Trust among Executives

Emily W. Choi, Özalp Özer

Jindal School of Management, The University of Texas at Dallas, Richardson, TX 75080, ewchoi@utdallas.edu, oozer@utdallas.edu

Yanchong Zheng

Sloan School of Management, Massachusetts Institute of Technology, Cambridge, MA 02142, yanchong@mit.edu

September 17, 2016

We integrate the results of a social network survey and a forecast information sharing experiment to determine whether and how trust and trustworthiness impact high-ranking executives' decisions in a dyadic supply chain. The members of our executive sample have on average 17 years of work experience. Over half of them hold positions at the C-level in world-leading organizations that span a diverse set of industries. By examining the roles of trust and trustworthiness in the decision making of high-ranking executives, we find strong external validation on the extent to which these nonpecuniary, behavioral factors may influence the outcomes of business interactions. We employ a multi-method research design that allows us to quantify the executives' *trust attitudes* (i.e., the executives' perceptions of trustworthiness of others) and *trust behaviors* (i.e., the executives' trust-demonstrating actions) and to reliably capture the correlation between the two. In particular, we design a social network survey to quantify two targeted measures of trust attitudes. *Network trust* refers to trust attitudes toward potential partners in current exchanges, while *preconditioned trust* refers to trust attitudes toward outside business partners in prior experiences. To quantify trust behaviors, we observe the executives making decisions in a forecast information sharing experiment that simulates a fundamental and actively studied research topic in supply chain management. Contrary to the conventional wisdom that managers primarily focus on financial objectives, we demonstrate that executives are significantly motivated by trust and are cognizant of when to trust in their business decisions. For example, executives exhibit high levels of trust and trustworthy behaviors (as college students do in prior studies) as long as the vulnerability entailed by trusting is not too high. When such vulnerability is high, however, executives are more careful about trusting than non-experienced individuals. In addition, executives with high preconditioned trust consciously base their trust behaviors on network trust (i.e., the perceived trustworthiness of their current exchange partners) and do not require (or rely on) repeated interactions to act trustfully. In contrast, executives with low preconditioned trust rely more on repeated interactions to trust their supply chain partners. These results offer valuable insights into how researchers can further integrate and advance our knowledge of trust, and how organizations can better leverage executives' trust intelligence to improve supply chain efficiency.*

Keywords: trust, trustworthiness, attitude, behavior, social network, executives, multi-method, behavioral operations, experimental economics

---

> *"I know who I can depend on, I know who to trust*
> *I'm watching the roads, I'm studying the dust."*
> *– Bob Dylan*

1.   Introduction

Trust is recognized as a key mechanism underlying behavior in social and economic exchanges. Sociologists understand trust to be essential for stable relationships, and economists view trust as the most efficient mechanism for conducting transactions (Zucker 1986). Nobel Laureate Kenneth Arrow states, "virtually every commercial transaction has within itself an element of trust" (Arrow 1972, p. 357). In the academic world, researchers have empirically shown that countries and regions with higher levels of trust experience less friction in economic exchanges and hence, more prosperous growth (Knack and Keefer 1997, La Porta et al. 1997, Zak and Knack 2001). In the business world, managers and executives are not oblivious to the role of trust as a critical lubricant in successful business relationships. As the study of supply chains is primarily concerned with interactions between business partners, it is essential that operations management (OM) scholars examine and seek to better understand the impact of trust on effective supply chain collaboration.

Studies of trust in supply chain collaboration have indeed shown that trust and trustworthiness play important roles in supply chain efficiency (e.g., Özer et al. 2011, 2014, Beer et al. 2015, Spiliotopoulou et al. 2016). These studies predominantly take an experimental approach to examine trust. Two questions often arise regarding this approach. The first question is whether trust is actually being observed in these experiments. Some researchers have questioned the behavioral measure of trust and its correlation with individual attitudes of trust (e.g., Glaeser et al. 2000, McEvily et al. 2012). While attitudes should correspond to behaviors according to the theory of planned behavior (Ajzen 1991), some studies have shown mixed results and a weak correlation between the two (e.g., Ben-Ner and Halldorsson 2010, Yamagishi et al. 2015). Therefore, there is a need to better understand whether the behaviors we observe and infer to be trust in experiments are actually related to trust attitudes. After all, trust is defined as a "psychological state" (Rousseau et al. 1998) rather than a behavior. Similarly, Hardin maintains that trust is in the "category of knowledge," not in the category of action (Hardin 2002, p. 58-59). Thus, we ask the question of whether *trust behavior* – the trusting action an individual takes in an interaction, is motivated by *trust attitude* – an individual's perception of trustworthiness from his or her partner.

The second question that often applies to experimental studies in general is, do behaviors observed experimentally hold external validity in terms of subject population? Typically, the subject pool in these experiments consists of college students. For research that focuses on how managers behave, such as many studies in supply chain research, one may question how well college students represent the target population. Conventional wisdom suggests that because managers, especially high-ranking ones, are exposed to large stakes and risks all the time, they tend to be particularly driven by financial objectives. Indeed, economists argue that managers and firms are primarily interested in profit maximization (e.g., DellaVigna 2009). Therefore, understanding whether and when managers exhibit trust behaviors similar to or different from college students has important methodological and practical implications.

In addressing these two questions, our research goals are twofold. First, we examine whether and when business executives exhibit trust and trustworthy behaviors in their business transactions with each other. Second, we investigate how well the executives' *trust attitudes* correspond with their *trust behaviors* in these transactions. To do so, we leverage a unique sample composed of high-ranking business executives enrolled in a 20-month executive MBA (EMBA) program at a university in the Northeastern United States. These executives are divided into two EMBA cohorts, one with 56 executives and the other with 57 executives. Table 1 presents the summary statistics on the demographics and backgrounds of our executive sample. They hold positions of general manager or higher; over half have the title of chief officer, director, vice president, or president. On average, they have 17 years of work experience. The organizations they lead span government agencies, non-profits, and private-sector industries including automotive, banking, biotechnology, consulting, electronics, entertainment, food & beverage, healthcare, industrial products, insurance, oil & gas, software, telecommunications, and utilities. The majority of these organizations are global leaders in their respective sectors. For example, among the private-sector organizations, 24 are Fortune 500 or S&P 500 companies or both, and have an annual revenue of U.S. \$1 billion or higher (average: U.S. \$54 billion). In their everyday work, these executives must consider financial objectives such as profitability and increasing shareholder value. Since these executives are accustomed to operating with this mindset, they will likely be financially driven while participating in our experiment. By verifying the roles of trust and trustworthiness among a population so highly conscious of financial goals, one can provide strong external confirmation of the extent to which these non-financial, behavioral factors influence the outcomes of business interactions.

Table 1   Summary Statistics of the Executive Sample

Items	Mean	Median	Std. Dev.	Min	Max
Age (years)	40.16	39	6.20	30	55
Work experience (years)	16.65	15	5.51	8	35
			Proportion of executives		
Female (female = 1, male = 0)			28%		
Doctorate degree (yes = 1, no = 0)			19%		
Position in C-level or higher (yes = 1, no = 0)			51%		
Direct value chain functions (yes = 1, no = 0)			40%		
Service industry (yes = 1, no = 0)			65%		

Notes. "Std. Dev." represents standard deviation. The last three factors relate to the most recent position that an executive held at the time of the study. Direct value chain functions refer to primary value chain activities (e.g., sourcing, production, sales) as opposed to indirect support functions (e.g., human resource, R&D, finance). We define whether an executive works in a direct value chain function based on classifications introduced by Porter (1985). We consider a position with the title of chief officer, director, vice president, or president to be C-level or higher. The entire sample contains 113 executives.

To quantify trust behaviors in a business context, we focus on one of the most fundamental and actively studied research topics in supply chain management: demand forecast information sharing in a dyadic supply chain. Specifically, we consider a supply chain with one supplier (he) and one retailer (she). The retailer has better forecast information about demand for the product due to her proximity to the end market. Because of a long production lead time, the supplier needs to determine production plans before

receiving binding orders from the retailer and would thus like to solicit the retailer's forecast information to facilitate this planning. However, since the retailer faces uncertainty in market demand, she may have an incentive to inflate her forecast to ensure abundant supply. Furthermore, as the supplier anticipates this tendency, he may not believe the retailer's forecast report to be credible and may thus discount the report when making decisions, regardless of whether the information provided by the retailer is truthful or not. Forecast manipulation and the resulting over-caution on the part of upstream supply chain members are prevalent across a range of industries, including electronics, medical equipment, and commercial aircrafts, limiting the efficiency of the corresponding supply chains (e.g., Lee et al. 1997, Cohen et al. 2003, Özer and Wei 2006). A group of researchers have examined when, how, and why trust and trustworthiness between supply chain partners can mitigate incentive conflicts and improve supply chain efficiency (e.g., Özer et al. 2011, 2014, 2016, Inderfurth et al. 2013, Scheele et al. 2014, Beer et al. 2015, Spiliotopoulou et al. 2016). We advance this line of research by demonstrating the significant role that trust plays in influencing high-ranking executives' business decisions, and by establishing that sociometric measures of trust attitudes correlate with decision-based measures of trust behaviors.

To quantify the executives' trust attitudes, we consider two measures that correspond to a business exchange relationship. Researchers have noted that the degree of trust differs for different targets (e.g., people or groups). Therefore, when determining one's trust attitude, the target of trust should be specified and correspond to the same target of trust as the behavioral measure (McEvily et al. 2012). Our first measure of trust attitude takes a social network perspective to determine an executive's trust toward his or her EMBA cohort. This target of trust is relevant because the executives interact with their cohort members in the forecast information sharing experiment. The cohort is a social network itself because the executives spent a year together every other weekend in a classroom setting.[1] A social network perspective examines patterns of relationships among people (or entities) and how these patterns affect individual perception and action (Granovetter 1985). These patterns of relationship are often called, structures or "networks" (Granovetter 1985, p. 490; Wasserman and Faust 1994, chapter 1). Networks can be investigated at multiple levels of analysis, such as at the individual (or egocentric) level, dyadic, or the whole network level (see Wasserman and Faust 1994 for a review of network analysis methods).[2] We focus on measuring the executives' trust attitudes toward the cohort at the egocentric level. Egocentric network analyses have been widely adopted to explain many social and economic phenomena (e.g., Uzzi 1996, Levin and Cross 2004). Specifically, we examine the number of cohort members each focal executive trusts and the number of others those trusted members trust. These direct and indirect patterns of trust relations and their interdependencies can be quantified by a fundamental egocentric network measure

---

[1] The term, "social network," should not be confused with social media applications such as Facebook or Twitter.

[2] Although the study of social networks is an area of sociology, it is inherently interdisciplinary and its origins come from other social science disciplines such as anthropology, social psychology, political science, communications science, and human geography (Freeman 1984).

called "centrality" (Bonacich 1987). In our context, this measure quantifies an executive's perception of trustworthiness from his or her exchange partners, which we call *network trust*. Our second measure of trust attitude focuses on the executives' trust toward their business partners in business exchange relationships outside their cohort. Their external business experiences may precondition their expectations of trustworthiness of professionals (in general) and influence their decisions in the forecast information sharing experiment. We call this second measure *preconditioned trust*.

A social network perspective on trust is especially relevant to supplier and retailer (or buyer) transactions. As Mark Granovetter, a pioneer in social network research, puts it, "continuing economic relations often become overlaid with social content that carries strong expectations of trust" (Granovetter 1985, p. 490). Many organizational studies demonstrate how the quality of a relationship (e.g., strong ties, weak ties, embeddedness) affects organizational outcomes such as performance (e.g., Uzzi 1996, Reagans and Zuckerman 2001, Azoulay et al. 2010), innovation (e.g., Ahuja 2000, Stuart 2000), and knowledge transfer (e.g., Reagans and McEvily 2003, Levin and Cross 2004). Trust is consistently discussed as an important element in these relationships. Thus, there is a self-evident need to explicitly measure trust in relationships and correspond it to business decisions. Using social network methods, we establish whether and how an executive's trust toward a network (the cohort) corresponds with trust behaviors observed in business decision experiments conducted among members of the network.

With this paper we make two key contributions. First, we demonstrate, with a unique sample of high-ranking executives, that trust and trustworthiness do play important roles in supply chain information sharing. To demonstrate that experimental results are generalizable, the reliability and reproducibility of these results need to be verified using similar or different subject pools (see Camerer et al. 2016 for a recent large-scale replication study). Despite the broad range of existing experimental and behavioral research, there have yet been few attempts to study business decision making with participants from the professional population, let alone target a sample with members of such high ranks and diverse backgrounds as the ones in this study. In addition, there is mixed evidence regarding the degree to which social preferences observed in laboratory experiments can be replicated in the field (see Levitt and List 2007, DellaVigna 2009 for excellent reviews). We contribute by showing that (i) high-ranking executives are indeed significantly motivated by trust, despite their daily focus on financial goals throughout their extensive business experiences; and (ii) these executives are more cognizant of when to rely on trust (or not) than non-experienced individuals (e.g., college students). These results both confirm the validity of using college students as an initial proxy for studying manager behavior and highlight environments for which testing the external validity of laboratory results on trust would be most valuable.

Second, to determine how trust attitudes and the supply chain environment jointly influence executives' trust behaviors when making business decisions, our study incorporates both a social network perspective and an experimental approach. As such, our research facilitates further integration and advancement of our knowledge of trust by demonstrating a path through which trust measures from attitudinal surveys

and those from economic experiments can be reconciled. We show that when relevant targets of trust are specified in both surveys designed to elicit trust attitudes and experiments designed to observe trust behaviors, these targeted measures of trust attitudes do significantly correlate with trust behaviors. We further demonstrate that different targeted measures of trust attitudes affect trust behaviors in distinctive ways. For example, we show that preconditioned trust is a prerequisite for network trust. That is, network trust matters only for those executives who have high preconditioned trust to begin with. These executives consciously base their trust behaviors on the perceived trustworthiness of their current exchange partners (i.e., network trust), and they do not rely on repeated interactions to decide how much to trust. By contrast, executives with low preconditioned trust rely on repeated interactions, instead of network trust, to exert trustful behaviors. Thus, our results offer actionable insights regarding how organizations can better leverage executives' knowledge about when to trust to improve efficiency in business transactions, as we elaborate on below and also summarize in our concluding remarks.

2.   Research Hypotheses

This section develops the hypotheses related to our main research question: Are the executives' *trust behaviors* in business decisions motivated by their *trust attitudes*, and if so, how? Before doing so, it is important to discuss how one operationalizes trust attitudes and trust behaviors. Based on a survey of a broad range of research on trust across disciplines, Rousseau et al. (1998) define trust as "a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behavior of another" (p. 395). Trust can be viewed as an attitude, since it refers to an individual's intention to trust another based on his or her *perception* of the trustworthiness of the other; that is, trust attitude captures the degree to which an individual would expect his or her partner to act in a caring and reliable way if they were to interact (McAllister 1995). Psychologists and sociologists primarily adopt attitudinal surveys to study trust in terms of a person's perception (and expectation) of another's trustworthiness which would implicitly relate to the person's intention to trust (Ajzen 1991). By contrast, trust behavior refers to an individual's *action* of trusting, as demonstrated by the actual decisions he or she makes when interacting with another individual. Thus, trust behavior captures the degree to which the individual demonstrates trust for his or her partner by making costly decisions when they interact. Economists and operations researchers predominantly use economic experiments to study trust in terms of a person's actions and decisions.

