Information, Advice or Delegation: What Leads to Higher Trust in a Distribution Channel?
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Abstract

Retailers often solicit assistance from manufacturers in the form of information report about market conditions or advice about retail decisions, or even by requesting manufacturers to make decisions on their behalf. However, the manufacturer’s pecuniary incentive often conflicts with that of the retailer’s, causing concerns about the manufacturer’s trustworthiness. We investigate whether and how the form of manufacturer assistance – information sharing, advice provision or delegation – affects retailer trust and coordination of channel decisions in this setting. We propose that the form of assistance affects non-pecuniary motives that give rise to trust and trustworthiness. Specifically, the extent to which the manufacturer is involved in assisting the retailer will influence the type of information processing the manufacturer performs, as well as the manufacturer’s decision rights to make retail decisions. We conduct laboratory experiments to test our predictions. We find that the level of trust and coordination decreases as the extent of the manufacturer’s involvement increases. Standard theory that is based solely on pecuniary motives cannot explain the observed differences because it predicts the same outcome – complete lack of trust and coordination – under all forms of manufacturer assistance. We further find that, despite the presence of manufacturer opportunism, retailers that are trusting make higher profits than retailers lacking in trust. Our results offer insights into how to effectively manage distribution channels and why some channel arrangements lead to more successful outcomes than others.*

Keywords: Advice, Delegation, Distribution Channel, Experimental Economics, Information Sharing, Trust


1 Introduction

A retailer (e.g., Safeway and Target) frequently relies upon the market knowledge of a national brand manufacturer (e.g., Clorox and Kraft) to make better-informed store-level retail decisions regarding,

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for example, product assortment, shelf space allocation and promotions (Progressive Grocer 2005; Ng and Ziobro 2014). The manufacturer often provides assistance in three distinct forms: share information about market conditions; offer advice about retail decisions; or even make retail decisions on the retailer’s behalf (Desrochers et al. 2003). Such assistance, if properly managed, can benefit both the retailer and the manufacturer (ACNielsen 2005; Grocery Manufacturers Association 2007). However, the manufacturer often has a pecuniary motive to influence retail decisions so as to unduly favor its own product even at the retailer’s expense. Consequently, some practitioners and academics are concerned that the manufacturer will behave opportunistically to exploit the retailer, and have questioned the value of relying on manufacturer assistance (Carameli Jr 2004; Morgan et al. 2007; Gooner et al. 2011; Pearlstein 2013). Others believe that trust between channel members can explain retailers’ continued reliance on various forms of manufacturer assistance (Gruen and Shah 2000; Dupre and Gruen 2004; Aastrup et al. 2007; Özer et al. 2011). This paper examines how the form of manufacturer assistance influences trust and trustworthiness, and which form of assistance leads to effective channel management.

The manufacturer’s assistance can broadly take one of three distinct forms: information sharing, advice provision and delegation. All three forms are observed in the industry across a variety of product categories (Federal Trade Commission 2001; Desrochers et al. 2003). Under an information sharing arrangement, the retailer simply obtains information from the manufacturer about the product’s market potential and uses this information to make retail decisions. For example, many U.S. retailers have partnered with General Mills to obtain access to its proprietary market research including a consumer panel survey known as “Shopper 360”. This survey provides consumer insights from 120,000 shopping trips across 30 retailers. A retailer can then use this information to decide product assortment and shelf space allocation in its stores (Progressive Grocer 2006).

Under an advice provision arrangement, the retailer receives a recommendation from the manufacturer regarding the course of action the retailer should undertake. The retailer then decides whether and to what extent it follows the manufacturer’s advice. For example, Carrefour, a leading France-based global retailer, receives advice from Colgate-Palmolive regarding shelf design and consumer education initiatives for oral care products (ECR Europe Conference 2004). Based on this advice, Carrefour determines the final shelf layouts and promotional activities in its stores.

Under a delegation arrangement, the manufacturer is largely responsible for making the actual retail-level decisions. The retailer decides upfront the extent of the manufacturer’s decision-making authority and later implements the manufacturer’s decisions. For example, the retailer may decide the maximum
assortment size it can carry and the maximum shelf space it can allocate. The manufacturer then decides the actual assortment and the shelf space allocated to each product. Delegation is commonly used in categories such as magazines and kitchen gadgets (Federal Trade Commission 2001).

Retailers seek manufacturers’ assistance because the manufacturers’ market knowledge can be used to make better retail decisions that create significant economic value (ACNielsen 2005; Grocery Manufacturers Association 2007). To fully benefit from a product’s market potential, the retailer must allocate store resources, such as shelf space and trained staff, to the product. Allocating more store resources to a product can significantly increase its sales by creating consumer awareness or capturing attention in the store (e.g., Dreze et al. 1995; Inman and Winer 1998; Chandon et al. 2009). Such store resources are, however, limited and costly to the retailer. Hence, how much resource to allocate for a product depends on its market potential. However, a national brand manufacturer is often more knowledgeable about its product’s market potential than the retailer is. In particular, because retailers carry a large variety of products, they often find it impractical to invest resources to understand consumer needs and market potential for every single product (e.g., Gruen and Shah 2000; ACNielsen 2005; Gooner et al. 2011). Consequently, retailers seek manufacturers’ market knowledge. A case in point is the consumer packaged goods industry, where the practice of using manufacturer assistance is widespread and well-documented (see, for example, Progressive Grocer 2012, 2013).

The practice of using manufacturer assistance has, however, been controversial because of considerable difference in retailer’s and manufacturer’s pecuniary incentives. The retailer prefers to provide more store resources to the manufacturer’s product only if it has high market potential. In contrast, the manufacturer prefers to obtain more store resources even if its product’s market potential is low, because store resources increase demand for its product. Hence, the manufacturer has a pecuniary motive to induce the retailer to provide more store resources than what may be optimal for the retailer. In addition, the manufacturer’s assistance is typically not governed by formal contracts. In fact, the manufacturer is never directly compensated for its assistance. Instead, it expects to benefit only indirectly through its influence on retail decisions (Progressive Grocer 2004; Morgan et al. 2007; Gooner et al. 2011; Hartley et al. 2013). Industry experts have acknowledged the potential for manufacturer opportunism. As one retailer notes: “It is the nature of the beast. Very few companies are going to give you 100% true [assistance] without skewing it in their favor somehow” (Alaimo 1997). In interviews conducted by Morgan et al. (2007), retailers expressed the belief that a manufacturer could bias the data analysis to support recommendations that maximize its own profit rather than the retailer’s. Other studies have
found similar sentiments among retailers (Dupre and Gruen 2004; Gooner et al. 2011). Such concerns have led some to question the value of using manufacturer assistance.\footnote{The manufacturer’s assistance may also extend to retail decisions for rival manufacturer brands (see for example, Subramanian et al. 2010; Kurtuluş and Toktay 2011). The concern about manufacturer opportunism also apply to this context. The retailer would prefer that store resources be allocated to different brands based on their relative market potentials. However, the manufacturer would prefer to have more resources for its own brand at the expense of rival brands, regardless of their market potentials.}

Other researchers and practitioners offer an alternative, and perhaps a more optimistic perspective. They suggest that trust between channel members can facilitate positive outcomes (Gruen and Shah 2000; Dupre and Gruen 2004; Özer et al. 2011; Beer et al. 2014). Thus, trust could explain the continued prevalence of this practice. However, the existence and extent of trust is not a foregone conclusion. Trust can vary considerably across retailers and manufacturers (e.g., Gruen and Shah 2000; Dupre and Gruen 2004). Given the prevalence of different forms of manufacturer assistance and the potential for significant economic gains and losses from this practice, understanding which form of assistance can better cultivate trust is critical for effective channel management.

Our main objective, therefore, is to investigate how the form of manufacturer assistance – information sharing, advice provision and delegation – influences the level of trust, trustworthiness and coordination of channel member decisions. We propose that the form of assistance will matter because it affects non-pecuniary motives that can give rise to trust and trustworthiness. To delineate the role of non-pecuniary motives, we first build a parsimonious analytical model that captures the key pecuniary trade-offs involved in managing such distribution channels. We refer to the predictions based on this model as standard theory predictions to emphasize that it is based only on pecuniary motives. We show that standard theory predicts lack of trust and coordination under all three arrangements due to conflicting pecuniary incentives. Therefore, any observed differences in outcomes between the different forms of arrangements cannot be explained only by pecuniary motives.

Next, we develop behavioral hypotheses regarding how the extent to which the manufacturer is involved in assisting the retail decision will influence non-pecuniary motives and lead to different outcomes because of the type of information processing that the manufacturer must perform to provide assistance, and the manufacturer’s decision rights to make retail decisions. We test our predictions through incentivized laboratory experiments that are designed based on the sequence of events and payoffs described in the analytical model. We find that the level of trust and coordination is decreasing with the extent of the manufacturer’s involvement in the retail decision. Despite the presence of manufacturer opportunism, retailers that are trusting make higher profits than retailers lacking in trust. Our results offer
insights into how to effectively manage distribution channels and why some channel arrangements lead to more successful outcomes than others.

2 Literature Review

Prior research on distribution channel management in the operations and marketing literature has extensively examined one particular form of manufacturer assistance, namely, information sharing. One stream of research has examined the incentives for demand information sharing under the assumption that the informed party reveals its information truthfully (e.g., Aviv 2003; Gal-Or et al. 2008; Mittendorf et al. 2013 and references therein). Another stream of research has examined the strategic implications of firms’ conflicting pecuniary incentives on their communication and usage of information (e.g., Desai 2000; Cachon and Lariviere 2001; Özer and Wei 2006; Guo and Iyer 2010; Shin and Tunca 2010; Gümüş 2014). This literature implicitly assumes the non-existence of trust, and has developed contracts to align pecuniary incentives to facilitate truthful information sharing. Recently, realizing that human behavior does not depend on pecuniary incentives alone, Özer et al. (2011) and (2014) investigate the role of trust and trustworthiness in information sharing. They determine when trust is important in information sharing, and how the supply chain environment (e.g., capacity cost, market uncertainty, country of origin) affects trust and resulting operational decisions. Several recent studies begin to further explore the behavioral aspects of information sharing (e.g., Hyndman et al. 2013; Inderfurth et al. 2013; Beer et al. 2014).

The study of delegation of retail decisions to a manufacturer has received much less attention in extant literature. Researchers have examined the delegation of assortment decisions (Kurtuluş and Nakkas 2011) and in-store promotional activities (Subramanian et al. 2010; Kurtuluş et al. 2014) under the assumption that the manufacturer credibly commits to a minimum target profit or demand for the retailer. In the context of salesforce management, researchers in marketing have examined the delegation of pricing decisions to the salesforce under different (pecuniary) incentive contracts (e.g., Bhardwaj 2001; Mishra and Prasad 2005; Simester and Zhang 2014). Recently, Lim and Ham (2014) examine the role of non-pecuniary motives in price delegation to the salesforce. They find that salespeople respond benevolently to price delegation, resulting in higher manager profits and higher use of delegation by managers than predicted by standard theory.

