
Reorientation of priorities (market or business)	262	0.50	0.70
New business process	262	0.44	0.66
Geographic expansion	262	0.37	0.54
M&A	262	0.34	0.58
Cooperation with other firms (e.g. joint venture, alliance)	262	0.26	0.51
Hiring	262	0.26	0.50
Change in distribution channels	262	0.18	0.43
Organizational restructuring	262	0.17	0.41
Outsourcing	262	0.15	0.36
Supply-chain reorientation	262	0.15	0.42
Focusing business or diversiture	262	0.14	0.37
Moving service in-house (in-sourcing, vertical integration)	262	0.14	0.37
Significant change in funding sources	262	0.13	0.36
IPO	262	0.02	0.12

Notes: Tabulation of dummies that are one if this strategic decision was one of 3 examples given for typical strategic decisions. Types of strategic changes are not mutually exclusive, and all types of changes relevant to a particular decision, as described by an interviewee, were selected. For example, if a decision to enter a new product market required both vertical integration into new manufacturing processes and expenditure on new manufacturing equipment, we would categorize the strategic decision as involving (1) New product or business line, (2) Large capital expenditure, and (3) Moving service in-house.

Appendix Table 2: Other Firm and CEO Correlates of the Strategy Score

	(1)	(2)	(3)	(4)	(5)	(6)
			Strategy Practices			
log rel. tenure position	-0.272**					
	(0.117)					
log rel. tenure company		-0.101				
		(0.083)				
log executive age			-1.440***			
			(0.290)			
Family ownership				-0.047		
				(0.156)		
Public firm					0.742***	
					(0.200)	
log firm age						0.095
						(0.069)
Noise controls	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Obs	262	262	262	262	262	262

Appendix Table 3: Porter RDD estimates for all questions, with different RDD specifications

Dependent variable	Non-parametric, baseline (IK-NN)		Non-parametric, IK-PI		Non-parametric FIK		Parametric, quadratic		Parametric, cubic	
	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error	Estimate	Std. Error
F1: Strategy Statement	0.031	-0.244	0.03	-0.239	-0.26	-0.509	0.153	-0.233	-0.092	-0.304
F2: Strategy Scope	0.601**	-0.304	0.629**	-0.292	1.444*	-0.772	0.32	-0.251	0.372	-0.306
F3: Strategic Differentiation	0.37	-0.456	0.379	-0.422	0.47	-0.71	0.545**	-0.259	0.496	-0.345
D1: Proactivity and External Focus	0.549	-0.406	0.559	-0.387	1.079	-0.737	0.467*	-0.252	0.478	-0.321
D2: Information for Strategy Selection	0.056	-0.316	0.057	-0.296	0.022	-0.822	-0.06	-0.234	-0.045	-0.299
D3: Strategy Meetings: Frequency	-0.144	-0.328	-0.155	-0.315	-0.964	-0.764	0.298	-0.253	0.078	-0.318
D4: Strategy Meetings: Involvement	-0.398	-0.366	-0.349	-0.332	-1.254	-0.814	0.249	-0.241	-0.106	-0.314
D5: Consideration of Alternatives	-0.225	-0.286	-0.217	-0.287	-0.66	-0.605	-0.015	-0.239	-0.24	-0.305
D6: Structured Criticism	-0.073	-0.316	-0.054	-0.318	-1.223	-1.018	0.04	-0.252	-0.167	-0.32
I1: Implementation Planning	-0.986**	-0.439	-0.986**	-0.404	-1.612**	-0.753	0.026	-0.233	-0.367	-0.285
I2: Strategy review and Follow-ups	-1.565***	-0.416	-1.560***	-0.372	-2.475***	-0.499	-0.063	-0.258	-0.338	-0.328
I3: Learning from Strategy Outcomes	-0.299	-0.318	-0.299	-0.338	-1.015*	-0.606	0.187	-0.228	0.065	-0.304
I4: Strategy Communication	-0.929***	-0.288	-0.969***	-0.302	-2.274***	-0.677	-0.277	-0.241	-0.607**	-0.3
I5: Resistance to Change	-0.562**	-0.275	-0.569**	-0.254	-0.672	-0.444	-0.245	-0.221	-0.735***	-0.267
Formalization	0.845**	-0.424	0.832**	-0.373	1.257**	-0.635	0.582**	-0.245	0.583*	-0.307
Development	-0.025	-0.25	-0.004	-0.246	-0.702	-0.545	0.235	-0.222	-0.001	-0.279
Implementation	-1.165***	-0.302	-1.269***	-0.332	-2.402***	-0.573	-0.126	-0.229	-0.601**	-0.279

Notes: Column headers display different RD specifications. Non-parametric estimates use local regressions with optimal bandwidth selections of 3 years, implying the use of 36 observations. The baseline uses bandwidth selection by (Imbens, and Kalyanaraman, 2012) using a nearest-neighbor variance estimation, denoted by IK-NN and is implemented by (Calonico, Cattaneo and Titiunuk, 2017). IK-PI uses the same bandtwidth selection procedure with analytic heteroscedasticity-robust "plug-in" variance estimates as discussed by (MacKinnon , 2013) is implemented by (Calonico, Cattaneo and Titiunuk, 2017). The FIK estimator uses an implementation of IK by (Nichols, 2011) and (Fuji, Imbens, and Kalyanaraman, 2009). Parametric approaches use the full sample of MBAs (185 observations) and assume different functional forms for the continuous function f(.). It is assumed to be either quadratic or cubic.