The proliferation of methods to operationalize trust attitudes and trust behaviors brings forward an important question: Are we actually measuring the same construct? We would be more confident to answer yes if trust attitudes correspond to trust behaviors. Researchers have used numerous approaches to study and measure trust attitudes and trust behaviors. In the organizational and management literatures alone, survey-based studies of trust attitudes have employed over 129 different measures of trust over the past 48 years (McEvily and Tortoriello 2011). In economics, moreover, a number of different experiments, or

"games," have been used to infer trust based on participants' decisions in the games (e.g., Berg et al. 1995, Forsythe et al. 1999, Ho and Weigelt 2005, Cai and Wang 2006, Bohnet et al. 2008, Özer et al. 2011). More pointedly, if trust is widely accepted and defined as an attitude, are the trust behaviors studied in experiments actually motivated by trust? For a long time, researchers consider attitudes and behaviors distinct but related constructs; however, empirical research has not always found them to be significantly correlated (e.g., Fishbein and Ajzen 1975, Ajzen 1991). Across disciplines, researchers have attempted to reconcile the different trust measures used in various attitudinal surveys and economic experiments. The results, however, have been mixed: a correlation between trust attitudes and trust behaviors does not always exist (see Glaeser et al. 2000, Ben-Ner and Halldorsson 2010, Yamagishi et al. 2015 for examples of mixed results).

How do we reconcile the relationship between trust attitudes and trust behaviors? An important lesson learned from the incoherent results from past research is that trust is not fixed – it changes depending on whom (or what) is to be trusted. Therefore, to reliably capture the correlation (if any) between trust attitudes and trust behaviors, one should correspond to the same whom (or what) when measuring both attitudes and behaviors. In particular, McEvily et al. (2012) advocate that the "target" of trust must be specified and match with the target of trust behaviors when eliciting trust attitudes. This suggestion aligns with Ajzen and Fishbein (1977), who note that, "significant relations between attitudes and behavior are usually obtained when there is correspondence with respect to both the target and the action elements" (p. 892). To say "I trust my brother to keep my secret" is one thing, but to say "I trust my business partner in our commercial transactions" is another. Experiences and perceptions vary in different types of relationship; e.g., trust attitudes toward members of one's family often differ from trust attitudes toward one's business partners (World Values Survey 2015). As our goal is to investigate whether and how executives' trust attitudes influence their trust behaviors in business exchanges, we choose to focus on business relationships and two particular targets of trust when eliciting the executives' trust attitudes. In the following discussion, we first explain our approach to measure the trust attitudes and trust behaviors of business executives, after which we develop our research hypotheses.

2.1. Trust Attitudes of Business Executives

We measure the executives' trust attitudes toward two targets: (i) other members of their EMBA cohort and (ii) other business professionals (outside of the EMBA cohort) with whom the executives have interacted in their prior business experiences.

The first target of trust we consider is relevant because the executives interact with their cohort members in the experiment that we use to study their trust behaviors. We leverage a social network approach to study the executives' trust attitudes targeted toward their cohort members as a whole. At the time of our study, the executives had already spent a year together in the EMBA program and had established relationships with one another. This history of interactions helps foster a social network within the cohort,

and it provides the executives with valuable information from which they can develop expectations about the trustworthiness of their fellow cohort members.

The social network perspective takes root in the sociological idea that the network of relationships in which a person is embedded (or positioned) influences the person's perceptions and tendency to behave in a certain way (Granovetter 1985, Wasserman and Faust 1994). With a social network approach, every executive evaluates his or her perception of trustworthiness from every member in the cohort one by one. This approach is necessary for two important reasons. First, expectations of trustworthiness are established in a dyadic relationship, i.e., from one individual to another. The specific, one-to-one evaluation results in more accurate measurement of an executive's aggregate perception of trustworthiness in the cohort. Second, both direct and indirect ties in a social network influence a person's perception of trustworthiness from others in the network (e.g., McEvily et al. 2003, Ferrin et al. 2006). To illustrate this idea, consider the example of a three-person social network with A, B, and C. Suppose that A has only interacted with B, but B also has interaction with C. If A trusts B and observes B's positive comments or behavior toward C, then A may also trust C even without any direct evidence to trust. If A also directly interacts with C, then A's perception of C's trustworthiness would be affected by both A's own direct experience and B's trust attitude toward C. By adopting a social network approach, we account for such interdependencies when measuring an executive's trust attitude toward the cohort network. We thus define this trust attitude as the executive's *network trust*.

The second target of trust we consider is the set of business professionals (outside of the EMBA cohort) with whom an executive has interacted in his or her prior business experience. This target is relevant to our context because an individual's prior experience with others in similar exchange conditions may precondition their trust attitudes. Indeed, the experiential view of trust (Brehm and Rahn 1997, Hardin 2002) suggests that one's disposition to trust is founded on prior experiences; an individual who has had successful relationships with trustworthy partners in the past will have a greater tendency to trust in the future, even when dealing with new partners. Trust is often founded upon one's background expectations; that is, if an individual has interacted with members of a specific community or social category (e.g., business professionals) in the past and they proved to be trustworthy, then he or she is more likely to expect members of that category to possess the same characteristic in similar future relationships (Zucker 1986, McKnight et al. 1998). In the context of our study, if an executive has experienced trustworthiness from other professionals in prior interactions, then he or she would be preconditioned to expect trustworthiness from professionals generally, including the other members of his or her EMBA cohort. Because of this potential spillover effect, it is relevant to investigate whether trust attitudes formed during prior business relationships correlate with trust behaviors in current exchanges. We thus define the executives' trust attitudes toward their outside business partners in prior relationships as their *preconditioned trust*.

2.2.   Trust Behaviors of Business Executives

Trust behaviors capture the degree to which an individual demonstrates trusts for his or her partner by actually making costly decisions when they interact. Accordingly, one needs a concrete decision context to measure trust behaviors. Various games have been developed for this purpose, with the trust game (Kreps 1990) and the investment game (Berg et al. 1995) being the most replicated.[3] We adopt the forecast information sharing game (Özer et al. 2011, 2014) to study the executives' trust behaviors. In this game, due to market uncertainty and misaligned incentives, the retailer in a dyadic supply chain may be motivated to inflate her demand forecast report when communicating to the supplier; in turn, the supplier may not fully believe or rely on the report when making costly production decisions. In this setting, the supplier's trust behavior is captured by the extent to which he relies on the retailer's report when committing to costly production.

We adopt the forecast information sharing game for three key reasons. First, the trust game and the investment game study trust behaviors in the context of decision rights; i.e., trusting consists of transferring decision rights to the trustee with the belief that the trustee will reciprocate. By contrast, we are more interested in studying trust behaviors in the context of strategic information sharing, since information asymmetry is prevalent in decentralized supply chains and a critical barrier to efficient supply chain management. Indeed, forecast information sharing is one of the most fundamental research topics in this field, as many important operational decisions, such as capacity investment and procurement, depend on this information. Second, researchers have called for designing and conducting more diverse experiments with structurally different games to advance the research on trust (and social preferences more broadly; Camerer 2003). Structurally new games allow us to study trust in diverse contexts to better understand how environmental and institutional factors affect trust as well as the resulting decisions. This new wave of "second-generation" experiments, as Camerer calls it, and particularly those experiments that adopt a field context, will help to establish a systematic body of knowledge on when trust outweighs self-interest to influence critical economic decisions. Third, as a key step to establishing the external validity of laboratory findings in the field, researchers have increasingly stressed the need to design experiments with the relevant field context and conduct experiments using experienced participants (e.g., Bohm 1994, Dyer and Kagel 1996, Eckel and Grossman 1996, Starmer 1999, Harrison and List 2004, 2008, Bartling et al. 2015). Our participants are a group of high-ranking business executives, the majority of whom have been managing and engaged with the supply/value chain of their respective organizations. Thus, the context of forecast information sharing in a decentralized supply chain fits squarely within their experiences and expertise, strengthening the relevance between the participant sample and the decision task.

---

[3] Other examples of games through which trust behaviors have been studied include the following. Forsythe et al. (1999) introduce a seller-buyer game in which the seller privately observes the true asset quality and makes a claim to the buyer; in turn, the buyer chooses the price at which to purchase the asset. Ho and Weigelt (2005) use a multi-period investment game in which the two players alternate each period between the roles of investor and recipient. Cai and Wang (2006) conduct an abstract cheap talk game based on the model developed by Crawford and Sobel (1982). Bohnet et al. (2008) adapt the trust game by asking the truster to report the minimum probability that the recipient will reciprocate such that he or she would be willing to trust in the first place.

2.3.   Relating Trust Attitudes to Trust Behaviors

Does network trust or preconditioned trust matter when executives make decisions that entail an element of trust? If so, how? One would expect that both network trust and preconditioned trust positively correlate with the executives' trust behaviors, as we specify relevant targets of trust attitudes (in our surveys) and trust behaviors (in our experiments). When the targets employed to measure trust attitudes align with those employed to measure trust behaviors, correlations between the two can be identified more reliably. For example, McEvily et al. (2012) show that when trust attitudes are elicited by specifying the particular groups of people with whom their participants play a trust game, trust behaviors and trust attitudes are highly correlated. In our case, we identify the cohort as one relevant target and business professionals outside the cohort as another relevant target. When trust is founded on background expectations pertaining to a social network or a social category, that trust may be transferred to any member of the same network or category (Zucker 1986). In our context, if an executive perceives other members of the EMBA cohort (a social network) or other business professionals (a social category) to be trustworthy, then he or she is likely to exhibit trustful behavior when interacting with people from these groups. We thus develop the following two hypotheses.

HYPOTHESIS 1. *Network trust (trust based on the perceived trustworthiness of other members of the EMBA cohort) positively correlates with trust behaviors in forecast information sharing.*

HYPOTHESIS 2. *Preconditioned trust (trust based on the perceived trustworthiness of business partners outside the cohort) positively correlates with trust behaviors in forecast information sharing.*

Our next set of hypotheses examine how network trust and preconditioned trust interact to shape the executives' trust behaviors. When both types of trust attitudes are high, we expect high trusting behavior to arise when the executives interact in a business context. The more difficult question is, if one type of trust attitude is high while the other type is low, which type plays a more important role in affecting behavior? Previous research has not yet studied how multiple targeted measures of trust attitudes jointly affect trust behaviors. Studying this joint effect informs us in answering two related questions: Is preconditioned trust (i.e., trust formed outside the current exchange group – the cohort) a prior condition for network trust (i.e., trust formed within the current exchange group) to form and influence trust behavior? Or can network trust replace preconditioned trust to shape trust behavior?[4]

One can propose that *preconditioned trust is a prerequisite for network trust*. That is, only those individuals who are preconditioned to trust will believe in and rely on network trust. Underlying this suggestion is the idea that trust toward the social category of business professionals in general is a prerequisite for trust toward specific members of that social category. Executives whose preconditioned trust is low do not generally trust other business professionals; hence, they are likely to disregard information about

---

[4] We do not ask the question of whether network trust could be a condition for preconditioned trust to be more strongly linked to trust behavior, because preconditioned trust is developed before network trust in the context of our study.

the trustworthiness of specific business partners and network trust will thus have no effect. Conversely, executives with high preconditioned trust appreciate the value of a trusting relationship and are therefore cognizant of their partner's perceived trustworthiness in any given relationship. As a result, higher network trust should increase trust behavior. Along these lines, Andersson (2012) shows that individuals who are more optimistic about others' benignity are more likely to build trusting relationships with dissimilar others and form non-kin networks. We summarize this hypothesis as follows.

HYPOTHESIS 3A. *Preconditioned trust is a prerequisite for network trust to influence trust behavior: network trust positively correlates with trust behaviors in forecast information sharing only when preconditioned trust is high.*

An alternative proposition is that *network trust could act as a substitute for preconditioned trust*; that is, high network trust compensates for low preconditioned trust, but if preconditioned trust is already high, then network trust has no additional effect on trust behavior. The reasoning behind this proposition is as follows. If an executive has low preconditioned trust toward the social category of business professionals, then he or she would rely on his or her perception of the trustworthiness of his or her current partners (i.e., network trust) to decide how much trust behavior to extend to them. In contrast, if the executive's preconditioned trust is high, then he or she would believe that business professionals are generally trustworthy (and do not need to rely on network trust). In our context, an executive with high preconditioned trust would, therefore, expect little or no opportunistic behavior from partners in any specific business relationship, including the other members of his or her EMBA cohort whom he or she would interact with in the experiment. Hence, network trust would not matter. Correspondent with the above reasoning, Zucker (1986) finds that among the U.S. population during the period of 1840 to 1920, trust within individual relationships grew as trust toward society in general declined. Likewise, Yamagishi and Yamagishi (1994) explain that due to low levels of general trust in Japan's institutions, Japanese individuals tend to rely on committed relationships where trust is built upon one's knowledge of one's partner. Lazzarini et al. (2008) also demonstrate experimentally that people with low levels of general trust tend to stick to committed relations. We summarize this proposition in the following hypothesis.

HYPOTHESIS 3B. *Network trust is a substitute for preconditioned trust to influence trust behavior: network trust positively correlates with trust behaviors in forecast information sharing only when preconditioned trust is low.*

2.4. Business Executives versus College Students

It has been a long-standing debate whether managers and professionals are motivated by non-pecuniary, behavioral factors in making business decisions. Conventional wisdom suggests that they are not because business decision makers are highly strategic and constantly engage in market interactions involving high monetary stakes. Indeed, some researchers argue that such professionals can be expected to behave almost

as "homo economicus" (e.g., DellaVigna 2009). The relevance of social factors, such as trust and trustwor-thiness, in a business context is further challenged because engaging in market transactions may suppress moral considerations (e.g., Levitt and List 2007, Falk and Szech 2013). These views raise important ques-tions about whether and when social preferences observed in laboratory experiments conducted using college students reflect those of the professional population. As management science is mainly concerned with managerial decision making, it is critical that scholars of the discipline verify the replicability of experimental results among professionals and identify discrepancies that exist.

While relatively few experimental studies on trust have been conducted using professionals, a consid-erable amount of experiments have been conducted to study other social preferences and cooperative behavior of professionals. Regarding the comparison between the behavior of professionals and that of college students, these studies yield mixed results. Some research suggests that professionals care less about others' welfare than students do (e.g., Fehr et al. 2003, Bigoni et al. 2013, Beck et al. 2014), some suggest the opposite (e.g., Fehr and List 2004, Duersch et al. 2012, Holm et al. 2013), and yet some suggests that the behavior of the two populations are similar (e.g., Sutter and Kocher 2007, Anderson et al. 2013). One series of studies indicate that how much one cares about others' well-being increases with age (e.g., List 2004, Bellemare and Kröger 2007, Carpenter et al. 2008, Johnson and Mislin 2011); yet, evidence also exists that more-educated and higher-income individuals are less concerned about inequity (e.g., Bellemare et al. 2008). In the field of behavioral operations, comparisons between manager and student behavior have been limited to the context of inventory decisions in the newsvendor and beer games; researchers have yet to find significant differences in the decisions made by managers and those made by college students (e.g., Croson and Donohue 2006, Bolton et al. 2012). Given the aforementioned mixed results, we establish the null hypothesis that executives will exhibit trust and trustworthy behaviors similar to those demonstrated by college students in prior experiments with the same setting.

HYPOTHESIS 4. *Conditional on the same supply chain environment, executives exhibit trust and trust-worthy behaviors similar to those of college students in forecast information sharing.*

To formally test our research hypotheses, we designed and conducted a social network survey and a forecast information sharing experiment with a group of high-ranking executives with extensive business experiences. Next we explain in detail the design and implementation of the survey and the game.