To the best of our knowledge, advice provision has not been studied as a distinct form of assistance in distribution channels. Following Bonaccio and Dalal (2006), we define advice as a recommendation regarding a decision or course of action to undertake. Advice provision can thus be contrasted against
information sharing, which is the communication of the underlying information to be used for deciding the course of action. Advice provision has been studied by behavioral researchers in the area of organizational decision making. This literature assumes that the incentives of the advisor and advisee are fully aligned, and focuses on factors that cause advisees to underutilize advice, such as anchoring and adjustment, ego-centric bias, and lack of access to advisor’s reasoning (e.g., Harvey and Fischer 1997; Krueger 2003; Yaniv 2004). Bonaccio and Dalal (2006) provide a comprehensive review of this literature. In contrast, economists have examined advice provision when the pecuniary incentives of the two parties are not aligned. However, they implicitly assume that advice provision is equivalent to communicating the underlying information used to formulate the advice (see, for example, Sobel 2010). In other words, the economics literature has not explicitly distinguished between advice provision and information sharing.

The aforementioned literature on information sharing, advice provision and delegation have by and large evolved separately from each other. A notable exception is Dessein (2002), who studies a setting in which a principal can either obtain information from an agent through cheap-talk communication, or delegate decision-making authority to the agent. He finds that the principal’s tradeoff is between the loss of information under cheap talk, and loss of control under delegation. Kartik (2009) extends this work to show that the principal would prefer cheap-talk communication over delegation if the agent incurs a sufficiently high non-pecuniary cost from distorting information. This result, however, is driven by the assumption that under delegation the agent does not incur any non-pecuniary cost from taking advantage of the principal. Kartik (2009) also does not distinguish between information and advice. Experimental economists have examined overcommunication in cheap talk games (e.g., Dickhaut et al. 1995; Cai and Wang 2006), the role of non-pecuniary behavioral motives in trust games (e.g., Berg et al. 1995; Ashraf et al. 2006), and the motivational effect of authority in delegation games (e.g., Falk and Kosfeld 2006; Charness et al. 2012; Fehr et al. 2013; Bartling et al. 2014). But they too have examined these issues separately in different settings. In contrast, we are interested in determining how the form of assistance impacts non-pecuniary motives across information sharing, advice provision, and delegation.

Our work contributes to the literature by introducing a comparison of information sharing, advice provision and delegation in a unified context, namely in a distribution channel. All three forms of assistance lead to the same outcome under extreme forms of trust, i.e., when both parties make decisions based only on their pecuniary payoff and have zero trust, or when they are fully-trusting and trustworthy. We investigate where actual behavior lies between these extremes. We determine how the form of assistance, and in particular the process through which assistance is provided, influence non-pecuniary
motives, trust and trustworthiness, and the resulting decisions and profits. To do so, we distinguish between various forms of manufacturer assistance based on the type of information processing that the manufacturer must perform to provide assistance, and the decision rights it has to make retail decisions.

A growing body of work in operations and in marketing investigates channel interactions using laboratory experiments. For example, researchers have examined contract design (e.g., Katok and Wu 2009; Lim and Ho 2007; Ho and Zhang 2008; Kalkanci et al. 2011), fairness concerns (Cui and Mallucci 2012; Katok et al. 2014), inventory decisions (e.g., Croson and Donohue 2006; Ho et al. 2010), and signaling trustworthiness (Beer et al. 2014). Gino and Pisano (2008) and Bendoly et al. (2010) provide reviews of this fast evolving area. We contribute to this literature by studying how the form of manufacturer assistance influences trust, trustworthiness and channel performance.

3 Standard Theory and Predictions

Consider a distribution channel with a manufacturer supplying its product to a retailer. The retailer can increase demand for the product by providing retail service in its stores, for example, by allocating shelf space and end-of-aisle displays, or by training sales staff to assist consumers about the product. All such activities determine the number of consumers who consider buying the product by creating and capturing consumer awareness. In conjunction, the product’s intrinsic appeal determines the number of consumers whose needs the product can meet. Demand for the product can therefore be expressed as

\[ D(q, s) = qs, \]  

where \( q > 0 \) denotes the product’s intrinsic appeal, and \( s \in [0, \bar{s}] \) denotes the retail service level. Note that retail service \( s \) is more effective in stimulating demand if the product’s intrinsic appeal \( q \) is higher; hence, the multiplicative form. For example, increasing consumer awareness for the product through a display is likely to be more effective in increasing demand if the product has a better match with consumer tastes. However, most retail services are costly to provide. Following the literature (e.g., Subramanian et al. 2010; Kurtuluş et al. 2014), we model the cost of retail service as

\[ C(s) = \frac{1}{2}ks^2, \]  

where \( k > 0 \) is the service cost parameter.

The product’s intrinsic appeal \( q \) depends on uncertain market condition. The manufacturer has superior information about the market condition than the retailer. Specifically, let \( q = \xi + \epsilon \), where \( \xi \) follows a distribution with cdf \( F(\cdot) \) and support \([\xi, \bar{\xi}]\); \( \epsilon \) follows a distribution with cdf \( G(\cdot) \), zero mean, support \([\underline{\epsilon}, \bar{\epsilon}]\) and is independent of \( \xi \). The manufacturer knows the realization of \( \xi \) but the retailer does
not. Neither firm knows the realization of \( \epsilon \). Thus, the actual realization of \( q \) remains uncertain to both firms. However, \( \xi \) is available to the manufacturer. Hence, it has more information about \( q \) than the retailer. We refer to \( \xi \) as the manufacturer’s demand information, and to \( \epsilon \) as the market uncertainty. We remark that \( \xi \) is an unbiased estimate of the product appeal, i.e., \( \mathbf{E}[q | \xi] = \xi \).

The manufacturer provides assistance in one of the three forms: information sharing (IS), advice provision (AP) or delegation (DL). The sequence of events under each form is as follows. The retailer and the manufacturer establish a distribution channel and transact at a wholesale price \( w \). The manufacturer first observes the realization of its demand information \( \xi \) at the start of the selling season. Under IS, the manufacturer provides an information report \( \hat{\xi} \in [\xi, \bar{\xi}] \) to the retailer. Then, the retailer sets the service level \( s \in [0, \bar{s}] \). Under AP, the manufacturer provides an advice \( \hat{s} \in [0, \bar{s}] \) to the retailer. Then, the retailer sets the service level \( s \in [0, \bar{s}] \). Under DL, the retailer first sets a service limit \( s_{lim} \in [0, \bar{s}] \). The manufacturer then decides the service level \( s_{dl} \in [0, s_{lim}] \) to be implemented. The service limit \( s_{lim} \) essentially determines the extent of the manufacturer’s decision-making authority.\(^2\) In all three cases, demand is realized after the service level is set and the retailer sells the product to consumers at a retail price \( p \). The maximum retail service level is \( \bar{s} = \frac{2}{k} (p - w) (\bar{\xi} + \bar{\epsilon}) \), which is the highest service level above which the retailer’s profit is negative irrespective of the realizations of \( \xi \) and \( \epsilon \). Any service level higher than \( \bar{s} \) is unambiguously dominated by a lower service level and, in particular, by \( s = 0 \).

Given the demand information \( \xi \) and service level \( s \), the retailer’s and the manufacturer’s expected profits are

\[
\Pi_R(s, \xi) = (p - w) \mathbf{E}[D(\xi + \epsilon, s) | \xi] - C(s) = (p - w) s \xi - \frac{1}{2} ks^2, \quad (3)
\]

\[
\Pi_M(s, \xi) = w \mathbf{E}[D(\xi + \epsilon, s) | \xi] = ws \xi. \quad (4)
\]

The retailer maximizes its expected profit conditional on its belief about \( \xi \) given available information, such as the manufacturer’s report \( \hat{\xi} \) or advice \( \hat{s} \). The manufacturer also takes actions to maximize its own expected profit. The model setup is common knowledge except for the realization of \( \xi \). The notation is summarized in Appendix A.

\(^2\)Holmström (1977), who was the first to formally model delegation, defines delegation as “the process by which the agent is given a set of alternatives [by the principal] from which she can choose based on her own preferences. In other words, the agent is delegated the final decision, possibly subject to some constraints imposed by the principal.” Subsequent work has adopted this definition and examined delegation in different settings (e.g., see Alonso and Matouschek (2008); Armstrong and Vickers (2010); Amador and Bagwell (2013) and references therein). In our setting, an upper limit for the manufacturer’s service level decision is sufficient to eliminate the manufacturer’s most opportunistic actions. Allowing for more general forms of restrictions on the manufacturer’s service level decision cannot improve the retailer’s expected profit under standard economic theory. Falk and Kosfeld (2006) adopt a similar approach in a firm-employee setting, wherein the firm can impose a minimum effort level on the agent to eliminate the agent’s most opportunistic actions.
Note that if the retailer knew the realization of $\xi$, the *retailer’s optimal service level* would be

$$ s_t(\xi) = \left( \frac{p - w}{k} \right) \xi. $$

(5)

The retailer, however, does not know the manufacturer’s demand information $\xi$. The service level that maximizes the retailer’s expected profit, given its prior belief about $\xi$, is

$$ s_{ni} = \left( \frac{p - w}{k} \right) \mu, $$

(6)

which is the retailer’s *uninformed service level* - the service level the retailer would set without the manufacturer’s assistance.

Note that the manufacturer’s expected profit in Equation (4) is strictly increasing in the retail service level. Therefore, irrespective of its demand information $\xi$, the manufacturer prefers that the retailer provides a high service level. Note also that the retailer’s optimal service level in Equation (5) is increasing in $\xi$. Thus, in IS, the manufacturer has every incentive to inflate its report of demand information (i.e., report $\hat{\xi} > \xi$). A strategic retailer may anticipate such manipulation and adjust its decisions. Anticipating such adjustment, a strategic manufacturer may potentially adopt various strategies, e.g., sometimes inflate and sometimes deflate. Consequently, the manufacturer’s information report is not correlated with its demand information, and the retailer’s service decision is independent of the information report it receives. In all equilibria, the retail service level is equal to the uninformed service level $s_{ni}$ irrespective of the manufacturer’s demand information.