3.   Trust Attitudes and the Social Network Survey

We rely on previously-validated survey questions to measure the executives' *trust attitudes* toward other members of their EMBA cohort and toward their outside business partners. In particular, we adapt to our context McAllister's (1995) Managerial Interpersonal Trust instrument, which was developed in light of various sociology and social psychology studies on interpersonal trust. Among such survey instru-ments, McAllister's survey instrument is the most relevant to our study for two reasons. First, the survey was developed using a participant and context similar to ours; i.e., inviting executive-level managers to

examine trust in their peer relationships with similar-level managers in a business context. Second, in a comprehensive review of trust measurements, McEvily and Tortoriello (2011) find that McAllister's instrument is among the most reliably replicated approaches for measuring trust.[5]

McAllister's (1995) survey instrument measures trust attitudes in two dimensions: affect and cognition. Affect-based trust describes a person's tendency to trust based on emotional ties and interpersonal care and concern. If an individual observes that his or her partner demonstrates genuine care for him or her and behaves altruistically in their interactions, then the individual is more likely to develop affect-based trust toward his or her partner (Clark and Mills 1979, Lewis and Weigert 1985, Clark et al. 1986, Organ 1988). In our context (i.e., the forecast information sharing game), a retailer who sufficiently cares about the supplier's welfare, or who dislikes exploiting the supplier due to a high emotional cost of deception may refrain from inflating (excessively) her forecast information. Hence, the more the supplier believes that a retailer is influenced by such emotional considerations, the more he will expect the retailer to be trustworthy. As a result, the supplier will demonstrate more affect-based trust toward the retailer.

The other dimension in McAllister's survey, cognition-based trust, describes a person's tendency to trust based on his or her belief in the reliability and competency of the other party. There is evidence that people tend to use a person's track records and how much he or she has followed through on his or her commitments to assess the person's trustworthiness (e.g., Lindskold 1978, Cook and Wall 1980, Granovetter 1985). This aspect is particularly critical when the relationship involves high interdependency (McAllister 1995). In our forecast information sharing game, the retailer's and supplier's actions affect each other's final payoffs. Therefore, the supplier's willingness to trust the retailer may depend on the supplier's perception about the retailer's reliability. The more he considers the retailer as reliable, the more he is willing to exhibit cognition-based trust toward the retailer.

McAllister's survey contains eleven questions in total, with five (resp., six) questions measuring affect-based (resp., cognition-based) trust.[6] We include in our survey two questions for each dimension that consistently have the highest factor loadings in both McAllister's and subsequent replication studies (e.g., Chua et al. 2008, Dunn et al. 2012).[7] The four chosen questions involve evaluating four statements: (i) "I felt comfortable to freely share my most outlandish ideas and hopes with them." (ii) "If I shared my problems with them, I know they would respond constructively and caringly." (iii) "I believe that they approach their jobs with professionalism and dedication." (iv) "Given their track records, I see no reason

---

[5] Another two widely-replicated surveys were developed by Cummings and Bromiley (1996) and Mayer and Davis (1999). However, these surveys were not explicitly designed to examine trust in peer relationships among managers and hence less applicable to our context. Cummings and Bromiley (1996) focus on an individual's trust toward a collective unit, such as an organization, while Mayer and Davis (1999) focus on a subordinate's trust toward top management.

[6] McAllister first developed an initial set of 48 questions from a comprehensive literature review. Following expert evaluations and exploratory factor analysis, this initial set of 48 questions was reduced to the final eleven questions.

[7] Factor loadings are produced by factor analysis and measure the degree to which survey questions are associated with the underlying unobservable constructs. A higher factor loading represents a stronger association. Factor loadings are commonly used by sociologists and psychologists as key indicators of the quality of a survey instrument (Kim and Meuller 1978).

to doubt their competence and preparation for our work." Statements (i) and (ii) measure affect-based trust, while statements (iii) and (iv) measure cognition-based trust. We next discuss how we implement the survey to study the executives' network trust and preconditioned trust in both dimensions.

3.1. Measuring Network Trust

To measure the executives' *network trust*, we applied McAllister's instrument using an egocentric network analysis approach (Wasserman and Faust 1994). In particular, we asked each executive to imagine that he or she was doing business with each member of his or her EMBA cohort. For each cohort member, the executive was asked to indicate how much he or she would agree with statements (i) and (iii) above if they were doing business together. Each executive stated his or her agreement scores for all cohort members in a roster where the cohort members had been randomly ordered. They did so first for statement (i) and second for statement (iii). The executives indicated their agreement with each statement for every cohort member on a seven-point Likert scale, with 1 meaning "strongly disagree," 4 meaning "neutral," and 7 meaning "strongly agree." We use only statements (i) and (iii) (one for each dimension) to measure network trust for two reasons. First, as the two cohorts in our sample had respectively 56 and 57 executives, each executive had to respond to each statement 55 or 56 times. We solicited scores for only one statement in each dimension to limit the length of the survey and the response burden on the executives, thus ensuring the quality of the responses. Using a single question to measure a variable of interest is common in social network research provided that the question has previously been validated (e.g., Marsden 1990, Borgatti and Cross 2003). Second, the two chosen questions consistently have the top factor loading values in their respective dimension in both the original and subsequent replication studies.

We adopt the concept of structural centrality in social network analysis (Freeman 1979, Bonacich 1987) to measure the executives' network trust based on their responses. Structural centrality captures the degree to which an individual is "somehow in the thick of things" or most active in a given network (Freeman 1979, p. 219). Relating to trust attitudes, the more structurally central an individual is, the more people in the network the individual perceives to be trustworthy. Hence, such an individual is more likely to generalize his or her trust attitude toward all members of the network. To determine the structural centrality of each executive in the cohort network, we follow Bonacich's (1987) approach to account for both direct and indirect ties in the network. That is, an executive's structural centrality depends on both the number of cohort members the executive trusts and the number of others those trusted members trust. The more people an executive trusts in his or her direct ties, and the more others those directly-trusted people also trust, the higher the executive's network trust.

Specifically, let s_{ij} be executive i's score toward executive j in a dimension (affect or cognition); i.e., s_{ij} is an integer between 1 and 7. Define the adjusted score $s'_{ij} = 0$ if $s_{ij} \leq 4$ and $s'_{ij} = 1$ if $s_{ij} > 4$. We treat scores of 1 to 4 as 0 because these scores mean the executive either does not feel any trust toward that member or is neutral about whether or not to trust. Conversely, we treat scores of 5 to 7 as 1 because these

scores mean the executive trusts the member to some extent. This dichotomizing approach is common in social network analysis (e.g., Cross and Cummings 2004, Everett and Borgatti 2014).[8] Given the adjusted scores, the executives' network trust is defined by the following system of equations (Bonacich 1987):

$$\text{NT}_i = \sum_{j \neq i} (\alpha + \beta \text{NT}_j) s'_{ij}, \quad \text{for all } i, j \in \{1, 2, \ldots, N\}, \tag{1}$$

where i is the executive index, N is the total number of executives in a cohort, NT_i is executive i's network trust, α is a scaling factor that multiplies all NT_i's to prevent them from growing unboundedly large with the size of the network, and $\beta \in (0,1)$ captures the effect of indirect ties on executive i's network trust.[9] Note that in social network analysis, β is typically chosen by the researcher depending on the research context. In our setting, a β value of 0 means that an executive's network trust depends only on his or her direct ties. Conversely, a β value of 1 means that both direct and indirect ties influence an executive's network trust with equal strength. We choose β to be strictly between 0 and 1 because (i) prior research has shown that both direct and indirect ties influence a person's perception of others' trustworthiness (e.g., McEvily et al. 2003, Ferrin et al. 2006); and (ii) direct experience has a stronger influence on a person's trust attitude than indirect evidence does (e.g., Paruchuri 2010). Some researchers have found that results based on different β values are highly consistent with each other (e.g., Shipilov et al. 2011).[10]

We utilize the most commonly used software for social network analysis, UCINET, to compute the executives' network trust, where α and β are automatically determined by UCINET's algorithm (Borgatti et al. 2002).[11] A higher value of NT_i implies that executive i shows more trust toward his or her cohort in the corresponding dimension. Analogously, we also measure the degree to which an executive is perceived to be trustworthy by his or her cohort members in both the affect and cognition dimensions. We call this measure the executive's *network trustworthiness*. This measure is defined in a similar way as Equation (1), with s'_{ij} replaced by s'_{ji}. In other words, how much an executive is perceived to be trustworthy by the network is dependent on both how many cohort members perceive the executive to be trustworthy and how many others perceive those members to be trustworthy. We use the notation NTW_i to denote executive i's network trustworthiness, with a higher value indicating that the executive is perceived to be more trustworthy by his or her fellow cohort members in the associated dimension.

---

[8] Alternatively, one can treat scores of 5 to 7 as 1 to 3 to differentiate the strength of positive trust from one executive to another. We repeat our analysis with this alternative adjustment and obtain identical results.

[9] In matrix form, the vector of the executives' network trust $\mathbf{NT}$ can be calculated as $\mathbf{NT} = \alpha(\mathbf{I} - \beta\mathbf{S})^{-1}\mathbf{S}\mathbf{1}$, where $\mathbf{I}$ is the identity matrix, $\mathbf{S}$ is the matrix of the adjusted scores s'_{ij}, and $\mathbf{1}$ is a column vector of ones.

[10] We repeat our analysis with $\beta = 0$ and obtain identical results as those discussed in §5.

[11] Specifically, β is set to be slightly smaller than the reciprocal of the largest eigenvalue of $\mathbf{S}$, the matrix of s'_{ij}; and α is selected such that $\sum_i \text{NT}_i^2 = N^2$.

3.2.   Measuring Preconditioned Trust

To measure the executives' *preconditioned trust*, we invited them to reflect on their typical experience interacting with external business partners outside the EMBA cohort.[12] They were asked to indicate on a seven-point scale how much they agree or disagree with each of the four statements (i) – (iv) discussed earlier. We use all four statements to measure preconditioned trust because we do not use a network approach in this part of the survey. To develop a quantitative measure of each executive's preconditioned trust, we first confirm his or her agreement scores for the two statements in each dimension are consistent with each other by measuring the associated Cronbach's α values. Provided that the responses are consistent, we then convert the original seven-point responses as follows. We treat scores of 1 to 4 as 0 and subtract the neutral score 4 from 5 through 7 to eliminate the jump in score from not trusting to somewhat trusting. Finally, we take the average of the converted scores for both statements in each dimension as the affect-based and cognition-based measures of the executive's preconditioned trust (e.g., Chua et al. 2008). A higher average score indicates a higher level of preconditioned trust in the corresponding dimension.

3.3.   Survey Implementation

Of the 113 executives that we surveyed, a total of 108 completed all questions in the survey (a 96% completion rate). To minimize possible spillover or priming effects, we administered the social network survey (using the Qualtrics software) two weeks prior to the forecast information sharing game. At the time the executives completed the survey, they had no knowledge of the game that they would play in two weeks. We established a two-week gap between the survey and the game for two reasons. First, the survey should be administered at a time that is reasonably close to when the game is played, as network trust is built over time. Measuring the executives' network trust too early would not capture the trust that one had gradually developed toward his or her cohort members by the time of the game. Second, because the executives were working full-time throughout the EMBA program and only returned to campus for classes every two weeks, a two-week separation also accommodated this logistical constraint. Finally, we assured the executives that their responses would be kept confidential and blinded to the authors. Confidentiality and blindedness were achieved by asking a graduate student not involved in the current research to replace each executive's name in the raw data with a randomly assigned numeric ID, before the data was analyzed by the authors. We design the survey to take about 20 to 25 minutes for an executive to complete.

4.   Trust Behaviors and the Forecast Information Sharing Game

To study and measure the executives' *trust behaviors* in a business context, we adopt the forecast information sharing game studied in Özer et al. (2011, 2014). In particular, we consider a two-tier supply chain with one supplier (he) and one retailer (she). The supplier produces a product at a unit cost c and sells

---

[12] We do not utilize a social network approach to measure preconditioned trust because the set of external business exchange relationships our executives have is large and varied.

to the retailer at a unit wholesale price w. The retailer sells the product to the market at a unit retail price r. The market demand for the product is expressed as $D = X + Y$. The variable X represents the private forecast information observed by the retailer but not by the supplier. The supplier knows only that X is distributed on $[X_L, X_H]$ with a cumulative distribution function (CDF) $F(\cdot)$. The variable Y represents the market uncertainty. Both the supplier and the retailer know only that Y is a zero-mean random variable distributed on $[Y_L, Y_H]$ with a CDF $G(\cdot)$. The game proceeds according to the following sequence. First, the retailer observes her private forecast information X and submits a forecast report $\hat{X}$ to the supplier. Second, the supplier observes $\hat{X}$ (but not X) and determines the production quantity Q. Third, the random demand D is realized, and the retailer orders $\min(D, Q)$ from the supplier. Finally, both parties' profits are realized. Note that when only pecuniary incentives are considered, the retailer does not share any overage risk due to excess inventory with the supplier but could suffer from the underage risk of failing to meet demand. Therefore, the retailer has an incentive to inflate her forecast in the report. Accordingly, the supplier may not consider the report to be truthful, but instead, discount the report when making the production decision. We refer the reader to Özer et al. (2011) for a formal description and analysis of this game.

In the experiment, we vary two factors in the supply chain environment: the supplier's production cost (low versus high cost) and the length of interactions (a single interaction versus repeated interactions). Varying the supplier's production cost changes the risk or vulnerability that the supplier endures by trusting the retailer's report. To see why, note that if the supplier were to produce more than the realized demand, he would fully bear the production cost of the excess inventory. Hence, a higher production cost makes the supplier more vulnerable to potential manipulation in the retailer's report. Prior literature has established that individuals are less likely to trust when they are in more vulnerable situations (Snijders and Keren 1999, Malhotra 2004, Özer et al. 2011). Moreover, varying the length of the interactions allows us to disentangle the spontaneous trust and trustworthiness that forms when there is no prospect for future interactions from the trust and trustworthiness that emerges in a long-term relationship. This distinction helps us understand how the effects of trust and trustworthiness on decisions differ in new business relationships versus established ones. Table 2 summarizes our experimental treatments and the number of executives who participated in each treatment.

All treatments of the forecast information sharing game were conducted during the lecture period of an introductory operations management course taken by the executives as part of the curriculum of the EMBA program. The executives were randomly assigned to one of the three treatments. In each treatment, interactions were restricted to members of the same cohort (i.e., the executives never interacted with a partner outside of their own cohort), and they were informed of this fact. Each executive participated in only one treatment (i.e., we used a between-subject design). Half of the executives in each treatment were randomly assigned the role of retailers while the other half were assigned the role of suppliers. The participants were separated into two classrooms according to their role. Each executive played the same

Table 2   Experimental Design

Treatment[*]	Production cost	Length of interactions	No. of participants[†]	No. of rounds
$C_H I_S$	High	Single	24	13
$C_L I_S$	Low	Single	20	13
$C_H I_R$	High	Repeated	26	10

Notes. In all treatments, $r = 140$, $w = 100$, X and Y are uniformly distributed on $[100, 400]$ and $[-75, 75]$. In the high-cost (low-cost) treatment, the supplier's unit production cost is $c = 80$ ($c = 20$).

*: C_i with $i = $ H or L represents a high cost or a low cost; I_i with $i = $ S or R represents single or repeated interactions.

†: 43 executives were ultimately not included in our study for the following reasons: 28 executives in one of the cohorts participated in a separate study not reported in the current paper; 7 executives did not show up on the day of the experiment; 5 executives did not complete the social network survey; and 3 executives did not submit their answers to the practice questions prior to the forecast information sharing experiment.

role in all rounds of the experiment. For the single-interaction treatments, the executives were informed that they would be randomly and anonymously matched with a new partner in each round. For the repeated-interaction treatment, they were informed that they would have the same anonymous partner in all rounds. Before the lecture in which the game was played, all executives were required to read the instructions and answer a series of practice questions as a homework assignment to ensure they had a good understanding of the game dynamics. In this assignment, the executives were also asked to indicate their production decisions for seven hypothetical values of X (100 to 400 in increments of 50), assuming that they were suppliers and knew the exact values of X. The executives' answers to this question reflect how well they could solve for the supplier's production decision under demand uncertainty.[13] These answers are used in measuring the executives' trust behaviors. We offered monetary incentives to the executives to motivate careful decision making during the experiment; the executives' final earnings were proportional to their experimental profits. On average they earned \$66, with individual earnings ranging from a minimum of \$13 to a maximum of \$96. The experiment lasted for about 80 minutes.[14]

We measure the executives' trust and trustworthy behaviors in the following ways.[15] First, the retailer's trustworthy behavior is measured by her average forecast inflation, $\overline{(\hat{X} - X)}$. A fully trustworthy retailer

[13] To derive the optimal production decision, the executives essentially solve the newsvendor problem commonly known in the operations management literature (Arrow et al. 1951). The executives' answers to this question show that they also exhibit the pull-to-center bias observed in prior experiments conducted with college students and procurement managers (e.g., Schweitzer and Cachon 2000, Bolton and Katok 2008, Bolton et al. 2012). That is, statistically speaking, the executives' production decisions lie somewhere between the average demand and the expected-profit-maximizing decision. Following Schweitzer and Cachon (2000), we use the adjustment score to measure the extent of the pull-to-center bias among our executives. The adjustment score is defined as the difference between an executive's production decision and the average demand, divided by the difference between the expected-profit-maximizing decision and the average demand. Thus, the adjustment score is a value between 0 and 1, with a smaller value indicating a stronger pull-to-center bias (i.e., the actual decision is closer to the average demand and farther away from the expected-profit-maximizing decision). The mean and median adjustment scores among our executives are 0.40 and 0.67, significantly different from both 0 and 1 (Wilcoxon signed rank test, $p < 0.001$).

[14] Since the executives participated in the experiment during their regular lecture period, the opportunity cost of occupying their time is likely to be low. The payment in this study was scaled to be three times as high as that offered to the U.S. participants in Özer et al. (2014). Although this does not reflect the income ratio between executives and undergraduate/graduate students perfectly, there is no evidence that our executive participants were careless or overly generous in the experiment. For example, the postexperiment discussion was characterized by a high level of engagement, ambition, and careful reasoning. See Bolton et al. (2012) for a discussion addressing similar scaling between manager and student payments.

[15] Our measures follow from Özer et al. (2014). We adopt the same measurement as these authors because in §5.3, we compare our data to the data collected by Özer et al. (2014) in order to investigate whether and how executives behave differently than college students in forecast information sharing. Other researchers have used similar measurements to study trust and trustworthy behaviors in a supply chain (e.g., Inderfurth et al. 2013, Özer et al. 2016, Spiliotopoulou et al. 2016).

shares her forecast truthfully, thus $\overline{(\hat{X} - X)} = 0$. Higher forecast inflation values reflect less trustworthy behavior, because they indicate that the retailer is deviating more from the actual forecast in hope of inducing higher production from the supplier. Second, the supplier's trust behavior is measured by his average production adjustment difference, $\overline{(Q_s - X)} - \overline{(Q - \hat{X})}$, where Q_s is the supplier's production decision if he observes the retailer's actual forecast. We capture the first term in this difference based on the executives' answers to the production decision question in their pre-experiment assignment. We capture the second term based on their decisions in the experiment. If the supplier is fully trusting, then he will believe $\hat{X} = X$, and his production decision will depend solely on how well he can make the decision in the face of uncertain demand. Hence, the two production adjustment quantities in the above measure would be equal, and the above measure would thus be equal to zero for a fully trusting supplier. If the supplier is not fully trusting, however, then he would account for the retailer's incentive to inflate her forecast and discount the report before making his production decision; the less trusting the supplier, the more he would discount the report. As a result, his average production adjustment difference would be positive, with larger values indicating lower trust.

5. Survey and Experimental Results

5.1. Summary Statistics: Executives' Trust Attitudes and Trust Behaviors

We first present the summary statistics for the executives' *trust attitudes*. Recall from §3.2 that we measure the executives' preconditioned trust by eliciting their agreement scores with respect to two statements in each dimension (affect and cognition). The Cronbach's α values of the executives' responses to the two statements in the affect and cognition dimensions are equal to 0.84 and 0.87, respectively, indicating high consistency (Kline 2000). Hence, we can use the average responses to the two statements in each dimension to measure the executives' preconditioned trust as discussed in §3.2.

Table 3 presents the summary statistics of the executives' network trust, network trustworthiness, and preconditioned trust. We highlight four observations. First, with respect to network trust and trustworthiness, the executives' affect-based network trust has the highest variation, followed by their cognition-based network trust. In contrast, their network trustworthiness has substantially less variations in both dimensions. Second, with respect to preconditioned trust, there again exists a higher variation in the affect dimension than in the cognition dimension. Indeed, the majority of the executives have very high cognition-based preconditioned trust, with the median being equal to 2, the second highest possible value of the scale. The lower variations in the executives' cognition-based trust attitudes may reflect their recognition that their business partners and cohort members are professionally and intellectually homogeneous. Third, we observe significant and large correlations between the affect and cognition dimensions within either network trust or preconditioned trust. Conversely, the correlations across the two trust measures are nonsignificant. The lack of correlation between network trust and preconditioned trust confirms that these two measures capture the executives' trust attitudes toward distinct targets (i.e., the EMBA cohort

versus business professionals outside of the cohort). Fourth, the small or nonsignificant correlation between network trust and trustworthiness suggests that those executives who trust others in the cohort are not necessarily perceived by others to be trustworthy. We demonstrate this result with two network graphs.

Table 3   Summary Statistics: Executives' Network Trust, Network Trustworthiness, and Preconditioned Trust
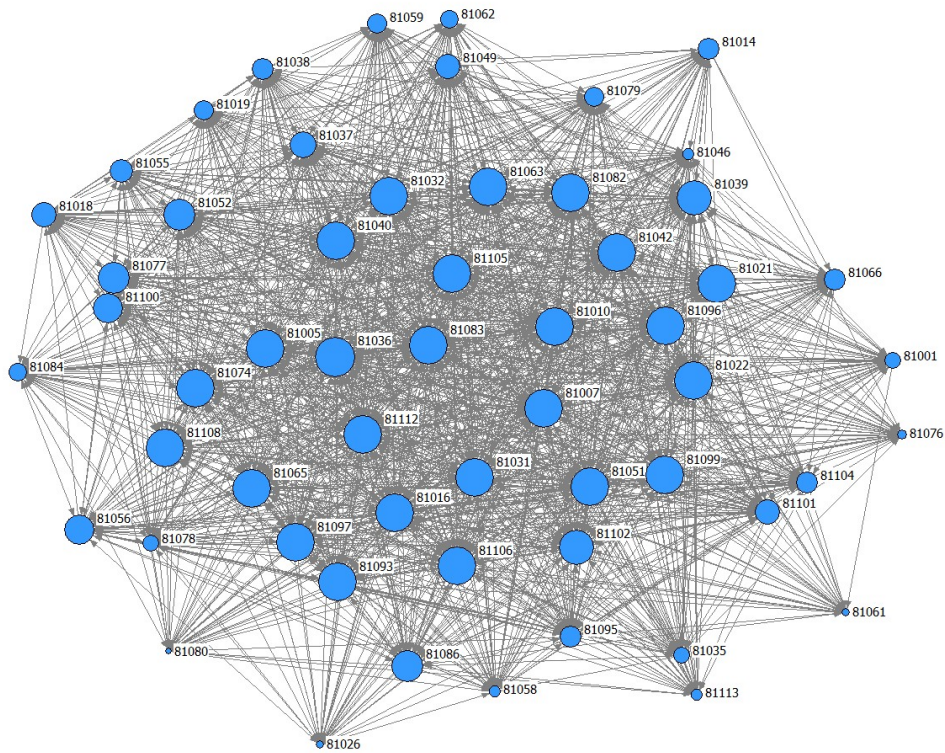
Item	Mean	Median	Std. Dev.	Min	Max	NT-Cognition	NTW-Affect	NTW-Cognition	PT-Affect	PT-Cognition
						Correlation Matrix				
NT-Affect	7.00	7.82	3.03	0.00	10.18	0.44^{***}	0.15	0.14	0.09	0.02
NT-Cognition	7.51	7.84	1.31	0.00	8.49		0.19^{**}	0.13	-0.07	0.12
NTW-Affect	7.47	7.55	0.92	5.45	9.38			0.62^{***}	0.14	0.13
NTW-Cognition	7.51	7.62	0.36	6.38	8.26				0.09	0.12
PT-Affect	1.05	1.00	1.00	0.00	3.00					0.51^{***}
PT-Cognition	1.64	2.00	0.91	0.00	3.00					

Notes. "Std. Dev." stands for standard deviation. "NT/NTW/PT" stands for the executives' network trust, network trustworthiness, and preconditioned trust in either the "Affect" or the "Cognition" dimension.
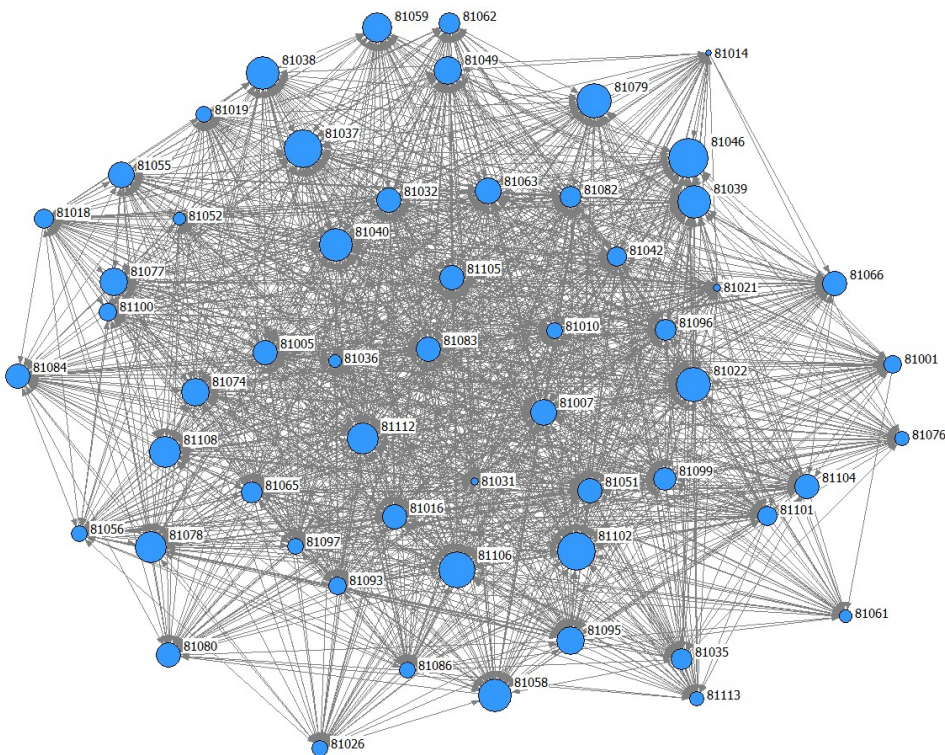***: $p < 0.01$; **: $p < 0.05$; p values are from significance tests on the correlation coefficients.

Figure 1a illustrates the executives' affect-based network trust in one of the cohorts. Each node in Figure 1a represents an executive. The 5-digit codes next to the nodes are the ID numbers assigned randomly to the executives to anonymize them in our data. A directed edge from node i to node j exists only when executive i has given executive j an adjusted score of 1 (i.e., when the original score is above 4). The size of a node indicates the magnitude of the associated executive's network trust, with a larger node representing higher network trust. The nodes are positioned such that executives with higher network trust are closer to the center of the graph; as one goes from the center toward the periphery, network trust of the executives decreases. Accompanying the network trust graph is the network trustworthiness graph for the same cohort, Figure 1b. In this second figure, all of the nodes are placed in the exact same positions as in Figure 1a; however, the node size represents the network trustworthiness of the corresponding executive. Reviewing both figures, we can see that there is a substantial amount of network trust and trustworthiness within the cohort, yet there also exist considerable variations in both measures across different executives. In addition, we observe that the sizes of the nodes between the two graphs do not necessarily correspond. This observation is consistent with the lack of correlation between the executives' network trust and network trustworthiness discussed earlier (see Table 3). Our observations suggest that trust and trustworthiness are related but distinct constructs that do not always align with each other (e.g., Hardin 2002, Ashraf et al. 2006).

Turning to the executives' *trust behaviors*, Table 4 presents the summary statistics regarding the executives' decisions in the forecast information sharing game, as well as our measures of trust and trustworthy behaviors. We highlight three observations. First, in all treatments, the correlations between the retailers' forecasts and their reports, and the correlations between the retailers' reports and the suppliers' production quantities are all significantly positive ($p < 0.01$). In addition, the average inflation, $\overline{(\hat{X} - X)}$, and average production adjustment difference, $\overline{(Q_1 - X)} - \overline{(Q_2 - \hat{X})}$, are significantly positive in all treatments (Wilcoxon rank sum test, $p < 0.01$). Hence, we observe partial trust and trustworthy behaviors as in prior

Figure 1   Illustration of Network Trust and Trustworthiness in an EMBA Cohort

(a) Network trust (the maximum value in this cohort is $NT_{81036} = 10.18$; the minimum value is $NT_{81061} = 0.49$)

(b) Network trustworthiness (the maximum value in this cohort is $NTW_{81046} = 9.38$; the minimum value is $NTW_{81014} = 5.45$)

studies (Özer et al. 2011, 2014), even with high-ranking executives who have extensive business experiences. Second, comparing $(\hat{X} - X)$ across the three treatments, we observe that the retailers demonstrate very similar trustworthy behaviors regardless of the supply chain condition (Kruskal-Wallis rank sum test, $p > 0.9$). Third, comparing $(\overline{Q_1 - X}) - (\overline{Q_2 - \hat{X}})$ between treatment $C_H I_S$ and treatment $C_L I_S$ or $C_H I_R$, we note that the suppliers tend to be more trusting when the production cost is low (Wilcoxon rank sum test, $p = 0.05$) and when the participants interact repeatedly (though not to a statistically significant degree; Wilcoxon rank sum test, $p = 0.12$).

Table 4   Summary Statistics of Game Behavior: Mean [Median] (Standard Deviation)

	Decisions		Retailers' trustworthy behaviors		Suppliers' trust behaviors	
Treatment	$\hat{X}$	Q_2	$(\hat{X} - X)$	$\mathrm{Corr}(\hat{X}, X)$	$(\overline{Q_1 - X}) - (\overline{Q_2 - \hat{X}})$	$\mathrm{Corr}(Q, \hat{X})$
$C_H I_S$	277 [278] (89)	205 [203] (80)	31 [19] (46)	0.81	60 [49] (58)	0.66
$C_L I_S$	286 [291] (91)	292 [300] (97)	38 [26] (63)	0.61	21 [14] (52)	0.73
$C_H I_R$	279 [293] (93)	212 [207] (87)	27 [12] (39)	0.85	38 [24] (60)	0.75

Notes. Label "Corr" means correlation. All correlations are significant with $p < 0.01$.