Similarly, in AP, a strategic retailer anticipates the manufacturer’s incentive to manipulate its advice by recommending a higher service level than is optimal for the retailer (i.e., $\hat{s} > s_t(\xi)$). Anticipating this manipulation, the retailer may adjust its advice accordingly. A strategic manufacturer then determines its advice strategy anticipating the retailer’s response. As a result, in all equilibria, the manufacturer’s advice is also uninformative, i.e., $\hat{s}$ is not correlated with $\xi$. Further, the retailer’s service decision is independent of any advice it receives and is equal to $s_{ni}$.

In DL, given any service limit $s_{lim}$ set by the retailer, the manufacturer can maximize its expected profit by setting the service level equal to the service limit $s_{lim}$. Anticipating the manufacturer’s behavior, the retailer maximizes its expected profit by setting $s_{lim} = s_{ni}$. Hence, the manufacturer sets the service level to $s_{ni}$. Therefore, the unique equilibrium decision in this case corresponds to the uninformed service level. Theorem 1 formally establishes these results by analyzing the interactions as a game of incomplete information. The proof is deferred to Appendix B.

**Theorem 1.** *Under all forms of assistance, the manufacturer does not base its assistance on its demand*
information. The retailer does not rely on the manufacturer’s assistance. The equilibrium retail service level is independent of the demand information and equal to $s_{81}$. Specifically, in IS (resp., AP), the manufacturer’s information report (resp., advice) is uninformative, and the retailer’s service decision is independent of the report (resp., advice) it receives. In DL, the manufacturer’s best response is to set a service level equal to the service limit, and the retailer sets a service limit equal to $s_{81}$.

Theorem 1 predicts that all forms of assistance lead to the same outcome – lack of trust and coordination if actions are based only on pecuniary motives. Thus, any observed differences in an environment that replicates precisely the model set up cannot be attributed to the pecuniary motives. We remark that the goal of the present model is to capture the key pecuniary tradeoffs involved in obtaining manufacturer assistance in many retail settings. In particular, our model captures three essential elements of such settings that are represented in Equations (1) - (6): (i) the manufacturer has better demand information about its product than the retailer, (ii) the demand information is relevant for the retailer to determine how much (costly) store resources it should allocate to support the manufacturer’s product, and (iii) the manufacturer prefers to obtain as much of the retailer’s store resources irrespective of its demand information. By focusing on these essential features, the model allows us to understand and quantify the role of pecuniary motives, while also keeping the experimental task and decisions faced by participants straightforward and simple when we examine the role of non-pecuniary motives. The model setup also enables participants to focus only on the key tradeoffs that matter, and minimizes possible cognitive errors and other potential confounding factors. Therefore, we intentionally keep all other decisions (e.g., retail price, assortment) exogenous and abstract away from additional model complexities (e.g., production costs). Next we investigate the role of non-pecuniary motives.

4 Behavioral Theory and Predictions

Standard theory predicts that all forms of assistance will perform the same because of the conflicting pecuniary motives. A growing body of experimental studies has, however, shown that non-pecuniary motives, such as social preferences and emotions associated with deception, can give rise to trust and trustworthiness in many settings including strategic communication games (Gneezy, 2005; Cai and Wang, 2006; Sánchez-Pagés and Vorsatz, 2007; Özer et al., 2011; Angelova and Regner, 2013) and delegation games (Falk and Kosfeld, 2006; Fehr et al., 2007; Charness et al., 2012; Lim and Ham, 2014). Therefore, contrary to standard theory predictions, we expect individuals to be trusting and trustworthy in all three forms of manufacturer assistance, resulting in some coordination, i.e., channel members coordinate their
decisions such that demand information affects the retail service level. In our context, trustworthiness is defined by the manufacturer’s ability and willingness to provide assistance in the retailer’s best interest, by providing informative report (in IS) or advice (in AP), or by setting a service level (in DL) based on the demand information. A trusting retailer relies on the manufacturer’s assistance by making its service decision based on the manufacturer’s input (in IS and AP), or by setting a service limit higher than $s_{\text{NL}}$, delegating more decision rights to the manufacturer (in DL) than standard theory prediction. Thus, we test the following hypotheses against the predictions from standard theory.

**Hypothesis 1 (Presence of Trust and Trustworthiness).** Under all forms of assistance: (a) the manufacturer assistance (i.e., information report, advice or service decision) is positively correlated with its demand information; and (b) the retailer relies on the manufacturer’s assistance (i.e., its decisions are positively correlated with the manufacturer’s input in IS and AP, and it sets a service limit higher than $s_{\text{NL}}$ in DL).

The standard theory (Theorem 1) represents one extreme that predicts complete lack of trust and trustworthiness due to the conflicting pecuniary motives. The other extreme is to assume that decision makers are fully trusting and trustworthy. At this extreme too, all forms of assistance will lead to the same outcome – the service level will be equal to the retailer’s optimal service level in all three cases.

We refer to a manufacturer as being **fully-trustworthy** if it acts in the retailer’s best interest. We refer to a retailer as being **fully-trusting** if it takes the manufacturer’s assistance as is. Specifically, in IS, a fully-trustworthy manufacturer provides a truthful report $\hat{\xi} = \xi$. A fully-trusting retailer takes the manufacturer’s report $\hat{\xi}$ to be true and sets a service level $s_i(\hat{\xi})$. In AP, a fully-trusting manufacturer provides unbiased advice that is equal to the retailer’s optimal service level, i.e., $\hat{s} = s_i(\xi)$. A fully-trusting retailer follows the manufacturer’s advice by setting $s = \hat{s}$. Finally, in DL, a fully-trustworthy manufacturer makes an unbiased service decision $s_{\text{DL}} = \min\{s_{\text{lim}}, s_i(\xi)\}$. A fully-trusting retailer sets a service limit $s_{\text{lim}} \geq s_i(\hat{\xi})$ such that the manufacturer has enough leeway to set the retailer’s optimal service level for all possible realizations of the demand information $\xi \in [\xi, \bar{\xi}]$. Thus, under all forms of assistance, the retail service level is equal to $s_i(\xi)$ if the manufacturer is fully-trustworthy and the retailer is fully-trusting. Thus, the form of assistance does not matter at either extremes of trusting and trustworthy behavior.

However, we expect that the form of assistance, i.e., the process through which assistance is provided,
affects non-pecuniary motives resulting in different levels of trusting and trustworthy behaviors and channel outcomes. Before we develop our behavioral hypotheses, we next define how trust, trustworthiness, and coordination are measured.

4.1 Measures
Our metrics are inspired by and hence are variations of those in Özer et al. (2011) and Özer et al. (2014). We measure the manufacturer’s trustworthiness based on the deviation from the fully-trustworthy decision. In IS and AP, a manufacturer that is not fully-trustworthy is likely to inflate its report (relative to the true demand information) or advice (relative to the unbiased advice) in order to induce the retailer to set a higher service level. In DL, a manufacturer that is not fully-trustworthy will inflate its service decision. The more inflated the manufacturer’s decision, the less trustworthy it is. Therefore, we use inflation with respect to the fully-trustworthy decision as the measure of trustworthiness. We define inflation as \( \hat{\xi} - \xi \) in IS, \( \hat{s} - s_i(\xi) \) in AP and \( s_{DL} - s_i(\xi) \) in DL.\(^4\)

We measure the retailer’s trust based on the deviation from the fully-trusting decision. In IS and AP, a retailer that is not fully-trusting will expect that the manufacturer inflates its report or advice. Therefore, the retailer will set a lower service level than suggested by the manufacturer’s report or advice. The more the retailer deflates the manufacturer’s report or advice, the less trusting the retailer is. In DL, a retailer that is not fully-trusting will expect the manufacturer to inflate the retail service decision, thereby hurting the retailer’s profit. Therefore, to restrict the extent by which the manufacturer can inflate its decision, the retailer will set a lower service limit than the fully-trusting limit of \( s_i(\hat{\xi}) \). The more the retailer deflates the service limit, the less trusting the retailer is. Therefore, we use deflation with respect to the fully-trusting decision as the measure of trust. In IS, the service level suggested by the manufacturer’s report is \( s_i(\hat{\xi}) \). Hence, deflation is given by \( s_i(\hat{\xi}) - s \). In AP, deflation is given by \( \hat{s} - s \). In DL, deflation is given by \( s_i(\bar{\xi}) - s_{lim} \).

We measure the coordination in channel decisions based on the extent to which the retail service level is influenced by the demand information. If there is some coordination in channel decisions then the manufacturer’s assistance will cause the retail service level to be based on the demand informa-

\(^4\)Inflation in IS can be equivalently expressed relative to the retailer’s optimal service level as \( s_i(\hat{\xi}) - s_i(\xi) \), where \( s_i(\hat{\xi}) \) is the service level suggested by the manufacturer’s information report (i.e., the retailer’s optimal service level taking the manufacturer’s information report to be true). This transformation allows us to compare inflation in IS and AP. We note that \( s_i(\hat{\xi}) - s_i(\xi) = ((p - w)/k)(\hat{\xi} - \xi) \). Therefore, inflation expressed in the action domain is simply inflation in the information domain multiplied by a constant factor \((p - w)/k\). In our experimental setting, \((p - w)/k = 1\). Hence, inflation expressed in either domain is numerically the same. We also remark that in the case of DL, we use the strategy method in our experimental design which allows us to measure inflation unconstrained by the retailer’s service limit decision (see §5).
tion. The higher the coordination, the higher the influence of the demand information on the service level. Therefore, we use sensitivity of retail service level to the demand information as the measure of coordination. Sensitivity is given by the slope of the regression between retail service level and the demand information. Finally, to compare channel member performance, we use the expected retailer and manufacturer profits, as defined in Equations (3) and (4).

4.2 Differences in the Assistance Processes

As one moves from IS, to AP, to DL, the manufacturer’s involvement in the retail service decision increases. This increase in involvement can be broken down into two elements: (i) the type of information processing that the manufacturer must perform to provide assistance, and (ii) the manufacturer’s decision rights to set the service level. The type of information processing depends on whether the manufacturer must formulate a service decision. The information processing is descriptive if the manufacturer only has to convey information, and prescriptive if it must formulate a service decision. Prescriptive information processing requires deeper reflection, which is associated with more effort and longer processing time as compared to descriptive information processing (Chaiken and Trope, 1999; Frederick, 2005; Kahneman, 2011; Rand et al., 2012).

Table 1: Manufacturer Involvement in IS, AP and DL

<table>
<thead>
<tr>
<th></th>
<th>IS</th>
<th>AP</th>
<th>DL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Information Processing</strong></td>
<td>Descriptive</td>
<td>Prescriptive</td>
<td>Prescriptive</td>
</tr>
<tr>
<td><strong>Decision Rights</strong></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 1 depicts how the forms of assistance differ in information processing and decision rights. IS and AP differ in the type of information processing – descriptive in IS since the manufacturer only has to convey information through a “report” of the market condition, and prescriptive in AP since the manufacturer has to formulate a service decision “advice” based on the market condition. They do not differ in decision rights – in either case, the manufacturer does not have a decision right to set the retail service level since it is the retailer that sets the service level. In contrast, AP and DL differ in the decision rights, but not in the type of information processing. In DL, the manufacturer has decision rights to set the service level, whereas in AP it does not. The type of information processing is prescriptive both under AP and DL since the manufacturer has to formulate a service decision in both cases. Thus, the extent of the manufacturer’s involvement increases as we move from IS to AP and to DL. The type of information processing changes from descriptive to prescriptive, and the decision rights
of the manufacturer increase. Next, we develop our behavioral hypotheses.

4.3 Impact of Information Processing

As discussed in §4.2, IS differs from AP (as well as DL) in the type of information processing, i.e., descriptive vs. prescriptive. Prior research across many contexts has shown that, when faced with ethical dilemmas, decision makers attempt to construct reasons that rationalize untrustworthy behavior in order to minimize their guilt and maintain a positive self-image despite having been untrustworthy (Konow, 2000; Murnighan et al., 2001; Mazar et al., 2008; Gino and Ariely, 2012). Consequently, decision makers are less trustworthy in situations that offer more flexibility to rationalize untrustworthy behavior (Schweitzer and Hsee, 2002; Dana et al., 2007; Haisley and Weber, 2010; Shalvi et al., 2011). Hence, under prescriptive processing (in AP), manufacturer participants would likely be less trustworthy than descriptive processing (in IS) because they have more flexibility in rationalizing their untrustworthy behavior. Note that the true demand information, under descriptive processing, serves as a salient and objective benchmark for a manufacturer to evaluate how truthful its report is, making it difficult to rationalize or ignore deviations from the truthful report. No such benchmark is available under prescriptive processing in AP. The manufacturer participants must determine the criteria for formulating the service decision, and construct its own subjective benchmark to evaluate its actions, giving him/her more flexibility to construct self-serving rationalizations and justify being less trustworthy. One would also expect the lower trustworthiness to induce lower trust in AP than in IS.

Prescriptive processing also requires deeper thinking and greater attention to profit implications than descriptive processing, which should lead to lower trust and trustworthiness in AP than in IS. Across disciplines, research has shown that encouraging deliberative thinking or suppressing intuitive and effortless decisions tend to increase self-serving behavior (Cappelletti et al., 2011; Cornelissen et al., 2011; Rand et al., 2012; Schulz et al., 2014; Zaki and Mitchell, 2013). For example, Zhong (2011) found that deliberative thinking, activated by a math problem-solving task or by simply framing the choice as a decision rather than an intuitive reaction, increases deception and decreases altruism in the context of donation to a charity. Under descriptive processing, the manufacturer is only required to report its information. However, under prescriptive processing, the manufacturer has to evaluate the

---

5For example, Schweitzer and Hsee (2002) conducted a negotiation study in which a used car seller had to provide a buyer with an estimate of the car’s mileage, and could lie about the estimate knowing the range of possible true values. Sellers lied to a greater extent when the range of possible true values was higher since they could rationalize the lie by using the increased uncertainty in the true value. Shalvi et al. (2011) conducted a study in which participants privately rolled a die and reported the outcome to gain money according to their report. Participants who observed multiple die rolls (but were required to report the first one) lied more than those who observed a single die roll because they could rationalize their lie based on the highest number they observed across multiple rolls.
profit implications of different service decisions and, thereby, engage in more deliberative thinking. The greater attention to profit implications is also likely to increase the manufacturer’s temptation to deceive the retailer and increase its motivation to rationalize its untrustworthy behavior.

Finally, under prescriptive processing, the retailer’s trust is likely to depend on the manufacturer’s capability to determine the retailer’s optimal service level. The capability of the trusted party to perform the task he or she is trusted with is a key determinant of trust (e.g., Mayer et al. 1995; Bonaccio and Dalal 2006; Twyman et al. 2008). To the extent that the retailer cannot be completely confident about the manufacturer’s capability to optimize, the retailer should be more trusting under descriptive processing than under prescriptive processing. We, thus, establish the following hypothesis.

**Hypothesis 2 (Lower Trustworthiness and Trust in AP than in IS).** (a) Manufacturers inflate advice more than they inflate information; (b) Retailers deflate advice less than they deflate information.

**Hypothesis 3 (Lower Coordination and Retailer Profit in AP than in IS).** (a). Coordination of channel decisions is lower in AP than in IS; (b) Expected retailer profit is lower in AP than in IS.6

### 4.4 Impact of Decision Rights

AP (as well as IS) differs from DL in the manufacturer’s decision rights, which can affect behavior as follows. Prior research has shown that having more decision rights can motivate an agent to be more benevolent or trustworthy towards the principal. Lim and Ham (2014) show that delegating pricing decisions to a salesperson causes the salesperson to be trustworthy because of social preferences such as positive reciprocity. Charness et al. (2012) show that delegating the wage decision leads to more effort from the employee simply due to the motivational effects of having more decision rights. In both studies, managers anticipate such motivational effects and allocate more decision rights than predicted by standard theory, resulting in higher payoff for both players. Therefore, in DL, the retailer may set a high service limit to transfer more decision rights to the manufacturer, and the manufacturer may respond benevolently by being more trustworthy than in AP. As a result, DL should lead to higher coordination and retailer profit than AP.

**Hypothesis 4 (Lower Trustworthiness and Trust in AP than in DL).** (a) Manufacturers inflate their advice more than they inflate their service decisions; (b) Retailers deflate advice more than they deflate the service limit.

---

6We remark that the manufacturer’s payoff can be higher from being untrustworthy than from being trustworthy when it faces trusting retailers. Therefore, we will report our findings in §6 regarding how manufacturer profits are impacted, and do not offer an a priori prediction.
Hypothesis 5 (Lower Coordination and Retailer Profit in AP than in DL). (a) Coordination of channel decisions is lower in AP than in DL; (b) Expected retailer profit is lower in AP than in DL.

However, DL can also lead to lower trust and trustworthiness for the following reasons. First, the manufacturer may self-servingly interpret the service limit as permission from the retailer that it is acceptable to set a service level as high as the limit. Falk and Kosfeld (2006) show that if an employer sets a minimum effort level for an employee, then the employee exerts lower effort. They suggest that the employee interprets the minimum effort level as an indication of how much voluntary effort is expected by the employer and, therefore, feels less guilty about exerting lower effort.\(^7\) Second, since the retailer retains the decision rights in AP, she can evaluate and respond to the risk posed by the manufacturer’s potential opportunism. As a result, the retailer is less vulnerable to the risk posed by manufacturer opportunism and, hence, likely to be more trusting in AP than in DL. For example, advice to set a low service level in AP may indicate to the retailer that the manufacturer is trustworthy. Thus, the retailer can judge the manufacturer’s trustworthiness from its advice and respond accordingly. In contrast, the retailer transfers the decision rights to the manufacturer in DL and cannot evaluate or respond to the manufacturer’s trustworthiness. A trusting retailer that sets a high service limit will be more exposed to the risks from manufacturer opportunism than in AP. To reduce this risk, the retailer may set a low service limit, resulting in low trust. When facing such risky situations, decision makers may also be unwilling to cede unlimited control even when it is in their material interest. Fehr et al. (2013) show that decision makers delegate less often to avoid ex-post regret of being overruled by their delegatee. Bartling et al. (2014) and Owens et al. (2014) find that decision makers may delegate less often because they intrinsically value retaining control. These effects lead to the following competing hypotheses.

Hypothesis 6 (Higher Trustworthiness and Trust in AP than in DL). (a) Manufacturers inflate their advice less than they inflate their service decisions; (b) Retailers deflate advice less than they deflate the service limit.

Hypothesis 7 (Higher Coordination and Retailer Profit in AP than in DL). (a) Coordination of channel decisions is higher in AP than in DL; (b) Expected retailer profit is higher in AP than in DL.

\(^7\)Falk and Kosfeld (2006) also propose that setting a minimum effort level can have other effects such as signaling distrust, and being perceived by employees as a restriction of their autonomy. These alternative reasons will also lead to lower effort levels in their setting. In our context, if a higher service limit is seen as signaling trust or providing greater autonomy, then it should lead to more trustworthiness. Whereas, if a higher service limit is seen as permission to set a higher service level, then it should lead to lower trustworthiness. We test these opposing predictions in §6.3.
5 Experimental Design and Procedure

We designed an experiment with three treatment conditions corresponding to the three forms of manufacturer assistance. In each treatment condition, participants played the channel game as described in §3. We used a between-subjects design. There were 3 experimental sessions for each treatment and 12 participants per session, resulting in a total of 108 participants (3 treatments x 3 sessions/treatment x 12 participants/session). We used the following model parameters in the experiment: \( k = 1, w = 0.5, p = 1.5, \xi = 10, \bar{\xi} = 80, \epsilon = -10, \bar{\epsilon} = 10 \). The maximum service level is, therefore, \( \bar{s} = \frac{2}{k} (p - w) (\bar{\xi} + \bar{\epsilon}) = 180 \).

The random variables \( \xi \) and \( \epsilon \) were uniformly distributed integers over their supports. To facilitate the comparison of results across treatments, we pre-generated the values of the random variables needed for each decision round and used the same values and sequence in all experimental sessions.\(^8\)

Participants’ decisions in the channel game are likely to be influenced by their ability to compute the service level based on the demand information. Therefore, we included a retailer-only task to measure participants’ ability. In the retailer-only task, each individual played the role of a retailer who observed the actual value of \( \xi \) and then made a decision on how much retail service \( s \) to provide. The retailer’s profit was identical to that in the channel game. Therefore, the retailer’s optimal service level was still given by \( s_i(\xi) \). We measure each participant’s ability using participant decision bias, defined as the average difference between the participant’s service decision and the optimal service level, i.e. the average of \( s - s_i(\xi) \).