5.2.   Are the Executives' Trust Behaviors Motivated by Their Trust Attitudes?

We now examine whether and how the executives' network trust and preconditioned trust impact their trust behaviors in the forecast information sharing game (i.e., Hypotheses $1 - 3$). To do so, we estimate the following two random-effects regression models.[16]

$$(Q - \hat{X})_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{NT}} \cdot \text{NT}_i + \lambda_{\hat{X}} \cdot \hat{X}_{it} + \lambda_{Qadj} \cdot (\overline{Q_s - X})_i + \lambda_t \cdot t + \delta_i + \varepsilon_{it},$$

$$(Q - \hat{X})_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{PT}} \cdot \text{PT}_i + \lambda_{\hat{X}} \cdot \hat{X}_{it} + \lambda_{Qadj} \cdot (\overline{Q_s - X})_i + \lambda_t \cdot t + \delta_i + \varepsilon_{it}.$$

The subscripts i and t correspond to executive i and round t. The 0-1 dummy variables C_L and I_R are equal to 1 if the current data point is from a low-cost treatment and a repeated-interaction treatment, respectively. The variables NT_i and PT_i represent executive i's network trust and preconditioned trust. We estimate the regressions with the affect-based or cognition-based measures separately because these two dimensions are significantly correlated within either network trust or preconditioned trust (see Table 3). We include the term $(\overline{Q_s - X})_i$ to control for executive i's capability to finding the optimal production decision if he or she can observe the actual forecast (see §4). The error terms include an individual-specific error δ_i and an independent error ε_{it}, capturing the random-effects structure. The regression estimates are summarized in Table 5.[17]

---

[16] Because our participants make decisions over multiple rounds, we use random-effects models to accommodate repeated measures in our data (e.g., Montmarquette et al. 2004, Özer et al. 2011). In addition, we verify that the demographic and background characteristics of the executives in the two cohorts are not significantly different (Wilcoxon rank sum tests (on continuous variables) and χ^2 tests (on proportions) for comparing all variables listed in Table 1 between the two cohorts, $p > 0.1$). Thus, analyzing all data in a pooled regression is appropriate. In §5.5, we further discuss the effects of the executives' demographics and backgrounds on their behaviors.

[17] We use two-sided (resp., one-sided) t tests when a hypothesis being tested is non-directional (resp., directional).

Table 5   Effects of Network and Preconditioned Trust on Executives' Trust Behaviors

Variable	Value (standard error)			
	Supplier's $(Q - \hat{X})$			
Intercept	-20.46 (29.31)	-136.92 (81.21)*	1.78 (17.24)	8.05 (21.43)
C_L	70.98 (18.32)***	63.10 (18.74)***	76.16 (17.74)***	69.69 (19.34)***
I_R	25.25 (16.62)*	32.12 (17.21)**	21.25 (15.81)*	20.84 (16.80)
NT-Affect	5.09 (3.08)*	–	–	–
NT-Cognition	–	20.22 (10.22)**	–	–
PT-Affect	–	–	14.55 (6.64)**	–
PT-Cognition	–	–	–	7.40 (8.51)
$\hat{X}$	-0.33 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***
$\overline{(Q_1 - X)}$	0.27 (0.16)*	0.21 (0.16)	0.22 (0.15)	0.30 (0.17)*
t	-0.34 (0.72)	-0.34 (0.72)	-0.34 (0.72)	-0.34 (0.72)

Note. "–" means the variable is not present in the regression.
***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

First note that everything else being equal, a higher value of the dependent variable in our regressions means that the supplier makes a higher production decision, i.e., showing stronger trust behavior. We observe from Table 5 that except for cognition-based preconditioned trust, all other three measures of trust attitudes have significantly positive coefficients. That is, executives with higher network trust (in either dimension) or higher preconditioned trust (in the affect dimension) demonstrate more trustful behaviors in forecast information sharing. We suspect that the lack of significance for the cognition-based preconditioned trust may be due to the low variance in this measure (see Table 3). Thus, our data supports Hypothesis 1 in both affect and cognition dimensions, and supports Hypothesis 2 in the affect dimension.

We next investigate the interaction effect between network trust and preconditioned trust on the suppliers' trust behaviors; i.e., Hypotheses 3A and 3B. We do so by examining the impact of network trust on the trust behaviors of executives with high preconditioned trust and those with low preconditioned trust separately. Because the cognition-based preconditioned trust does not significantly affect the executives' trust behaviors, we focus on the affect dimension of both network trust and preconditioned trust in this analysis. To simplify exposition, we hereafter omit reference to the affect dimension in our discussions. For our analysis, we first divide the suppliers into two groups based on their preconditioned trust. The "high-preconditioned-trust" (resp., "low-preconditioned-trust") group consists of executives with a preconditioned trust measure that is larger than or equal to 1 (resp., smaller than 1). Recall from §3 that preconditioned trust is calculated as the average response score to two statements, with a score of 0 to each statement meaning that the executive does not trust or is neutral about trusting his or her outside business partners. Therefore, a preconditioned trust measure of 1 or above implies that the executive is at least somewhat trusting for both statements. Hence, we use the value 1 to divide all suppliers from all three treatments into two groups. This division is further justified because in our data, the distributions of the executives' preconditioned trust are not significantly different across the three treatments $C_H I_S, C_L I_S,$ and $C_H I_R$ (Kruskal-Wallis rank sum test, $p > 0.9$). The above group definitions result in 21 high-preconditioned-trust suppliers (65.6%) and 11 low-preconditioned-trust suppliers (34.4%). We

then estimate the following random-effects regression model for the high- and low-preconditioned-trust suppliers separately.[18]

$$(Q - \hat{X})_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{NT}} \cdot \text{NT}_i + \lambda_{\hat{X}} \cdot \hat{X}_{it} + \lambda_{Q1adj} \cdot (\overline{Q_s - X})_i + \lambda_t \cdot t + \delta_i + \varepsilon_{it}.$$

Table 6 summarizes the regression estimates for both high- and low-preconditioned-trust suppliers. We highlight three observations. First, network trust has a significant positive effect on high-preconditioned-trust suppliers' behaviors in the game, but does not significantly affect the behavior of low-preconditioned-trust suppliers (i.e., the coefficient for NT is significantly positive only for high-preconditioned-trust suppliers). Second, repeated interactions significantly increase trust behaviors for low-preconditioned-trust suppliers, but have no effect on high-preconditioned-trust suppliers (i.e., the coefficient for I_R is significantly positive only for low-preconditioned-trust suppliers). Third, lowering the production cost always induces more trust behaviors in the game regardless of the suppliers' preconditioned trust (i.e., the coefficient for C_L is always significantly positive).

Table 6   Effects of Treatment Conditions and Network Trust on Suppliers' Behavior

Variable	Value (standard error)	
	High-preconditioned-trust suppliers	Low-preconditioned-trust suppliers
Intercept	-5.19 (36.91)	-16.82 (33.76)
C_L	64.68 (19.36)***	66.29 (23.03)**
I_R	2.70 (18.70)	54.45 (18.74)**
NT	5.44 (3.82)*	-0.12 (3.68)
$\hat{\xi}$	-0.30 (0.03)***	-0.39 (0.05)***
$(\overline{Q_1 - \xi})$	0.28 (0.21)	0.12 (0.15)
t	-1.50 (0.85)*	2.04 (1.34)

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

These observations support Hypothesis 3A instead of Hypothesis 3B. That is, within our data, *preconditioned trust functions as a prerequisite for network trust.* Thus, network trust matters only when an executive has high preconditioned trust to begin with. In addition, network trust plays a more important role in shaping such executives' trust behaviors than repeated interactions do. In sharp contrast to this observation, when the executives have low preconditioned trust, network trust has no effect on their behaviors. Instead, they rely on environmental factors such as repeated interactions in long-term relationships to determine how much they are willing to trust their partners. These results offer the first empirical evidence of how certain targeted measures of trust attitudes (network trust and preconditioned trust) and the supply chain environment (production cost and the length of the relationship) jointly influence

---

[18] Alternatively, we run another regression with all suppliers' data: $(Q - \hat{X})_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{NT}} \cdot \text{NT}_i + \lambda_{\text{HiPT}} \cdot \text{HiPT} + \lambda_{\text{HiPT},C_L} \cdot \text{HiPT} \cdot C_L + \lambda_{\text{HiPT},I_R} \cdot \text{HiPT} \cdot I_R + \lambda_{\text{HiPT,NT}} \cdot \text{HiPT} \cdot \text{NT}_i + \lambda_{\hat{X}} \cdot \hat{X}_{it} + \lambda_{Q1adj} \cdot (\overline{Q_s - X})_i + \lambda_t \cdot t + \delta_i + \varepsilon_{it}.$ Here, the variable HiPT is a dummy variable that equals 1 if an executive belongs to the high-preconditioned-trust group and 0 otherwise. Including the interaction terms between HiPT and each of C_L, I_R, and NT_i allows us to examine whether a low cost, engaging in repeated interactions, and the executives' network trust have different effects on their trust behaviors depending on their level of preconditioned trust. We confirm that results from this alternative regression are the same as those reported in the paper.

high-ranking executives' trust behaviors in a business exchange context (forecast information sharing in a dyadic supply chain).

We also examine how network trust, network trustworthiness, and preconditioned trust affect the executives' trustworthy behaviors as retailers in the forecast information sharing game. We observe that none of these measures has any significant effect on the retailers' behaviors (see Appendix A, Table A.1). These results suggest that the retailer's tendency to exert trustworthy behaviors does not correspond to their trust attitudes or how trustworthy they are perceived by their EMBA peers. Because trust is relational whereas trustworthiness is only limitedly relational (Levi and Stoker 2000), it is not too surprising to observe a lack of correlation between the executives' trust attitudes and the extent of trustworthy behaviors they demonstrate.

5.3.   Are the Executives' Behaviors Similar to or Different from College Students'?

We next investigate whether there exist systematic differences in the behaviors of executives and those of college students (i.e., Hypothesis 4). To do so, we compare the current data obtained from executives to the data obtained from U.S. college students collected by Özer et al. (2014) under the same treatment conditions. Comparing our findings to this particular dataset is justified because we follow the same experimental design, procedures, and measurements of trust and trustworthy behaviors for the forecast information sharing game as in Özer et al. (2014).
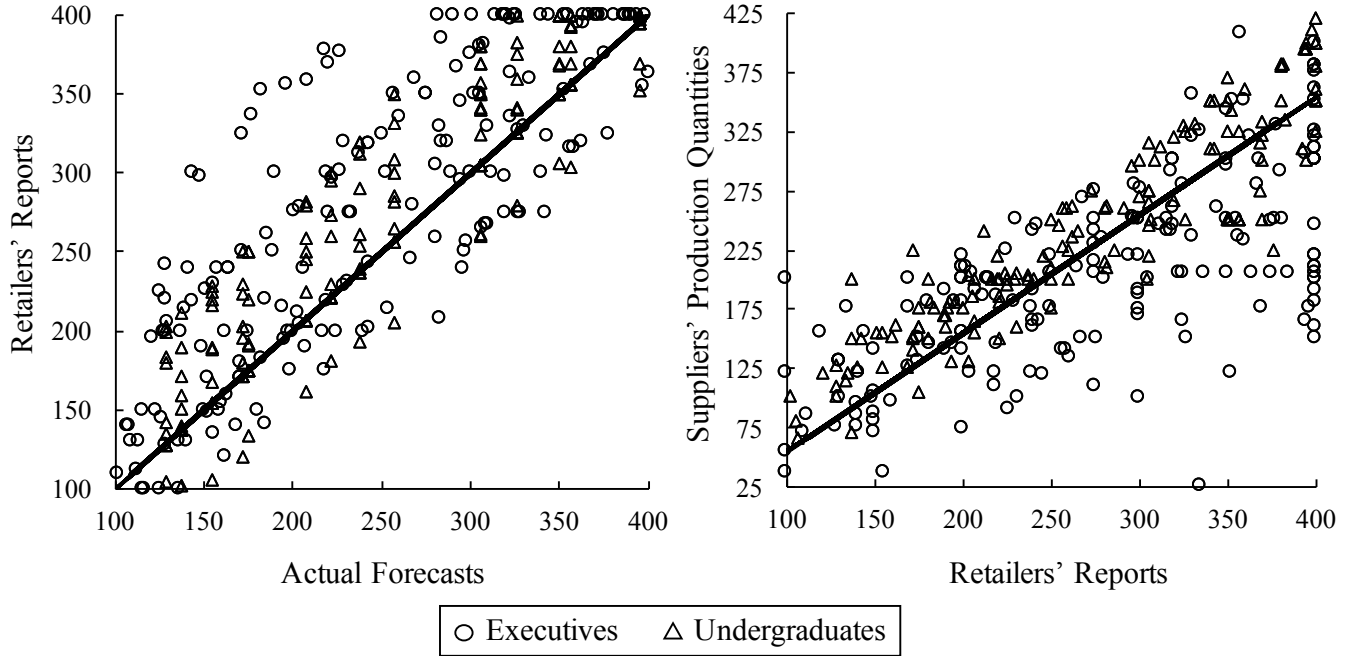
Figure 2 compares the decisions of the executives in the current study with those of the college students in Özer et al. (2014) for treatment $C_H I_S$. Circles represent data from the executive sample, and triangles represent data from the college student sample. The left panel illustrates the retailers' reports relative to their actual forecasts, and the right panel illustrates the suppliers' production quantities relative to the retailers' reports. The solid line in the left panel corresponds to the 45-degree line; any circle or triangle on this line represents a retailer participant that truthfully shared his or her forecast with the supplier. The solid line in the right panel corresponds to the optimal production quantities for suppliers who fully trust the retailers' reports;[19] any circle or triangle on or above this line represents a supplier that exhibited relatively high trust toward the reports they received. The figures for the other two treatments are very similar to the ones presented. We observe substantial overlaps between the two data samples, providing visual evidence that the behaviors of executives and the behaviors of college students are similar.

To statistically analyze potential behavioral differences (or the lack thereof) between the two samples, we examine the following random-effects regression models.[20]

$$\hat{X}_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{Exec}} \cdot \text{Exec} + \lambda_{\text{Exec} \cdot C_L} \cdot \text{Exec} \cdot C_L + \lambda_{\text{Exec} \cdot I_R} \cdot \text{Exec} \cdot I_R$$

---

[19] Formally, given a report $\hat{X}$, the optimal production quantity if the supplier fully trusts the report is $\hat{X} + G^{-1}((w-c)/w)$, where $G^{-1}(\cdot)$ is the inverse of the CDF of market uncertainty, w is the wholesale price, and c is the production cost.

[20] Because the retailers' reports are bounded between 100 and 400, we are in a situation with boundary conditions and hence, applying a Tobit regression model is desirable. We repeat all of our analysis of the retailers' behaviors using a random-effects Tobit regression model (see, e.g., Özer et al. 2014) and obtain similar results. We report results from the simpler random-effects linear model here because the parameter estimates are easier to interpret.

Figure 2   Comparing Behaviors of Executives and College Students (Treatment C$_H$I$_S$)

$\boxed{\bigcirc \text{ Executives} \qquad \triangle \text{ Undergraduates}}$

$$+\lambda_X \cdot X_{it} + \lambda_t \cdot t + \delta_i + \varepsilon_{it}, \tag{2}$$

$$(Q - \hat{X})_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{Exec}} \cdot \text{Exec} + \lambda_{\text{Exec} \cdot C_L} \cdot \text{Exec} \cdot C_L + \lambda_{\text{Exec} \cdot I_R} \cdot \text{Exec} \cdot I_R$$

$$+\lambda_{\hat{X}} \cdot \hat{X}_{it} + \lambda_{Qadj} \cdot (\overline{(Q_s - X)})_i + \lambda_t \cdot t + \delta_i + \varepsilon_{it}. \tag{3}$$

The 0-1 dummy variable Exec are equal to 1 if the current data point is from an executive participant. We include the interaction terms $\text{Exec} \cdot C_L$ and $\text{Exec} \cdot I_R$ to investigate whether the supply chain conditions have different effects on executives versus college students. All other variables are defined the same as in the regression models in §5.2. Table B.1 in Appendix B summarizes the coefficient estimates for both Equations (2) and (3).