In each experimental session, participants were randomly seated in front of computer terminals networked through a z-Tree program (Fischbacher 2007). They could only interact through computer terminals and were not allowed to communicate in any other way among themselves. Participants started with the retailer-only task, which involved 2 practice rounds and 10 paying rounds. Then there was a 5-minute break, followed by the channel game (IS, AP or DL) with 2 practice rounds and 11 paying rounds. In the channel game, participants were paired anonymously in each round and did not know the identity of the person they were playing with. To further minimize the possibility of repeated interaction effects, no participant was matched more than once with another participant. The experimental instructions clearly stated that there would be no re-matching. Participants could be assigned different roles (either the manufacturer or the retailer) from one round to the next. By rotating roles, participants could gain

\(^8\)We selected the sequence of random values from a sample of 100,000 sequences. To ensure that the sequence used was sufficiently representative of draws from a uniform distribution, we selected the sequence that minimized the Kolmogrov-Smirnov test statistic (which is used to compare an empirical distribution with a reference distribution) computed relative to the uniform distribution.
a better understanding of the strategic considerations of both roles in the game, giving standard theory its best chance to be supported. Rotating roles also ensured that the individual compensation did not differ systematically due to fixed role assignment. In each session, half of the participants took on the role of a manufacturer in 5 (of 11) rounds, and the remaining half in 6 rounds.9

In the IS treatment, the channel game proceeded as follows. In each round, the manufacturer participant observed the value of demand information $\xi$ and sent a report to his retailer partner. The retailer participant set the retail service level after observing her partner’s report. After both decisions were made, demand and firm profits were automatically computed. Participants then received feedback, including the value of the realized intrinsic appeal $q$, the manufacturer’s report $\hat{\xi}$, the retailer’s service level $s$, the respective profit of the firms, and their own cumulative profit. The AP treatment was identical to the IS treatment with the only difference that the manufacturer participant sent an advice $\hat{s}$ to the retailer.

In the DL treatment, the retailer participant set the retail service limit $s_{\text{lim}}$. Simultaneously, we obtained the manufacturer participant’s decision using the \textit{strategy method}: we elicited the service level decision $s_{\text{dl}}$ for several possible values of the service limit, and then used this response to determine the manufacturer’s service decision given the actual service limit set by the retailer participant. The manufacturer participant made these decisions after observing the value of $\xi$. The strategy method allows us to determine the extent of the manufacturer’s trustworthiness unconstrained by the actual service limit set by the retailer.10 The strategy method has been commonly used in the literature to observe the full range of behavior of a second-mover for different possible decisions of a first-mover (e.g., Fehr and Fischbacher 2004; Falk et al. 2008; Charness et al. 2012). To keep the manufacturer’s task manageable, we used nine equally-spaced values for the service limit from 20 to the maximum service level of $\bar{s} = 180$. We refer to these nine values (20, 40, 60...180) as the sample limits. If the actual service limit set by the retailer was in between these sample limits, then we obtained the manufacturer service decision by linearly interpolating from the responses for the two closest sample limits.11 We measured the manufacturer’s trustworthiness in DL as the average inflation in the manufacturer’s response for the

9See Bolton et al. (2004); Ho and Zhang (2008); Özer et al. (2011); Bolton et al. (2013); Wang and Haruvy (2013) for the use of rotating role assignment in related literature.

10We also conducted three pilot sessions of the DL treatment without the strategy method. Manufacturer participants set the service level decision $s_{\text{dl}}$ after observing the service limit set by her retailer partner. In this case, we cannot measure the inflation in manufacturer decisions if $s_{\text{lim}} \leq s_i (\xi)$. Consequently, the inflation measure is not directly comparable. However, the results for all other measures are similar to those obtained under the strategy method. The details are available from the authors upon request.

11For example, if the actual service limit is 53, then we interpolated from the manufacturer’s responses for sample limits of 40 and 60.
sample limits of 80 to 180.\textsuperscript{12}

For both the retailer-only task and the channel game, detailed experimental instructions were displayed on the computer screen. Participants could read the instructions at their own pace. After all participants finished reading the instructions, the experimenter highlighted the key components of the task by reading a pre-prepared script. The game setup and information structure were common knowledge for all participants. Each participant also had a hard copy of a reference sheet, which summarized key information about the task. Participants then had to pass a computerized quiz before starting the first practice round. Also, on each decision screen, each participant could use a decision support tool to better understand how their decisions (or their partner’s decisions) may affect the outcomes of that decision round.\textsuperscript{13} After the retailer-only task and channel game were completed, participants filled out an exit survey about their decisions in the channel game and provided information about their demographics and academic background. Besides a $10 fixed participation fee, individual compensation was proportional to how much profit was accumulated in the retailer-only task and the channel game. The experimenter paid cash to each participant in private, thanked and dismissed participants one by one. Each experimental session lasted for about two and a half hours. Individual payments ranged from $20 to $40, with an average of $32.35.

6 Experimental Results

Table 2 provides summary statistics for the retailer-only task and the channel game. In the retailer-only task, we observe that participant decisions are close to optimal in all treatment conditions and participant decision bias does not differ significantly from zero ($p = 0.89, 0.52, \text{ and } 0.88$ respectively in IS, AP and DL).\textsuperscript{14} In the channel game, our main interest is in comparing the effects of the three forms of manufacturer assistance.\textsuperscript{15} We make two preliminary observations from the summary statistics in Table 2. First, inflation (trustworthiness) and deflation (trust) are lowest in IS and highest in DL. Second, sensitivity (coordination) and retailer’s expected profits are also highest in IS and lowest in DL. These observations suggest that trusting and trustworthy behaviors decline as the manufacturer’s

\textsuperscript{12}We do not include sample limits below 80 because the retailer’s optimal service level can be higher than these sample limits for some values of $\xi$. We remark that including observations from sample limits below 80 whenever the optimal service level is lower than these limits does not qualitatively affect our findings. Our current procedure ensures that inflation is consistently based on the same number of sample limits in each decision round.

\textsuperscript{13}The experimental instructions, screen-shots of the experimental software, and other experimental documents are available from the authors upon request.

\textsuperscript{14}All p-values are 2-sided unless stated otherwise.

\textsuperscript{15}In DL, four manufacturer participants did not change the service level decision from its default value of zero for several sample limits. Their responses were treated as missing observations and excluded from the analysis. Including these observations does not significantly alter any of our conclusions.
involvement in the service decision increases from IS to AP to DL. Next, we investigate these differences formally.

Table 2: Summary Statistics: Mean, [Median], (Standard Deviation)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Retailer-Only Task</th>
<th>Channel Game</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decision Bias</td>
<td>Inflation</td>
</tr>
<tr>
<td>IS</td>
<td>-0.09 [0.45]</td>
<td>11.01 [5]</td>
</tr>
<tr>
<td>AP</td>
<td>0.58 [0.00]</td>
<td>18.78 [10]</td>
</tr>
<tr>
<td>DL</td>
<td>-0.11 [0.05]</td>
<td>51.48 [54]</td>
</tr>
</tbody>
</table>

Observations per treatment: 36 for retailer-only task, 198 in channel game for IS, AP, 176 for channel game in DL.

6.1 Testing for the Presence of Trust and Trustworthiness

6.1.1 Does Information Sharing Support Trust and Trustworthiness?

We estimate the following random-effects regressions for manufacturer and retailer decisions in IS,

\[ \hat{\xi}_{it} = \alpha_0 + \alpha_1 \xi_t + \alpha_2 b_i + \alpha_3 t + \varepsilon_i + \eta_{it}, \]  

\[ s_{it} = \beta_0 + \beta_1 \hat{\xi}_{it} + \beta_2 b_i + \beta_3 t + \varepsilon_i' + \eta_{it}', \]

where i and t are participant and decision round indices, respectively. Equation (7) allows us to test for correlation between manufacturers’ reports (\( \hat{\xi}_{it} \)) and their demand information (\( \xi_t \)). We use a Tobit model to account for the possible right-censoring of the report. We use \( \hat{\xi}_{it}^* \) to denote the latent variable for \( \hat{\xi}_{it} \) in this Tobit model. Equation (8) allows us to test for correlation between the retailers’ service decisions (\( s_{it} \)) and the reports they received (\( \hat{\xi}_{it} \)). In both cases, we control for participant decision bias (\( b_i \)), time trend (\( t \)), and unobserved participant-level heterogeneity (\( \varepsilon_i \) and \( \varepsilon_i' \)). Table 3 provides the regression results. We observe that manufacturers’ reports are significantly and positively correlated with their demand information, and retailers’ service decisions are significantly and positively correlated with manufacturers’ reports. Thus, contrary to standard theory predictions, manufacturers base their reports on their information and retailers rely on these reports. Hence, Hypothesis 1 is supported for IS.

6.1.2 Does Advice Provision Support Trust and Trustworthiness?

We estimate the following random-effects regressions for manufacturer and retailer decisions in AP,

\[ \hat{s}_{it} = \alpha_0 + \alpha_1 \xi_t + \alpha_2 b_i + \alpha_3 t + \varepsilon_i + \eta_{it}, \]  

\[ s_{it} = \beta_0 + \beta_1 \hat{s}_{it} + \beta_2 b_i + \beta_3 t + \varepsilon_i' + \eta_{it}', \]

See Fehr et al., 1998; Charness, 2004; Özer et al., 2011 for uses of random-effects regression models in related literature.
Equation (9) allows us to test for correlation between manufacturers’ advice ($\hat{s}_{it}$) and their demand information ($\xi_t$). We use a Tobit model to account for the possible right-censoring of advice. We use $\hat{s}_{it}^*$ to denote the latent variable for $\hat{s}_{it}$ in this Tobit model. Equation (10) allows us to test for correlation between the retailers’ service decisions ($s_{it}$) and the advice they received ($\hat{s}_{it}$). From Table 3, we observe that manufacturers’ advice is significantly and positively correlated with their demand information, and retailers’ service decisions are significantly and positively correlated with manufacturers’ advice. Hence, Hypothesis 1 is supported for AP.

Table 3: Regression Results for Presence of Trust and Trustworthiness: Estimate (Standard Error)

<table>
<thead>
<tr>
<th>Variable</th>
<th>IS</th>
<th>AP</th>
<th>DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\hat{\xi}^*$</td>
<td>25.29** (3.33)</td>
<td>12.55** (3.183)</td>
<td>19.65** (6.06)</td>
</tr>
<tr>
<td>$s_{\xi}$</td>
<td>0.67** (0.05)</td>
<td>—</td>
<td>0.88** (0.09)</td>
</tr>
<tr>
<td>$\hat{s}$</td>
<td>—</td>
<td>0.44** (0.04)</td>
<td>—</td>
</tr>
<tr>
<td>$\hat{s}_{dl}$</td>
<td>—</td>
<td>—</td>
<td>0.12** (0.03)</td>
</tr>
<tr>
<td>$\beta$</td>
<td>0.01 (0.42)</td>
<td>0.42 (0.43)</td>
<td>-0.07 (0.52)</td>
</tr>
<tr>
<td>$t$</td>
<td>0.04 (0.30)</td>
<td>0.16 (0.25)</td>
<td>0.70 (0.58)</td>
</tr>
</tbody>
</table>

Notes: ** indicates $p \leq 0.01$

6.1.3 Does Delegation Support Trust and Trustworthiness?

We estimate the following random-effects regressions for manufacturer and retailer decisions in DL,

$$s_{dl,it}^* = \alpha_0 + \alpha_1 \xi_t + \alpha_2 b_i + \alpha_3 t + \varepsilon_i + \eta_{it},$$  \hspace{1cm} (11)

$$l_{it} = \beta_0 + \beta_2 b_i + \beta_3 t + \varepsilon_i + \eta_{it}.$$  \hspace{1cm} (12)

Equation (11) allows us to test for correlation between manufacturers’ service decision ($s_{dl,it}$) and their demand information ($\xi_t$). We use a Tobit model to account for the possible right-censoring of the service decision because of the service limit. We use $s_{dl,it}^*$ to denote the latent variable for $s_{dl,it}$ in this Tobit model. Equation (12) allows us to test whether the service limit is significantly higher than the standard theory prediction of $s_{Ni}$, where $l_{it} = s_{lim,it} - s_{Ni}$. A positive intercept would indicate that the retailer places more trust than predicted by theory. From Table 3 we observe that the manufacturer’s service decisions are significantly and positively correlated under both regressions for sample limits of 80 ($s_{dl,80}^*$) and 180 ($s_{dl,180}^*$)\(^{17}\). Thus, there is significant trustworthiness. The intercept for the retailer’s service limit decision is negative and significant. Thus, retailers do not rely on manufacturers, and delegate even lesser decision rights than predicted by standard theory. Hence, Hypothesis 1(a) is supported but

\(^{17}\)We report the results for the lowest (80) and highest (180) sample limits that are always higher than the retailer’s optimal service level. The results for the intervening sample limits are similar and deferred to Appendix C.1.
Hypothesis 1(b) is rejected for DL.

6.2 Comparison Across Arrangements

We compare trust and trustworthiness across the three forms of assistance using the trust measure (deflation, denoted by $r$) and trustworthiness measure (deflation, denoted by $m$) defined in §4.1. We estimate the following random-effects regressions

$$m_{it} = \alpha_0 + \alpha_1 IS + \alpha_2 DL + \alpha_3 \xi_t + \alpha_4 b_i + \alpha_5 t + \varepsilon_i + \eta_{it}, \quad (13)$$

$$r_{it} = \beta_0 + \beta_1 IS + \beta_2 DL + \beta_3 \xi_t + \beta_4 b_i + \beta_5 t + \varepsilon_i' + \eta_{it}, \quad (14)$$

where, $IS$ is the indicator variable for the IS treatment, and $DL$ is the indicator variable for the DL treatment. Their coefficients determine whether inflation/deflation is higher or lower relative to AP. From Table 4, we observe that the coefficients of $IS$ in both regressions are negative and significant, while those of $DL$ are positive and significant. Thus, inflation and deflation are lowest in IS and highest in DL. In other words, trust and trustworthiness are highest in IS and lowest in DL. Hence, we find support for Hypotheses 2, reject Hypothesis 4 but find support for Hypothesis 6.

Table 4: Regression Results for Equations (13) and (14): Estimate (Standard Error)

<table>
<thead>
<tr>
<th>Variable</th>
<th>$m$</th>
<th>$r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>32.70**</td>
<td>7.12*</td>
</tr>
<tr>
<td>$IS$</td>
<td>-8.24**</td>
<td>-6.69*</td>
</tr>
<tr>
<td>$DL$</td>
<td>32.22**</td>
<td>20.07**</td>
</tr>
<tr>
<td>$\xi$</td>
<td>-0.36**</td>
<td>0.38**</td>
</tr>
<tr>
<td>$b$</td>
<td>0.37</td>
<td>0.41</td>
</tr>
<tr>
<td>$t$</td>
<td>0.10</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Notes: ** indicates $p \leq 0.01$, * indicates $p \leq 0.05$.

Next, we determine under which form of assistance channel members coordinate their decisions better. To do so, we estimate the following random-effects regression,

$$s_{ijt} = \lambda_0 + \lambda_1 \xi_t + \lambda_2 IS \cdot \xi_t + \lambda_3 DL \cdot \xi_t + \lambda_4 IS + \lambda_5 DL + \lambda_6 b_i + \lambda_7 b_j' + \lambda_8 t + \varepsilon_i + \varepsilon_j' + \eta_{ijt}, \quad (15)$$

where $i$ indexes the participant in the retailer role, $j$ indexes the participant in the manufacturer role, and $t$ indexes the decision round. The coefficient of $\xi_t$ provides the sensitivity of retail service level to demand information in AP. The coefficients of the interaction terms $IS \cdot \xi_t$ and $DL \cdot \xi_t$ allow us to compare whether service decisions are more or less sensitive to demand information in IS and DL relative to AP. We include as controls the time trend ($t$), decision biases of participants in retailer role ($b_i$) and manufacturer role ($b_j'$), and unobserved participant-level heterogeneity in the retailer and manufacturer roles ($\varepsilon_i$ and $\varepsilon_j'$). From Table 5, we observe that the interaction term $IS \cdot \xi_t$ is positive but not statistically
significant, and the interaction term $DL \cdot \xi_t$ is negative and significant. Thus, coordination of channel decisions is directionally higher in IS, and significantly lower in DL compared to AP.

Finally, we estimate the following random-effects regressions to compare expected profits,

\[
\Pi_{R,it} = \alpha_0 + \alpha_1 IS + \alpha_2 DL + \alpha_3 \xi_t + \alpha_4 b_i + \alpha_6 t + \varepsilon_i + \eta_{it},
\]

\[
\Pi_{M,it} = \beta_0 + \beta_1 IS + \beta_2 DL + \beta_3 \xi_t + \beta_4 b_i + \beta_6 t + \varepsilon'_i + \eta'_{it},
\]

where $i$ and $t$ are participant and round indices, respectively. The coefficients of $IS$ and $DL$ provide a measure of how much more or less channel members’ expected profits are in IS and DL relative to AP. We include as controls the expected demand level ($\xi_t$), participant decision bias ($b_i$), time trend ($t$), and unobserved participant-level heterogeneity.\(^{18}\) From Table 5, we observe that the coefficient for $IS$ is positive but not significant in Equation (16). The coefficient for $DL$ is negative and significant. Thus, retailer profits are not significantly different between IS and AP, and is significantly lower in DL. We also observe from Table 5 that the coefficient for $IS$ is negative but not significant in Equation (17). The coefficient for $DL$ is negative and significant. Thus, manufacturer profits do not differ significantly between IS and AP, and is significantly lower in DL. Hence, we reject Hypothesis 3 and Hypothesis 5, but find support for Hypothesis 7.

Table 5: Regression Results for Equations (15),(16) and (17): Estimate (Standard Error)

<table>
<thead>
<tr>
<th>Variable</th>
<th>$s$</th>
<th>$\Pi_R$</th>
<th>$\Pi_M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>27.43** (2.68)</td>
<td>-665.50** (49.95)</td>
<td>-65.95 (53.85)</td>
</tr>
<tr>
<td>$IS$</td>
<td>-3.89 (3.48)</td>
<td>33.77 (38.31)</td>
<td>-26.85 (40.62)</td>
</tr>
<tr>
<td>$DL$</td>
<td>3.36 (3.56)</td>
<td>-110.71** (39.27)</td>
<td>-200.12** (41.87)</td>
</tr>
<tr>
<td>$IS \cdot \xi$</td>
<td>0.06 (0.06)</td>
<td>$-$</td>
<td>$-$</td>
</tr>
<tr>
<td>$DL \cdot \xi$</td>
<td>-0.23** (0.06)</td>
<td>$-$</td>
<td>$-$</td>
</tr>
<tr>
<td>$\xi$</td>
<td>0.23** (0.04)</td>
<td>35.09** (0.68)</td>
<td>20.92** (0.74)</td>
</tr>
<tr>
<td>$b$</td>
<td>0.54** (0.20)</td>
<td>5.97 (3.46)</td>
<td>-0.62 (3.76)</td>
</tr>
<tr>
<td>$b'$</td>
<td>-0.05 (0.15)</td>
<td>$-$</td>
<td>$-$</td>
</tr>
<tr>
<td>$t$</td>
<td>0.17 (0.15)</td>
<td>5.90 (4.51)</td>
<td>8.22 (4.88)</td>
</tr>
</tbody>
</table>

Notes: ** indicates $p \leq 0.01$, * indicates $p \leq 0.05$.

To summarize, trust, trustworthiness, coordination and retailer profit decline as we move from IS to AP to DL, i.e., with increasing manufacturer involvement in the retail service decision. We remark that, even though trust and trustworthiness are significantly higher in IS than in AP, coordination of channel decisions and retailer profits are only directionally higher in IS compared to AP. We explain the

\(^{18}\)We also estimated Equations (16) and (17) with controls for the decision bias and unobserved heterogeneity of the partner participant. We obtain similar results. Hence, we report the results of the simpler model.
reason in §7. In DL, even though there is evidence of manufacturer trustworthiness, the lack of trust results in a lack of coordination. In particular, retailer participants set even lower limits than predicted by the standard theory, suggesting that they were unwilling to cede control even when doing so is in their material interest.

6.3 Information Processing under Information Sharing vs. Advice Provision

We analyze participants’ usage of the on-screen decision support tool and their exit survey responses. In all treatment conditions, manufacturer participants had access to an on-screen decision support tool. Using this tool, participants could calculate their profit and their partner’s profit for different service levels. The decision support tool displayed a table with the distribution of profits given possible realizations of demand. The z-Tree program used for the experiment allowed us to track whether and how many times a participant used the decision tool in each decision round, as well as the time taken to make the decision. We also collected exit-survey responses in which participants provided open-ended descriptions of their strategies as the manufacturer.

Participants spent more time and effort evaluating profit implications under prescriptive processing (AP) than under descriptive processing (IS). The decision support tool was used for 45% of decisions in IS, and 81% in AP. To examine whether the difference in usage rate is significant, we estimated a random-effects logit regression controlling for the actual demand information (ξ), participant decision bias (b), and time trend (t). We find that the usage of the decision support tool was significantly lower in IS than in AP (z = −3.65, p < 0.01). Conditional on using the tool, the number of times a participant used a tool in a decision round was also significantly lower in IS (4 times in IS, 6.2 times in AP, z = −2.24, p = 0.03 in a censored random-effects Poisson regression controlling for ξ, b and t). Participants also took less time to make their decisions in IS (30.5 seconds in IS, and 45.5 seconds in AP, z = 2.71 and p < 0.01 in a random-effects regression controlling for ξ, b and t).\(^\text{19}\) Thus, consistent with our discussion in §4.3, more time and effort was spent in evaluating profit implications under prescriptive processing.