Table 7   Comparison of Executives' and College Students' Trust and Trustworthy Behaviors

Comparison	Coefficient	Value (standard error)	
		Retailer's $\hat{X}$	Supplier's $(Q_2 - \hat{X})$
C$_H$I$_S$: Executivies – Undergrads	λ_{Exec}	9.19 (15.43)	-42.78 (14.04)**
C$_L$I$_S$: Executives – Undergrads	$\lambda_{\text{Exec}} + \lambda_{\text{Exec} \cdot C_L}$	7.20 (15.28)	-6.01 (14.01)
C$_H$I$_R$: Executives – Undergrads	$\lambda_{\text{Exec}} + \lambda_{\text{Exec} \cdot I_R}$	16.06 (14.60)	-19.21 (13.45)
Executives: C$_L$I$_S$ – C$_H$I$_S$	$\lambda_{C_L} + \lambda_{\text{Exec} \cdot C_L}$	7.29 (15.02)	67.01 (14.54)**
Executives: C$_H$I$_R$ – C$_H$I$_S$	$\lambda_{I_R} + \lambda_{\text{Exec} \cdot I_R}$	-2.66 (14.31)	18.42 (13.47)†

†$p < 0.1$; **$p < 0.01$.

Table 7 summarizes the statistical results when comparing the trust behaviors of the executives to those of the college students in Özer et al. (2014). We first observe from column 3 of Table 7 that none of the coefficients are significant. Hence, the executives and the college students behave very similarly in the role of retailers regardless of the supply chain condition. This observation suggests that the extent

of trustworthy behaviors the retailers exhibit is quite stable in the face of changes to the supply chain environment that we study. Our result is in line with earlier findings that trustworthiness is mainly driven by unconditional kindness (Ashraf et al. 2006) and hence, is a relatively stable trait. Second, we observe from column 4 of Table 7 that the only significant result occurs under treatment $C_H I_S$. In this treatment, the coefficient estimate λ_{Exec} is significantly negative; thus, all else being equal, the executives in the role of suppliers in this treatment set much lower production quantities than the college students do. Hence, when the production cost is high and under single interactions, the executives exhibit much lower trust. However, when either the production cost is low or the participants engage in repeated interactions, the executives do not behave significantly differently from the college students in the role of suppliers. Finally, in rows 4 and 5 and column 4 of Table 7, we observe that both lowering the production cost and engaging in repeated interactions significantly increase the executives' trust behaviors in the game. These results are consistent with prior findings based on experiments using college students (Özer et al. 2011, 2014). The above observations demonstrate that despite their far more extensive business experiences, our executives exhibit trust and trustworthy behaviors very similar to those demonstrated by college students in prior studies, as long as the vulnerability entailed by trusting is not too high. Hence, we find partial support for Hypothesis 4, noting the exception that executives are more sensitive to their level of vulnerability when determining whether or not to trust.

5.4. The Impact of Trust on Supply Chain Efficiency

Here we discuss how much trust impacts supply chain efficiency among our executive sample. We define supply chain efficiency as the ratio of the expected supply chain profit given the supplier's actual production decision to the optimal expected supply chain profit given the optimal production decision in a centralized system. Formally, let Q^c be the integrated or centralized firm's optimal production decision and Q be the supplier's actual production decision. Then the corresponding supply chain efficiency is $E = [r\mathbb{E}_Y \min\{X + Y, Q\} - cQ]/[r\mathbb{E}_Y \min\{X + Y, Q^c\} - cQ^c] \times 100\%$. To analyze the impact of trust on supply chain efficiency, we estimate a set of random-effects regression models where the dependent variable is the observed supply chain efficiency and the independent variables include the treatment dummies and the executives' network trust and preconditioned trust. In addition, as in our earlier analysis, we divide the data into high-preconditioned-trust and low-preconditioned-trust groups based on the suppliers' preconditioned trust, and then analyze the effect of network trust on supply chain efficiency for these two groups separately. The detailed regression results of these analyses are summarized in Appendix C. The results are consistent with our earlier findings. In particular, when we examine the effects of network trust and preconditioned trust using the data from all participants, both trust attitudes in both affect and cognition dimensions have a significantly positive effect on supply chain efficiency. That is, if the supplier in a supply chain has higher network trust or higher preconditioned trust, then the supply chain is more efficient. When we separate the data into supply chains involving high- versus low-preconditioned-trust suppliers, we again observe that network trust has a significantly positive effect on supply chain

efficiency only when the supply chain has a high-preconditioned-trust supplier; for supply chains with a low-preconditioned-trust supplier, network trust has no effect at all.

5.5.   The Effects of the Executives' Backgrounds and Game Experiences

The rich biographical data we have on our executives allows us to study the effects of their demographic and personal backgrounds on their behaviors in the forecast information sharing game. The demographic variables we obtain include gender and age. The background information available to us includes years of work experience, whether the executive has a doctorate degree, whether the executive's most recent position is in a service-oriented or product-oriented industry, whether the executive's most recent position is directly related to primary value chain functions (e.g., sourcing, production, sales) as opposed to indirect support functions (e.g., human resource, research & development, finance), and whether the executive's most recent position is at the C-level or higher. We include these demographic and background factors in our regression analysis to investigate their effects on the executives' behaviors in the game (see Appendix D, Tables D.1 and D.2). Regarding the suppliers' trust behaviors, we observe that having worked in a direct value chain function increases trust; these executives make higher production decisions, all else being equal. In addition, among high-preconditioned-trust suppliers, longer years of work experience leads to lower trust, whereas working in a service-oriented industry increases trust. Regarding the retailers' trustworthy behaviors, none of the demographic or background factors has a significant effect.

Our executives may adjust their behaviors during the experiment after observing the outcomes of interactions in prior rounds. Thus, we also analyze how such feedback information affects the executives' decisions over time (see Appendix D, Tables D.3–D.6). For the suppliers, we examine their feedback with either the value of $(\hat{X} - D)$ in the immediate last round or the average value of this term in all past rounds. Here, $\hat{X}$ is the report from the retailer matched with the supplier, and D is the realized demand. We observe that both immediate and average feedback have a significantly negative effect on the suppliers' trust behaviors ($p < 0.01$). Namely, if a supplier has observed a report higher than the realized demand (indicating the possibility of deception) in the past, then the supplier would reduce his production quantity going forward. For the retailers, we examine their feedback with either the value of $(Q_2 - \hat{X})$ in the immediate last round or the average value of this term in all past rounds. Here, $\hat{X}$ is the retailer's report, and Q_2 is the production quantity from the supplier matched with this retailer. We do not observe any significant effect of the feedback terms on the retailers' behaviors.

Importantly, we note that all of our prior conclusions about the executives' behaviors under different treatment conditions, as well as the roles of network trust and preconditioned trust in shaping their trust behaviors, remain unchanged after controlling for demographics, backgrounds, and feedback in the game.

6.   Discussion and Conclusions

In this paper, we design a social network survey and combine it with a forecast information sharing experiment to study the roles of trust and trustworthiness in shaping high-ranking executives' information

sharing and inventory decisions. Together, the social network survey and the business decision game allow us to investigate whether and how the executives' *trust behaviors*, as reflected by their actual decisions, are influenced by their *trust attitudes* toward different targets relevant to the business context. Our executives have on average 17 years of work experience, and over half of them have worked in C-level or higher positions at world-leading organizations. By examining the roles of trust and trustworthiness among this sample, we offer strong external validation of the extent to which these non-pecuniary, behavioral factors may influence costly business decisions and the overall efficiency of business interactions. Contrary to the conventional wisdom that managers are primarily focused on financial objectives, we demonstrate that executives are significantly motivated by trust in business decisions, and are cognizant of when to rely on trust and trustworthiness.

In particular, we offer the first empirical evidence of how targeted measures of trust attitudes (*network trust* and *preconditioned trust*) and the supply chain environment (the supplier's production cost and the length of relationship) jointly influence high-ranking executives' *trust behaviors* in a business decision context (forecast information sharing in a dyadic supply chain). Network trust describes the executives' trust attitudes toward other executives in their EMBA cohort, who represent their potential partners in the forecast information sharing game. Preconditioned trust describes the executives' trust attitudes toward other business professionals outside the cohort with whom they have interacted in prior relationships. Our results show that considered separately, both trust attitudes positively correlate with trust behaviors. Hence, executives with higher network trust or higher preconditioned trust exhibit more trust behaviors in the game. When examining the interaction effect of these two targeted measures of trust attitudes, we find support for the proposition that preconditioned trust is a prerequisite for network trust. That is, network trust matters only for those executives who have high preconditioned trust to begin with. These executives consciously base their trust behaviors on the perceived trustworthiness of their partners (i.e., network trust) and do not rely on repeated interactions to decide how much to trust. In contrast, executives with low preconditioned trust do not believe in social capital and as a result, resort to environmental factors (e.g., repeated interactions) to determine how they will behave. By comparing the executives' behaviors in the forecast information sharing game with the behaviors of college students in similar prior studies, we show that (i) both samples exhibit very similar trustworthy behaviors regardless of the supply chain condition, and (ii) the trust behaviors of the two samples are also very similar, provided that the vulnerability entailed by trusting is not too high. However, when such vulnerability is high, e.g., when the supplier's production cost is high and the parties interact only once, executives are more careful about trusting than college students.

Our results have valuable implications for both future research and management practices. For researchers, our study facilitates the integration and further advancement of our knowledge of trust by demonstrating a path with which trust measures from attitudinal surveys and those from experiments of business games may be reconciled. We show that when targets of trust are specified in surveys eliciting

trust attitudes and correspond to the target of trust behaviors, there is significant correlation between these targeted measures of trust attitudes and the trust behaviors in business decisions. We further demonstrate that different targeted measures of trust attitudes can affect trust behaviors to different degrees, thus highlighting the need to define the relevant targets of trust carefully when measuring trust attitudes. Another implication that our findings have for researchers is that experimentation with student participants does serve as a valid preliminary method for understanding manager and executive behavior. Given their accessibility and the lower costs involved, students represent a useful population sample for researchers seeking to advance behavioral research in the operations, supply chain, and management fields, in general. Nevertheless, we also highlight the need for researchers to examine to the greatest extent possible, the external validity of their experimental findings with student participants for more experienced populations. This validity check is particularly valuable if the research context concerns an environment in which the decisions being studied involve high risks and stakes.

Managerially, we show that executives are highly cognizant of when to trust and when not to. Accordingly, by better leveraging this intelligence, organizations can reduce frictions and improve efficiency. For example, organizations could benefit by more strategically assigning responsibilities (e.g., developing new business partners) to managers with high preconditioned trust, as these managers are mindful of the value of trust and will consciously account for the perceived trustworthiness of the partner when deciding how much to trust. In addition, such managers are more likely to initiate relationships based on trust rather than relying on long-term, committed relationships to cultivate trustworthy behavior among their partners; thus more open, new business opportunities can arise. Note that even trusting executives do not trust blindly. They are better than non-experienced individuals (e.g., college students) at recognizing the risks and vulnerabilities in an environment that could make it riskier to trust. This skill benefits organizations in two ways. First, if the organizations could better understand the environmental and institutional factors that result in lower trust, they could make efforts to alleviate or even eliminate these factors. Second, organizations could also more effectively distinguish situations when relying on trust alone would be sufficient from situations when establishing formal contracts or committed relations would be necessary. Consequently, supply chains could largely reduce unnecessary transaction costs by eliminating activities that only serve to monitor and curtail opportunistic behaviors but add no value.

References

Ahuja, G. 2000. Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative Science Quarterly* **45**(3) 425–455.

Ajzen, I. 1991. The theory of planned behavior. *Organizational Behavior & Human Decision Process* **50**(2) 179–211.

Ajzen, I., M. Fishbein. 1977. Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin* **84**(5) 888–918.

Anderson, J., S. Burks, J. Carpenter, L. Götte, K. Maurer, D. Nosenzo, R. Potter, K. Rocha, A. Rustichini. 2013. Self-selection and variations in the laboratory measurement of other-regarding preferences across subject pools: Evidence from one college student and two adult samples. *Experimental Economics* **16**(2) 170–189.

Andersson, M. 2012. Dispositional optimism and the emergence of social network diversity. *Sociological Quarterly* **53**(1) 92–115.

Arrow, K. 1972. Gifts and exchanges. *Philosophy & Public Affairs* **1**(4) 343–362.

Arrow, K., T. Harris, J. Marschak. 1951. Optimal inventory policy. *Econometrica* **19**(3) 250–272.

Ashraf, N., I. Bohnet, N. Piankov. 2006. Decomposing trust and trustworthiness. *Experimental Economics* **9**(3) 193–208.

Azoulay, P., N. Repenning, E. Zuckerman. 2010. Nasty, brutish, and short: Embeddedness failure in the pharmaceutical industry. *Administrative Science Quarterly* **55**(3) 472–507.

Bartling, B., R. Weber, L. Yao. 2015. Do markets erode social responsibility? *Quarterly Journal of Economics* **130**(1) 219–266.

Beck, A., R. Kerschbamer, J. Qiu, M. Sutter. 2014. Car mechanics in the lab – Investigating the behavior of real experts on experimental markets for credence goods. *Journal of Economic Behavior & Organization* **108**(1) 166–173.

Beer, R., H. Ahn, S. Leider. 2015. Can trustworthiness in a supply chain be signaled? Working paper, Indiana University, Bloomington, IN.

Bellemare, C., S. Kröger. 2007. On representative social capital. *European Economic Review* **51**(1) 183–202.

Bellemare, C., S. Kröger, A. van Soest. 2008. Measuring inequity aversion in a heterogeneous population using experimental decisions and subjective probabilities. *Econometrica* **76**(4) 815–839.

Ben-Ner, A., F. Halldorsson. 2010. Trusting and trustworthiness: What are they, how to measure them, and what affects them. *Journal of Economic Psychology* **31**(1) 64–79.

Berg, J., J. Dickhaut, K. McCabe. 1995. Trust, reciprocity, and social history. *Games & Economic Behavior* **10**(1) 122–142.

Bigoni, M., G. Camera, M. Casari. 2013. Strategies of cooperation and punishment among students and clerical workers. *Journal of Economic Behavior & Organization* **94**(1) 172–182.

Bohm, P. 1994. Behaviour under uncertainty without preference reversal: A field experiment. J. Hey, ed., *Experimental Economics*, chap. 2. Springer-Verlag GmbH, Berlin, Germany, 5–20.

Bohnet, I., F. Greig, B. Herrmann, R. Zeckhauser. 2008. Betrayal aversion: Evidence from Brazil, China, Oman, Switzerland, Turkey, and the United States. *American Economic Review* **98**(1) 294–310.

Bolton, G., E. Katok. 2008. Learning-by-doing in the newsvendor problem: A laboratory investigation of the role of experience and feedback. *Manufacturing & Service Operations Management* **10**(3) 519–538.

Bolton, G., A. Ockenfels, U. Thonemann. 2012. Managers and students as newsvendors. *Management Science* **58**(12) 2225–2233.

Bonacich, P. 1987. Power and centrality: A family of measures. *American Journal of Sociology* **92**(5) 1170–1182.

Borgatti, S., R. Cross. 2003. A relational view of information seeking and learning in social networks. *Management Science* **49**(4) 432–445.

Borgatti, S., M. Everett, L. Freeman. 2002. UCINET VI User Manual. Analytic Technologies, Columbia, SC.

Brehm, J., W. Rahn. 1997. Individual-level evidence for the causes and consequences of social capital. *American Journal of Political Science* **41**(3) 999–1023.

Cai, H., J. Wang. 2006. Overcommunication in strategic information transmission games. *Games & Economic Behavior* **56**(1) 7–36.

Camerer, C. 2003. *Behavioral Game Theory: Experiments in Strategic Interaction*. Princeton University Press, Princeton, NJ.

Camerer, C., A. Dreber, E. Forsell, T. Ho, J. Huber, M. Johannesson, M. Kirchler, J. Almenberg, A. Altmejd, T. Chan, E. Heikensten, F. Holzmeister, T. Imai, S. Isaksson, G. Nave, T. Pfeiffer, M. Razen, H. Wu. 2016. Evaluating replicability of laboratory experiments in economics. *Science* **351**(6280) 1433–1436.

Carpenter, J., C. Connolly, C. Myers. 2008. Altruistic behavior in a representative dictator experiment. *Experimental Economics* **11**(3) 282–298.