Moreover, participants’ responses in the exit survey suggest that the true demand information served as a salient benchmark in IS while profit implications were more salient in AP.\(^\text{20}\) When asked to describe their strategy as a manufacturer, 75% of participants in IS made explicit reference to the true demand information, using it as a benchmark to describe whether or how much they inflated their reports (e.g.,

\(^{19}\text{In DL, the usage rate for the tool was 69\% and the tool was used 7.7 times per decision round conditional on usage. These figures do not differ significantly from AP (p = 0.12 and p = 0.31, respectively). The decision time in DL (72.8 seconds) was considerably longer than in IS and AP because of the strategy method.}

\(^{20}\text{See Falk and Kosfeld (2006) for a similar use of post-experiment open-ended responses to understand behavior.} \)
“About 20 points higher than the true information”, “I tried to add 5 to 10 to the true information”). In contrast, only 42% of participants did so in AP. Instead, 64% of participants in AP stated their strategy in terms of profit implications for themselves and the retailer (e.g., “A good split so that I and my retailer would profit”, “Make it beneficial to me and did not hurt the retailer”), whereas only 25% of participants did so in IS.

Finally, participants’ self-reported trustworthy behavior is more consistent with their actual behavior in IS than in AP, lending support to the argument that prescriptive processing offers more flexibility to rationalize untrustworthy behavior. Specifically, in IS, 39% of participants self-reported their strategy as being truthful or only inflating slightly (e.g., “I reported accurately”, “I tried my best to be completely honest”, “I usually reported close to the actual information”). The average inflation in their reports was 4.57 compared to the average inflation of 15.28 for the remaining participants, and this difference is significant.\(^21\) In AP, 50% of participants self-reported their strategy as one that was meant to benefit both themselves and the retailer (e.g., “Benefit both of us the most”, “Tried striking win-win.”, “Best decision to benefit both of us”). The average inflation in their advice was 17.93 compared to the average inflation of 19.63 for the remaining participants, and this difference is not significant.\(^22\) We remark that while descriptions of trustworthy behavior in IS are based on deviation from the true information, those in AP are with reference to some notion of jointly benefiting both players. Consequently, participants in AP could more easily accommodate the consideration of their own profit without appearing untrustworthy. Further, the notion of “jointly benefit both players” is flexible enough to accommodate untrustworthy behavior.

The above observations provide evidence that prescriptive processing leads to deeper thinking and heightened attention to profit implications, which should increase untrustworthy behavior. In addition, prescriptive processing provides more scope for self-serving rationalizations, whereas the true information serves as a salient benchmark under descriptive processing, restricting the scope for such rationalizations. These observations lend further support to our discussion in §4.3.

### 6.4 Impact of Providing Explicit Benchmark for Advice

From §4.3, the lower trustworthiness in AP than in IS could either be due to the availability of an objective benchmark in IS to evaluate one’s behavior, or due to the deeper thinking and greater attention to profit implications in AP. To explore this further, we designed a modified version of the AP treatment,\(^{21}\) \(p < 0.01\), random-effects regression controlling for the actual demand information, participant decision bias, and time trend 

\(^{22}\) \(p = 0.75\), random-effects regression controlling for \(\xi\), \(b\) and \(t\)
namely the APB treatment condition, in which we provided an objective benchmark for advice. In particular, in each decision round, manufacturer participants were provided with the retailer’s optimal service level $s_i(\xi)$. The APB treatment was identical to the AP treatment in all other respects. If the objective benchmark influences manufacturer trustworthiness, then trustworthiness should be higher in APB than in AP. Furthermore, the availability of an objective benchmark for advice should also eliminate retailer’s uncertainty about the manufacturer’s capability to perform the optimization task. Thus, if retailers’ concern about manufacturer capability is a significant factor influencing the level of trust, then trust should be higher in APB than in AP.

We find that the average inflation under APB (mean = 17.26, median = 10.5, sd = 25.27) is not significantly different than that under AP. Thus, AP and APB have similar levels of trustworthiness. Additional analysis suggests that providing an explicit benchmark did not alter the type of information processing. Manufacturer participants continued to pay considerable attention to profit implications. The usage rate of the decision support tool by manufacturer participants was 87% in APB, which was not significantly different than that in AP. Moreover, only 37% of participants made explicit reference to the retailer’s optimal service level in describing their strategy, while 75% described their strategy in terms of profit implications for themselves and the retailer. We also find that the average deflation in their decisions under APB (mean = 23.06, median = 15, sd = 29.16) is not significantly different than that under AP. Thus, the level of trust also did not differ between AP and APB.

Therefore, we conclude that the lower trustworthiness in AP compared to IS is not due to the availability of an objective benchmark. Rather, the deeper thinking and greater attention to profit implications in AP results in lower trustworthiness. Also, these results provide additional evidence that retailers’ concern about manufacturer’s capability to determine an optimal service level is not a significant factor affecting retailer trust.

6.5 Role of Service Limit under Delegation

As discussed in §4.4, the lower trustworthiness in DL compared to AP could be because the manufacturer interpreted the service limit as permission to set a high service level. If this is indeed the case, then one would expect that manufacturer participants inflate their decisions more for higher service limits. Alternatively, if a higher service limit is seen as a signal of trust or as providing more autonomy, then manufacturers should inflate their service decisions more for lower service limits. To investigate this further, we compared manufacturer participants’ decisions across different service limits.

Figure 1 shows the cumulative distribution of manufacturer service decisions for service limits of 80
and 180. If the retailer’s service limit did not affect the trustworthiness of manufacturer participants, then one should expect that the cumulative distributions coincide up to the service level of 80. If participants inflated their decisions more for higher service limits, then one should expect that the distribution for the sample limit of 80 is to the left of the distribution for the sample limit of 180, i.e., for any given service level, more participants choose a higher service decision under the sample limit of 180 than under the sample limit of 80. We observe from Figure 1 that the distribution for the sample limit of 80 is indeed to the left of the distribution for the sample limit of 180. Moreover, the difference between the distributions is significant.

We find that the service decisions are significantly higher under the higher service limit \( p < 0.01 \), Wilcoxon’s signed rank test). Hence, indeed a higher service limit is taken as permission to set a higher service level.

Figure 1: Cumulative Distribution of Service Level Decisions for Service Limits of 80 and 180

7 Trust and Trustworthiness Types

Table 2 in §6 shows considerable variation in the extent of trusting and trustworthy behaviors in each treatment. Here, we investigate how variation in participants’ behaviors affect performance. To do so, we group participants into distinct trustworthiness and trust types in each treatment condition. A participant’s trustworthiness type is based on her average inflation in the manufacturer role. Specifically,

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23 Other pairwise comparisons yield the same qualitative result and are deferred to Appendix C.2.
24 To test this difference, we modify the distribution of service decisions under a sample limit of 180 such that any service decision higher than 80 is set equal to 80. Falk and Kosfeld (2006) also use this approach to compare the distribution of agents’ effort decisions with and without a minimum effort level limit imposed by the principal. They too use the strategy method to obtain the agent’s effort response with and without the limit. To compare these responses, they modify the distribution of decisions without a limit by changing the decisions lower than the limit to be equal to the limit. In our context, the service limit of 180 corresponds to not having a limit since it is equal to the highest allowed service level \( s = 180 \).
25 We take the average difference in service decisions under the two sample limits for each participant to account for repeated observations. We also estimate a random-effects Tobit regression for participant decisions using the modified distribution for the sample limit of 180, and including \( \xi, b \) and \( t \) as controls. We find that decisions are significantly more inflated under the higher limit \( p < 0.01 \).
we rank participants in increasing order of their average inflation and divide them into three equal-sized
groups (a tertile split), representing three trustworthiness types. We label the type with the least inflation
as *saints*, the type with the most inflation as *scoundrels*, and the intermediate type as *in-betweens*. We
also group participants into three *trust types* using a tertile split based on each participant’s average
deflation in the retailer role. We label the three trust types as *believers, in-betweens*, and *skeptics* in the
increasing order of trusting behavior.

**Figure 2: Behavioral Types in IS**

(a) Trustworthiness Types: Saints vs. Scoundrels

(b) Trust Types: Believers vs. Skeptics

In all treatments, we find that the trust and trustworthiness types differ considerably in their behaviors. In addition, participants’ behaviors are consistent over time, e.g., those participants who are
on average saints continue to be saints over time. Figure 2 graphically depicts these differences for the
case of IS. Figure 2(a) plots manufacturers’ reports $\hat{\xi}$ against their demand information $\xi$ for saints and
scoundrels. The dashed line is the truthful report $\hat{\xi} = \xi$. The solid lines are the fitted linear relationships
between $\hat{\xi}$ and $\xi$ for saints and scoundrels. We immediately observe that saints are relatively truthful
while scoundrels inflate their reports substantially. Figure 2(b) plots retailers’ service decisions $s$ against
manufacturers’ reports $\hat{\xi}$ for believers and skeptics. The dashed line represents the service decisions of
a fully-trusting retailer, i.e., $s = s_i(\hat{\xi})$. The solid lines are the fitted linear relationships between $s$ and
$\hat{\xi}$ for believers and skeptics. Believers are relatively trusting while skeptics discount the manufacturer
reports substantially. The pattern of behaviors across trust and trustworthiness types is similar in AP.
In DL, scoundrels consistently inflate close to the service limit. Saints inflate considerably less, though
they still set significantly higher service levels than the retailer’s optimal service level. Believers set significantly higher service limits than the skeptics. We perform formal comparisons to establish that the trust types and trustworthiness types differ significantly and these differences persist over time in each treatment condition. We defer the details to Appendix C.3.

We remark that the heterogeneity in trust and trustworthiness across participants can explain why IS and AP do not differ significantly in the extent of coordination and retailer profit despite the higher trust and trustworthiness in IS. Coordination in channel decisions and retailer profits can be expected to be highest when retailers who are believers (highly trusting) are paired with manufacturers who are saints (highly trustworthy). We find that by random chance believers were paired less frequently with saints in IS than in AP (28% in IS, 46% in AP, \( p = 0.03 \)). This mismatch counteracts the effects of higher levels of trust and trustworthiness in IS. Consequently, coordination and retailer profit are not significantly higher than in AP. Next, we investigate the implications of trusting and trustworthy behaviors for channel member profits in more detail.

7.1 The Manufacturer’s Perspective

We estimate the following random-effects regression to test the effect of types on manufacturers’ profits:

\[
\Pi_{M,it} = \beta_0 + \beta_1 I_{M,i} + \beta_2 S_{M,i} + \beta_3 I_{R,it} + \beta_4 S_{R,it} + \beta_5 \xi_t + \beta_6 t + e_i + \eta_{it},
\]

where \( I_{M,i} \) and \( S_{M,i} \) are indicator variables for participant \( i \)'s trustworthiness types, and denote in-betweens and scoundrels respectively. \( I_{R,it} \) and \( S_{R,it} \) are indicator variables for the trust types of participant \( i \)'s retailer partner in round \( t \), and denote in-betweens and skeptics respectively.