Chua, R., P. Ingram, M. Morris. 2008. From the head and the heart: Locating cognition- and affect-based trust in managers' professional networks. *Academy of Management Journal* **51**(3) 436–452.

Clark, M., J. Mills. 1979. Interpersonal attraction in exchange and communal relationships. *Journal of Personality & Social Psychology* **37**(1) 12–24.

Clark, M., J. Mills, M. Powell. 1986. Keeping track of needs in communal and exchange relationships. *Journal of Personality & Social Psychology* **51**(2) 333–338.

Cohen, M., T. Ho, Z. Ren, C. Terwiesch. 2003. Measuring imputed cost in the semiconductor equipment supply chain. *Management Science* **49**(12) 1653–1670.

Cook, J., T. Wall. 1980. New work attitude measures of trust, organizational commitment and personal need nonfulfillment. *Journal of Occupational Psychology* **53**(1) 39–52.

Crawford, V., J. Sobel. 1982. Strategic information transmission. *Econometrica* **50**(6) 1431–1451.

Croson, R., K. Donohue. 2006. Behavioral causes of the bullwhip effect and the observed value of inventory information. *Management Science* **52**(3) 323–336.

Cross, R., J. Cummings. 2004. Tie and network correlates of performance in knowledge intensive work. *Academy of Management Journal* **47**(6) 928–937.

Cummings, L., P. Bromiley. 1996. The organizational trust inventory (OTI): Development and validation. R. Kramer, T. Tyler, eds., *Trust in Organizations: Frontiers of Theory and Research*. SAGE Publications, Inc., Thousand Oaks, CA, 261–287.

DellaVigna, S. 2009. Psychology and economics: Evidence from the field. *Journal of Economic Literature* **47**(2) 315–372.

Duersch, P., J. Oechssler, R. Vadovic. 2012. Sick pay provision in experimental labor markets. *European Economic Review* **56**(1) 1–19.

Dunn, J., N. Ruedy, M. Schweitzer. 2012. It hurts both ways: How social comparisons harm affective and cognitive trust. *Organizational Behavior & Human Decision Processes* **117**(1) 2–14.

Dyer, D., J. Kagel. 1996. Bidding in common value auctions: How the commercial construction industry corrects for the winner's curse. *Management Science* **42**(10) 1463–1475.

Eckel, C., P. Grossman. 1996. Altruism in anonymous dictator games. *Games & Economic Behavior* **16**(2) 181–191.

Everett, M., S. Borgatti. 2014. Networks containing negative ties. *Social Networks* **38** 111–120.

Falk, A., N. Szech. 2013. Morals and markets. *Science* **340**(6133) 707–711.

Fehr, E., U. Fischbacher, B. von Rosenbladt, J. Schupp, G. Wagner. 2003. A nation-wide laboratory: Examining trust and trustworthiness by integrating behavioral experiments into representative surveys. The Institute for the Study of Labor (IZA) Discussion Paper Series, No. 715, Bonn, Germany.

Fehr, E., J. List. 2004. The hidden costs and returns of incentives – Trust and trustworthiness among CEOs. *Journal of the European Economic Association* **2**(5) 743–771.

Ferrin, D., K. Dirks, P. Shah. 2006. Direct and indirect effects of third-party relationships on interpersonal trust. *Journal of Applied Psychology* **91**(4) 870–883.

Fishbein, M., I. Ajzen. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Addison-Wesley, Reading, MA.

Forsythe, R., R. Lundholm, T. Rietz. 1999. Cheap talk, fraud, and adverse selection in financial markets: Some experimental evidence. *Review of Financial Studies* **12**(3) 481–518.

Freeman, L. 1979. Centrality in social networks: Conceptual clarification. *Social Networks* **1**(3) 215–239.

Freeman, L. 1984. Turning a profit from mathematics: The case of social networks. *Journal of Mathematical Sociology* **10**(3–4) 343–360.

Glaeser, E., D. Laibson, J. Scheinkman, C. Soutter. 2000. Measuring trust. *Quarterly Journal of Economics* **115**(3) 811–846.

Granovetter, M. 1985. Economic action and social structure: The problem of embeddedness. *American Journal of Sociology* **91**(3) 481–510.

Hardin, R. 2002. *Trust and trustworthiness*. Russell Sage Foundation, New York, NY.

Harrison, G., J. List. 2004. Field experiments. *Journal of Economic Literature* **42**(4) 1009–1055.

Harrison, G., J. List. 2008. Naturally occurring markets and exogenous laboratory experiments: A case study of the winner's curse. *Economic Journal* **118**(528) 822–843.

Ho, T., K. Weigelt. 2005. Trust building among strangers. *Management Science* **51**(4) 519–530.

Holm, H., S. Opper, V. Nee. 2013. Entrepreneurs under uncertainty: An economic experiment in China. *Management Science* **59**(7) 1671–1687.

Inderfurth, K., A. Sadrieh, G. Voigt. 2013. The impact of information sharing on supply chain performance under asymmetric information. *Production & Operations Management* **22**(2) 410–425.

Johnson, N., A. Mislin. 2011. Trust games: A meta-analysis. *Journal of Economic Psychology* **32**(5) 865–889.

Kim, J., C. Meuller. 1978. *Introduction to Factor Analysis: What It Is and How to Do it*. Sage University Paper Series on Quantitative Applications in the Social Sciences, 07-013. Sage Publications, Inc, Newbury Park, CA.

Kline, P. 2000. *The Handbook of Psychological Testing*. 2nd ed. Routledge, London, United Kingdom.

Knack, S., P. Keefer. 1997. Does social capital have an economic payoff? A cross-country investigation. *Quarterly Journal of Economics* **112**(4) 1251–1288.

Kreps, D. 1990. Corporate culture and economic theory. J. Alt, K. Shepsle, eds., *Perspectives on Positive Political Economy*. Cambridge University Press, Cambridge, United Kingdom, 90–143.

La Porta, R., F. Lopez de Silanes, A. Shleifer, R. Vishny. 1997. Trust in large organizations. *American Economic Review* **87**(2) 333–338.

Lazzarini, S., G. Miller, T. Zenger. 2008. Dealing with the paradox of embeddedness: The role of contracts and trust in facilitating movement out of committed relationships. *Organization Science* **19**(5) 709–728.

Lee, H., V. Padmanabhan, S. Whang. 1997. Information distortion in a supply chain: The bullwhip effect. *Management Science* **43**(4) 546–558.

Levi, M., L. Stoker. 2000. Political trust and trustworthiness. *Annual Review of Political Science* **3** 475–507.

Levin, D., R. Cross. 2004. The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer. *Management Science* **50**(11) 1477–1490.

Levitt, S., J. List. 2007. What do laboratory experiments measuring social preferences reveal about the real world? *Journal of Economic Perspectives* **21**(2) 153–174.

Lewis, J., A. Weigert. 1985. Trust as a social reality. *Social Forces* **63**(4) 967–985.

Lindskold, S. 1978. Trust development, the GRIT proposal, and the effects of conciliatory acts on conflict and cooperation. *Psychological Bulletin* **85**(4) 772–793.

List, J. 2004. Young, selfish and male: Field evidence of social preferences. *The Economic Journal* **114**(492) 121–149.

Malhotra, D. 2004. Trust and reciprocity decisions: The differing perspectives of trustors and trusted parties. *Organizational Behavior & Human Decision Processes* **94**(2) 61–73.

Marsden, P. 1990. Network data and measurement. *Annual Review of Sociology* **16** 435–463.

Mayer, R., J. Davis. 1999. The effect of the performance appraisal system on trust for management: A field quasi-experiment. *Journal of Applied Psychology* **84**(1) 123–136.

McAllister, D. 1995. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of Management Journal* **38**(1) 24–59. URL `http://www.jstor.org/stable/256727`.

McEvily, B., V. Perrone, A. Zaheer. 2003. Trust as an organizing principle. *Organization Science* **14**(1) 91–103.

McEvily, B., J. Radzevick, R. Weber. 2012. Whom do you distrust and how much does it cost? An experiment on the measurement of trust. *Games & Economic Behavior* **74**(1) 285–298.

McEvily, B., M. Tortoriello. 2011. Measuring trust in organisational research: Review and recommendations. *Journal of Trust Research* **1**(1) 23–63.

McKnight, D., L. Cummings, N. Chervany. 1998. Initial trust formation in new organizational relationships. *Academy of Management Review* **23**(3) 473–490.

Montmarquette, C., J.-L. Rullière, M.-C. Villeval, R. Zeiliger. 2004. Redesigning teams and incentives in a merger: An experiment with managers and students. *Management Science* **50**(10) 1379–1389.

Organ, D. 1988. *Organizational Citizenship Behavior: The Good Soldier Syndrome*. Lexington Books, Lexington, MA.

Özer, Ö., U. Subramanian, Y. Wang. 2016. Information sharing, advice provision or delegation: What leads to higher trust and trustworthiness? Forthcoming in *Management Science*.

Özer, Ö., W. Wei. 2006. Strategic commitments for an optimal capacity decision under asymmetric forecast information. *Management Science* **52**(8) 1239–1258.

Özer, Ö., Y. Zheng, K. Chen. 2011. Trust in forecast information sharing. *Management Science* **57**(6) 1111–1137.

Özer, Ö., Y. Zheng, Y. Ren. 2014. Trust, trustworthiness, and information sharing in supply chains bridging China and the United States. *Management Science* **60**(10) 2435–2460.

Paruchuri, S. 2010. Intraorganizational networks, interorganizational networks, and the impact of central inventors: A longitudinal study of pharmaceutical firms. *Organization Science* **21**(1) 63–80.

Porter, M. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press, New York, NY.

Reagans, R., B. McEvily. 2003. Network structure and knowledge transfer: The effects of cohesion and range. *Administrative Science Quarterly* **48**(2) 240–267.

Reagans, R., E. Zuckerman. 2001. Networks, diversity, and productivity: The social capital of corporate R&D teams. *Organization Science* **12**(4) 502–517.

Rousseau, D., S. Sitkin, R. Burt, C. Camerer. 1998. Not so different after all: A cross-discipline view of trust. *Academy of Management Review* **23**(3) 393–404.

Scheele, L., M. Slikker, U. Thonemann. 2014. Designing incentive systems for truthful demand information sharing – Theory and experiment. Working paper, University of Cologne, Cologne, Germany.

Schweitzer, M., G. Cachon. 2000. Decision bias in the newsvendor problem with a known demand distribution: Experimental evidence. *Management Science* **46**(3) 404–420.

Shipilov, A., S. Li, H. Greve. 2011. The prince and the pauper: Search and brokerage in the initiation of status-heterophilous ties. *Organization Science* **22**(6) 1418–1434.

Snijders, C., G. Keren. 1999. Determinants of trust. D. Budescu, I. Erev, R. Zwick, eds., *Games & Human Behavior: Essays in Honor of Amnon Rapoport*. Lawrence Erlbaum Associates, Inc., Mahwah, NJ, 355–386.

Spiliotopoulou, E., K. Donohue, M. Gürbüz. 2016. Information reliability in supply chains: The case of multiple retailers. *Production & Operations Management* **25**(3) 548–567.

Starmer, C. 1999. Experiments in economics: Should we trust the dismal scientists in white coats? *Journal of Economic Methodology* **6**(1) 1–30.

Stuart, T. 2000. Interorganizational alliances and the performance of firms: A study of growth and innovation rates in a high-technology industry. *Strategic Management Journal* **21**(8) 791–811.

Sutter, M., M. Kocher. 2007. Trust and trustworthiness across different age groups. *Games & Economic Behavior* **59**(2) 364–382.

Uzzi, B. 1996. The sources and consequences of embeddedness for the economic performance of organizations. *American Sociological Review* **61**(4) 674–698.

Wasserman, S., K. Faust. 1994. *Social Network Analysis: Methods and Applications*. Cambridge University Press, Cambridge, United Kingdom.

World Values Survey. 2015. 1981-2014 longitudinal aggregate v.20150418. Aggregate data file produced by JDSystems, Madrid, Spain, retrieved at `www.worldvaluessurvey.org`.

Yamagishi, T., S. Akutsu, K. Cho, Y. Inoue, Y. Li, Y. Matsumoto. 2015. Two-component model of general trust: Predicting behavioral trust from attitudinal trust. *Social Cognition* **33**(5) 436–458.

Yamagishi, T., M. Yamagishi. 1994. Trust and commitment in the United States and Japan. *Motivation & emotion* **18**(2) 129–166.

Zak, P., S. Knack. 2001. Trust and growth. *Economic Journal* **111**(470) 295–321.

Zucker, L. 1986. Production of trust: Institutional sources of economic structure, 1840–1920. B. Staw, L. Cummings, eds., *Research in Organizational Behavior*, vol. 8. JAI Press, Greenwich, CT, 53–111.

Appendix A: Impacts of Network Trust, Network Trustworthiness, and Preconditioned Trust on Retailers' Trustworthy Behaviors

To test whether an executive's network trust, network trustworthiness, and preconditioned trust has an effect on his or her behavior as a retailer in the forecast information sharing game, we estimate the following random-effects regression models.

$$\hat{X}_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{NT}} \cdot \text{NT}_i + \lambda_X \cdot X_{it} + \lambda_t \cdot t + \delta_i + \varepsilon_{it},$$

$$\hat{X}_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{NTW}} \cdot \text{NTW}_i + \lambda_X \cdot X_{it} + \lambda_t \cdot t + \delta_i + \varepsilon_{it},$$

$$\hat{X}_{it} = \text{Intercept} + \lambda_{C_L} \cdot C_L + \lambda_{I_R} \cdot I_R + \lambda_{\text{PT}} \cdot \text{PT}_i + \lambda_X \cdot X_{it} + \lambda_t \cdot t + \delta_i + \varepsilon_{it}$$

The variables NT, NTW, PT represent the executive's network trust, network trustworthiness, and preconditioned trust. Similar to our analysis on the suppliers' behavior, we examine the affect and cognition dimension of each measure separately in each regression. Table A.1 summarizes the regression results. We observe that none of the three measures in any dimension has an effect on the retailers' behavior in any treatment.

Table A.1   Effects of Network Trust, Network Trustworthiness, and Preconditioned Trust on Trustworthy Behaviors

Variable	Value (standard error)					
	Retailer's $\hat{X}$					
Intercept	62.26 (22.29)***	74.45 (49.62)	65.55 (41.40)	65.94 (48.68)	82.86 (16.30)***	78.63 (21.58)***
C_L	8.12 (18.27)	6.92 (19.22)	7.65 (18.82)	8.13 (18.84)	7.06 (18.69)	7.51 (18.79)
I_R	4.96 (17.81)	-2.58 (17.92)	-2.52 (17.60)	-2.09 (17.81)	-1.52 (17.50)	-2.87 (17.50)
NT-Affect	3.52 (2.14)	–	–	–	–	–
NT-Cognition	–	2.10 (6.10)	–	–	–	–
NTW-Affect	–	–	3.45 (5.31)	–	–	–
NTW-Cognition	–	–	–	3.30 (6.17)	–	–
PT-Affect	–	–	–	–	7.39 (7.36)	–
PT-Cognition	–	–	–	–	–	6.93 (9.19)
X	0.77 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***
t	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)

Notes. "–" means the variable is not present in the regression.
***: $p < 0.01$; p values are derived from t tests.

Appendix B: Regression Estimates for Comparing the Behaviors of Executives and College Students

Table B.1 summarizes the coefficient estimates of Equations (2) and (3) for comparing behaviors between executives and college students in Özer et al. (2014). We also analyze a set of alternative regression models where we include the interaction term between the dummy variable Exec and the variable X (in the retailer regression) and $\hat{X}$ (in the supplier regression). Our results remain similar under these alternative models.

Appendix C: Regression Results on Supply Chain Efficiency

Table C.1 summarizes the regression results on how trust impacts supply chain efficiency. Each column corresponds to a different regression model with different sets of independent variables. We observe very similar results as in §5.2. First, having a low production cost always improves supply chain efficiency, as can be seen by the significantly positive coefficients for C_L in all models. Second, a supply chain involving a supplier with higher network trust or higher preconditioned trust in either affect or cognition dimension is more efficient, as shown in the significantly positive coefficients for the network trust and preconditioned trust measures in columns 2–5 of Table C.1. Third,

Table B.1 **Regression Estimates for Equations** (2) **and** (3)**:**
Executives versus College Students

Variable	Value (standard error)	
	Retailer's $\check{X}$	Supplier's $(Q_2 - \hat{X})$
Intercept	64.84 (12.04)**	37.40 (11.34)**
C_L	9.27 (15.67)	30.24 (14.63)*
I_R	-9.53 (15.68)	-5.15 (13.94)
Exec	9.19 (15.43)	-42.78 (14.04)**
Exec $\cdot C_L$	-2.00 (21.75)	36.77 (19.80)†
Exec $\cdot I_R$	6.87 (21.27)	23.57 (19.44)
X	0.81 (0.02)**	–
$\hat{X}$	–	-0.22 (0.02)**
$\overline{(Q_1 - X)}$	–	0.26 (0.12)*
t	0.41 (0.32)	-0.74 (0.35)*

Notes. "–" means the variable is not present in the regression.
†$p < 0.1$; *$p < 0.05$; **$p < 0.01$.

for supply chains involving a supplier with high preconditioned trust, supply chain efficiency significantly increases with the supplier's network trust but is not affected by repeated interactions (Table C.1, column 6). In contrast, for supply chains involving a supplier with low preconditioned trust, the supplier's network trust has no effect on supply chain efficiency, but efficiency is significantly higher under repeated interactions (Table C.1, column 7).

Table C.1 **Regression Results on Supply Chain Efficiency**

Variable	Value (standard error)				High-preconditioned-trust suppliers	Low-preconditioned-trust suppliers
	All suppliers					
Intercept	66.90 (6.55)***	52.26 (16.96)***	70.82 (4.57)***	67.79 (5.05)***	66.73 (7.28)***	82.99 (13.28)***
C_L	10.75 (3.31)***	9.45 (3.54)***	11.37 (3.14)***	10.08 (3.15)***	10.35 (3.09)***	11.17 (7.72)*
I_R	8.60 (3.32)***	9.36 (3.51)***	7.94 (3.11)**	8.15 (3.10)***	4.55 (6.81)	10.32 (3.33)***
NT-Affect	0.89 (0.61)*	–	–	–	0.56 (0.17)***	-0.08 (1.26)
NT-Cognition	–	2.81 (2.12)*	–	–	–	–
PT-Affect	–	–	2.92 (1.27)**	–	–	–
PT-Cognition	–	–	–	3.45 (1.44)**	–	–
X	0.02 (0.01)	0.02 (0.01)	0.01 (0.01)	0.02 (0.01)	0.04 (0.01)***	-0.05 (0.03)*
t	0.18 (0.32)	0.18 (0.32)	0.18 (0.32)	0.18 (0.32)	-0.22 (0.35)	0.91 (0.65)

Note. "–" means the variable is not present in the regression.
***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

Appendix D: Effects of Demographics, Backgrounds, and Game Experience on Behavior

We present here the regression estimates for the additional analyses in which we control for the executives' demographic and background factors, as well as the feedback they receive during the course of the experiment. We leave out the factors of age and having a doctorate degree in our regressions because (i) age is significantly correlated with years of work experience ($r = 0.86, p < 0.001$); and (ii) having a doctorate degree is significantly correlated with being in a position directly related to value chain functions ($r = 0.53, p < 0.001$). In addition, years of work experience is also significantly correlated with being in a C-level position ($r = 0.35, p = 0.01$). We estimate our regressions by including either years of work experience or being in a C-level position as a control variable and observe similar results. Therefore, we present here only the results controlling for years of work experience. Tables D.1 and D.2 summarize the regression results. We observe that being in a position directly related to value chain functions generally has a significantly positive effect on the suppliers' trust behaviors. In addition, among high-preconditioned-trust

suppliers, longer years of work experience leads to weaker trust behaviors, whereas working in a service-oriented company increases trust behaviors. Among retailers, none of the demographic or background factors have any effect on behavior.

Table D.1   Regression Results on Suppliers' $(Q_2 - \hat{X})$ When Controlling for Demographics and Backgrounds

	Value (standard error)				High-preconditioned-trust suppliers	Low-preconditioned-trust suppliers
Variable	All suppliers					
Intercept	-30.55 (36.04)	-142.42 (81.56)*	-2.27 (29.79)	9.48 (33.18)	21.90 (35.99)	-237.59 (86.49)***
C_L	86.32 (19.07)***	73.83 (20.15)***	88.93 (18.59)***	82.17 (20.84)***	69.23 (16.12)***	-2.17 (42.26)
I_R	39.87 (16.49)**	42.66 (17.31)**	32.25 (15.51)**	30.88 (17.11)*	7.02 (14.79)	5.58 (31.78)
NT-Affect	6.91 (2.92)**	–	–	–	7.21 (3.12)**	13.73 (6.62)
NT-Cognition	–	22.36 (10.55)**	–	–	–	–
PT-Affect	–	–	16.74 (6.13)**	–	–	–
PT-Cognition	–	–	–	7.09 (8.31)	–	–
$\hat{X}$	-0.33 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***	-0.31 (0.03)***	-0.43 (0.06)***
$\overline{(Q_1 - X)}$	0.17 (0.15)	0.14 (0.16)	0.12 (0.15)	0.21 (0.17)	0.13 (0.19)	0.01 (0.10)
t	-0.34 (0.72)	-0.34 (0.72)	-0.34 (0.72)	-0.34 (0.72)	-1.50 (0.85)*	2.02 (1.34)
Female	-4.39 (14.79)	2.10 (15.38)	-3.38 (14.40)	-7.20 (16.09)	-9.96 (16.19)	98.64 (50.60)
Work years	-2.03 (1.59)	-2.04 (1.62)	-1.69 (1.52)	-1.48 (1.69)	-3.98 (1.62)**	6.19 (2.83)
Service	13.65 (13.94)	8.05 (14.52)	19.05 (13.64)	15.09 (14.94)	25.74 (13.12)*	27.02 (13.96)
VC related	42.35 (17.90)**	31.07 (17.70)*	34.58 (16.96)*	30.93 (18.75)	22.67 (16.11)	94.46 (34.49)

Notes. The variables "Female," "Service," and "VC related" are dummy variables that are equal to 1 when the executive is female, works in a service-oriented industry, and works in a position directly related to value chain functions, respectively. "–" means the variable is not present in the regression.
***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

Table D.2   Regression Results on Retailers' $\hat{X}$ When Controlling for Demographics and Backgrounds

Variable	Value (standard error)					
Intercept	58.87 (32.06)*	69.16 (48.47)	55.17 (43.37)	54.82 (48.20)	74.55 (29.14)**	78.23 (30.16)***
C_L	14.08 (18.42)	12.33 (19.52)	13.33 (18.82)	13.92 (18.85)	13.30 (18.66)	12.64 (19.10)
I_R	13.71 (19.27)	6.15 (19.13)	6.73 (18.93)	7.26 (19.09)	8.80 (18.95)	4.56 (19.05)
NT-Affect	3.29 (2.14)	–	–	–	–	–
NT-Cognition	–	2.49 (6.88)	–	–	–	–
NTW-Affect	–	–	4.61 (5.37)	–	–	–
NTW-Cognition	–	–	–	4.86 (6.64)	–	–
PT-Affect	–	–	–	–	8.30 (7.16)	–
PT-Cognition	–	–	–	–	–	5.25 (10.18)
X	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***
t	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)	-0.36 (0.55)
Female	2.65 (16.67)	-1.95 (17.01)	-1.19 (16.81)	-2.05 (16.87)	0.34 (16.73)	0.50 (17.29)
Work years	-0.14 (1.14)	-0.30 (1.30)	-0.36 (1.20)	-0.43 (1.25)	-0.12 (1.15)	-0.35 (1.27)
Service	-11.43 (15.92)	-10.18 (16.41)	-10.27 (16.23)	-11.20 (16.39)	-11.05 (16.12)	-7.09 (17.01)
VC related	18.71 (15.47)	19.84 (16.65)	20.94 (15.68)	19.43 (16.01)	22.42 (15.54)	20.05 (16.09)

Notes. The variables "Female," "Service," and "VC related" are dummy variables that are equal to 1 when the executive is female, works in a service-oriented industry, and works in a position directly related to value chain functions, respectively. "–" means the variable is not present in the regression.
***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

Tables D.3–D.6 summarize the regression results when feedback in the experiment is controlled for. We observe that the feedback variable has a significantly negative coefficient in all supplier regressions (except that immediate feedback has no effect on high-preconditioned-trust suppliers' behaviors). The negative coefficients imply that all else being equal, observing a higher report in the past leads to a larger (downward) production adjustment by the

Table D.3   Regression Results on Suppliers' $(Q_2 - \hat{X})$ When Controlling for Game Feedback

	Value (standard error)							
Variable	Feedback in immediate last round				Average feedback in all past rounds			
Intercept	-21.31 (29.02)	-151.98 (79.28)*	5.10 (17.61)	11.61 (21.66)	10.55 (28.18)	-127.09 (72.82)*	23.64 (16.77)	29.98 (20.47)
C_L	68.49 (17.91)***	59.65 (18.19)***	73.85 (17.54)***	67.66 (19.11)***	73.75 (16.90)***	64.57 (16.65)***	78.30 (15.95)***	72.13 (17.54)***
I_R	20.58 (16.29)	28.34 (16.76)*	16.04 (15.68)	15.60 (16.65)	13.36 (15.44)	22.32 (15.39)*	10.50 (14.31)	10.09 (15.32)
NT-Affect	5.57 (3.02)**	–	–	–	3.84 (2.87)*	–	–	–
NT-Cognition	–	22.52 (9.96)**	–	–	–	21.68 (9.12)**	–	–
PT-Affect	–	–	14.17 (6.57)**	–	–	14.01 (5.97)**	–	–
PT-Cognition	–	–	–	7.00 (8.42)	–	–	–	7.01 (7.72)
$\hat{X}$	-0.34 (0.03)***	-0.34 (0.03)***	-0.34 (0.03)***	-0.34 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***	-0.33 (0.03)***
$(\overline{Q_1 - X})$	0.25 (0.15)	0.19 (0.15)	0.20 (0.15)	0.28 (0.17)	0.28 (0.15)*	0.23 (0.14)	0.24 (0.14)*	0.32 (0.16)*
t	0.13 (0.80)	0.13 (0.80)	0.13 (0.80)	0.13 (0.80)	-0.53 (0.79)	-0.55 (0.79)	-0.55 (0.79)	-0.55 (0.79)
$(\hat{X} - D)$	-0.10 (0.04)***	-0.10 (0.04)***	-0.10 (0.04)***	-0.10 (0.04)***	-0.54 (0.10)***	-0.55 (0.10)***	-0.55 (0.10)***	-0.55 (0.10)***

Note. "–" means the variable is not present in the regression.

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

Table D.4   Regression Results on High- and Low-Preconditioned-Trust Suppliers' $(Q_2 - \hat{X})$ When Controlling for Game Feedback

	Value (standard error)			
	Feedback in immediate last round		Average feedback in all past rounds	
Variable	High-preconditioned-trust suppliers	Low-preconditioned-trust suppliers	High-preconditioned-trust suppliers	Low-preconditioned-trust suppliers
Intercept	-5.02 (37.13)	-19.88 (35.94)	26.76 (35.48)	10.79 (36.51)
C_L	63.22 (19.19)***	61.52 (24.82)**	69.50 (17.83)***	68.27 (24.69)**
I_R	0.97 (18.60)	44.77 (20.19)**	-5.38 (17.31)	36.34 (20.21)*
NT	5.79 (3.79)*	0.62 (3.95)	4.22 (2.53)*	-1.38 (3.96)
$\hat{X}$	-0.31 (0.04)***	-0.38 (0.05)***	-0.31 (0.04)***	-0.38 (0.05)***
$(\overline{Q_1 - X})$	0.25 (0.20)	0.13 (0.17)	0.25 (0.19)	0.19 (0.17)
t	-1.05 (0.98)	2.48 (1.42)*	-2.03 (0.98)**	2.61 (1.35)*
$(\hat{X} - D)$	-0.07 (0.04)	-0.15 (0.07)**	-0.53 (0.13)***	-0.59 (0.15)***

Note. "–" means the variable is not present in the regression.

***: $p < 0.01$; **: $p < 0.05$; *: $p < 0.1$; p values are derived from t tests.

suppliers. In other words, the more the suppliers suspect forecast inflation in the past, the less they produce. Game feedback, however, has no effect on the retailers' behaviors.

Table D.5   Regression Results on Retailers' $\hat{X}$ When Controlling for Game Feedback in Immediate Last Round

Variable	Value (standard error)					
Intercept	64.10 (23.06)***	75.94 (51.05)	63.20 (42.51)	65.57 (50.05)	86.80 (17.09)***	82.57 (22.42)***
C_L	6.43 (18.69)	4.98 (19.77)	5.79 (19.31)	6.43 (19.35)	5.20 (19.19)	5.77 (19.32)
I_R	5.23 (18.20)	-2.96 (18.40)	-2.79 (18.03)	-2.37 (18.28)	-1.89 (17.95)	-3.44 (17.97)
NT-Affect	3.88 (2.19)	–	–	–	–	–
NT-Cognition	–	2.52 (6.26)	–	–	–	–
NTW-Affect	–	–	4.43 (5.45)	–	–	–
NTW-Cognition	–	–	–	3.98 (6.33)	–	–
PT-Affect	–	–	–	–	8.25 (7.55)	–
PT-Cognition	–	–	–	–	–	7.42 (9.44)
X	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***
t	-0.54 (0.62)	-0.54 (0.62)	-0.54 (0.62)	-0.54 (0.62)	-0.54 (0.62)	-0.55 (0.62)
$(Q_2 - \hat{X})$	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)	0.01 (0.03)

Note. "–" means the variable is not present in the regression.

***: $p < 0.01$; p values are derived from t tests.

Table D.6   Regression Results on Retailers' $\hat{X}$ When Controlling for Average Game Feedback in All Past Rounds

Variable	Value (standard error)					
Intercept	62.96 (23.16)***	75.24 (50.69)	62.71 (42.24)	64.94 (49.71)	85.91 (17.39)***	81.32 (22.57)***
C_L	7.47 (19.16)	6.29 (20.24)	6.84 (19.78)	7.60 (19.79)	5.89 (19.74)	6.95 (19.77)
I_R	5.61 (18.21)	-2.45 (18.41)	-2.38 (18.08)	-1.89 (18.30)	-1.68 (18.01)	-2.92 (18.01)
NT-Affect	3.84 (2.18)	–	–	–	–	–
NT-Cognition	–	2.40 (6.23)	–	–	–	–
NTW-Affect	–	–	4.30 (5.43)	–	–	–
NTW-Cognition	–	–	–	3.85 (6.30)	–	–
PT-Affect	–	–	–	–	8.08 (7.60)	–
PT-Cognition	–	–	–	–	–	7.23 (9.39)
X	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***	0.76 (0.02)***
t	-0.56 (0.64)	-0.57 (0.64)	-0.56 (0.64)	-0.57 (0.64)	-0.55 (0.64)	-0.57 (0.64)
$(Q_2 - \hat{X})$	-0.01 (0.08)	-0.01 (0.08)	-0.01 (0.08)	-0.01 (0.08)	0.00 (0.08)	-0.01 (0.08)

Note. "–" means the variable is not present in the regression.

***: $p < 0.01$; p values are derived from t tests.