Manufacturers benefit from retailers’ trust. In Table 6, the coefficients of \( I_R \) and \( S_R \) are negative in all three treatment conditions, and significant in all cases. Hence, manufacturers realize lower profits if they are paired with an in-between or a skeptic than a believer. In IS and AP, retailers that are in-betweens and skeptics deflate the manufacturers’ information reports or advice by a considerable extent. As a result, manufacturers have limited influence on retailers’ decisions.\(^{26}\) In contrast, believers are more influenced by the information report or advice. Consequently, manufacturers fare better if the retailer is more trusting. In DL, skeptics and in-betweens set significantly lower service limits than believers. Thus, manufacturers fare worse when paired with skeptics.

Trustworthy behavior does not pay off. In Table 6 the coefficients of \( I_M \) and \( S_M \) are positive in

\(^{26}\)In IS, the mean service level set by skeptics is 25.76, whereas the mean optimal service level based on the actual demand conditions, i.e., \( s_0(\xi) \), is 42.75. In AP, the corresponding figures are 31.37 and 43.63. Thus, skeptics considerably under-provide service relative to the actual demand conditions. The difference is statistically significant in both IS and AP (\( p < 0.01 \) in both cases; we use random-effects regressions for the difference and test whether the intercept is significantly positive).
all cases, and significant in IS and DL. Hence, the trustworthy behavior of saints comes at the expense of their own pecuniary payoff. One might think that saints may have been trustworthy because they were less capable in making decisions that maximized their pecuniary payoffs. However, in the retailer-only task, saints did not differ significantly from the other types in their expected profits.²⁷ Hence, saints were equally capable as others in making decisions that maximized their pecuniary payoffs. These observations suggest that saints are trustworthy because of non-pecuniary motives.

Table 6: Impact of Behavioral Types on Manufacturer Profit: Estimate (Standard Error)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>IS</th>
<th>AP</th>
<th>DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-66.47</td>
<td>-36.08</td>
<td>160.46</td>
</tr>
<tr>
<td></td>
<td>(86.31)</td>
<td>(87.91)</td>
<td>(76.30)</td>
</tr>
<tr>
<td>IR</td>
<td>-176.82**</td>
<td>-175.33**</td>
<td>-214.76**</td>
</tr>
<tr>
<td>S</td>
<td>523.01**</td>
<td>-383.48**</td>
<td>-463.64**</td>
</tr>
<tr>
<td>M</td>
<td>113.70**</td>
<td>93.36</td>
<td>160.79</td>
</tr>
<tr>
<td>S</td>
<td>208.53**</td>
<td>35.06</td>
<td>23.83</td>
</tr>
<tr>
<td>ξ</td>
<td>23.82**</td>
<td>(1.06)</td>
<td>(1.16)</td>
</tr>
<tr>
<td>t</td>
<td>4.97</td>
<td>6.13</td>
<td>6.55</td>
</tr>
</tbody>
</table>

Notes: ** indicates \( p \leq 0.01 \), * indicates \( p \leq 0.05 \).

7.2 The Retailer’s Perspective

We estimate the following random-effects regression to test the effect of types on retailers’ profits

\[
\Pi_{R,it} = \alpha_0 + \alpha_1 I_{R,i} + \alpha_2 S_{R,i} + \alpha_3 I_{M,it} + \alpha_4 S_{M,it} + \alpha_5 \xi_t + \alpha_6 t + \epsilon_i + \eta_{it},
\]

where \( I_{R,i} \) and \( S_{R,i} \) are indicator variables for participant \( i \)'s trust type, and denote in-betweens and skeptics respectively. \( I_{M,it} \) and \( S_{M,it} \) are indicator variables for the trustworthiness type of participant \( i \)'s manufacturer partner in round \( t \), and denote in-betweens and scoundrels respectively.

Table 7: Impact of Behavioral Types on Retailer Profits: Estimate (Standard Error)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>IS</th>
<th>AP</th>
<th>DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-604.84**</td>
<td>-708.89**</td>
<td>-552.36**</td>
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<tr>
<td></td>
<td>(88.68)</td>
<td>(85.93)</td>
<td>(95.36)</td>
</tr>
<tr>
<td>IR</td>
<td>-29.28</td>
<td>54.36</td>
<td>-37.21</td>
</tr>
<tr>
<td>S</td>
<td>205.51**</td>
<td>-72.62</td>
<td>-220.87**</td>
</tr>
<tr>
<td>M</td>
<td>17.11</td>
<td>(56.30)</td>
<td>-24.67</td>
</tr>
<tr>
<td>S</td>
<td>-80.40</td>
<td>(57.14)</td>
<td>74.53</td>
</tr>
<tr>
<td>ξ</td>
<td>36.14**</td>
<td>38.61**</td>
<td>30.34</td>
</tr>
<tr>
<td>t</td>
<td>7.15</td>
<td>(7.37)</td>
<td>(7.31)</td>
</tr>
</tbody>
</table>

Notes: ** indicates \( p \leq 0.01 \), * indicates \( p \leq 0.05 \), + denotes \( p \leq 0.1 \).

**Trusting behavior can pay off.** We observe from Table 7 that skeptics fare worse than believers

²⁷To make the comparison, we use a random-effects regression with indicator variables for the trustworthiness type. We find that the coefficients for the indicator variables are not significant.
(coefficient of $S_R$ is negative) and this difference is significant in IS and DL. In IS, even though manufacturers are not completely trustworthy, their input is still informative. As a result, believers benefit from relying on their input. Skeptics, however, realize significantly lower profits because they “overly” discount the manufacturers’ input and fail to exploit the information contained in the manufacturer reports. In other words, trusting behavior can pay off even in the presence of manufacturer opportunism. Similarly in DL, believers benefit from delegating some authority to manufacturers, whereas skeptics set even lower service limits than the standard theory prediction. Thus, skeptics retain control even when it is not in their material benefit to do so.

Retailers benefit from manufacturers’ trustworthiness. We observe from Table 7 that retailers fare directionally better if their manufacturer partner is more trustworthy (coefficients of $S_M$ in IS, and $I_M$ and $S_M$ in AP, and $I_M$ in DL are negative). To understand the effect of trustworthiness further, we estimate Equation (19) for retailer profits separately for each trust type. We defer the details to Appendix C.4. Our analysis shows that in IS and AP, manufacturer’s trustworthiness matters considerably for believers, but not for skeptics. Since believers mostly trust the manufacturer’s information report or advice, it is important that their manufacturer partner is trustworthy. Skeptics, on the other hand, significantly discount any information or advice they receive. Hence, their profit is not influenced significantly by the manufacturer’s trustworthiness. In DL, even believers do not trust much and set low service limits. Hence, manufacturer trustworthiness does not significantly influence outcomes.

8 Discussion and Conclusion

This paper investigates the practice of a retailer relying on a manufacturer’s assistance to make better-informed retail decisions. While some practitioners and academics have been skeptical about the value of this practice, others believe that trust and trustworthiness between channel members can facilitate co-ordination and help realize significant gains. Our study offers a more refined perspective. It shows that whether and to what extent trust can arise in the channel depends on the form of manufacturer assistance and, in particular, the process through which assistance is provided. We study how the three prevalent forms of manufacturer assistance – information sharing (IS), advice provision (AP) and delegation (DL) – affect trust, trustworthiness and coordination of channel decisions. All three forms of assistance lead to the same outcome under extreme forms of trust, i.e., when both parties make decisions based only on their pecuniary payoff and have zero trust, or when they are fully-trusting and trustworthy. We investigate where actual behavior lies between these extremes, and how the form of
assistance affects the extent of trust, and hence coordination and channel member profits.

Some of our results are as follows. IS leads to higher trust and trustworthiness than AP because of *prescriptive processing* of information by manufacturers in AP. Prescriptive processing leads to deeper thinking and greater attention to profit implications. Prescriptive processing also provides more flexibility for the manufacturer to rationalize its untrustworthy behavior. We further find that AP leads to higher trust and trustworthiness than DL. In DL, the manufacturer interprets the limit on its decision rights set by the retailer as permission from the retailer to set a high service level, which lowers the manufacturer’s guilt from being untrustworthy. In addition, the retailer is reluctant to cede control to the manufacturer even when doing so is in its own material interest. Finally, while trustworthy behavior does not pay, trusting behavior pays off despite the presence of manufacturer opportunism. A retailer that is more trusting fares better than a retailer lacking in trust. Our results also suggest that while concerns regarding opportunism are not completely misplaced, they do not preclude effective manufacturer assistance. Even in the absence of complex contracts to govern manufacturers’ behavior, retailers can benefit from manufacturer assistance in the form of information sharing and advice provision. Retailers should, however, be circumspect about delegating authority to manufacturers. When delegation is the form of assistance, then retailers should have formal contracts to coordinate channel decisions.

Our results have implications for other distribution channel arrangements in which the retailer relies on the manufacturer’s assistance, such as vendor managed inventory (VMI). In VMI, the retailer delegates the decision rights to set retail inventory levels and replenishment policies to the manufacturer subject to certain bounds specified by the retailer (see, for example, Aviv 2004 and Chapter 8 in Simchi-Levi et al. 2008 for a detailed review of this literature). While VMI is expected to lead to efficiencies such as fewer stockouts and lower inventory costs, the results of this practice have been mixed (Blackhurst et al., 2005; Dong et al., 2007; Claassen et al., 2008). Researchers have pointed to the lack of trust as an important reason for poor performance under VMI (Blackhurst et al., 2005; Petersen et al., 2005; Simchi-Levi et al., 2008; Brinkhoff et al., 2015). In particular, the retailer may not delegate sufficient decision rights to the manufacturer to manage inventory. Moreover, the manufacturer may not act to minimize the retailer’s inventory costs, and instead move as much inventory as allowed by the retailer. Our findings support the concern that delegation results in lower trust and trustworthiness. Instead, the retailer may be better served if it retains control of inventory decisions, and the manufacturer shares any demand information it has or provides advice regarding replenishment decisions.

Our results and discussions also inform other operational and management context in which a prin-
principal relies on the assistance of an informed agent whose pecuniary incentives conflict considerably with those of the principal. For example, individual investors rely on different forms of assistance provided by third parties such as stock market analysts, financial advisors and fund managers to make financial investment decisions. The interests of these third parties can differ considerably from those of the investors’ (Angelova and Regner, 2013; Danilov et al., 2013). Therefore, choosing the right form of assistance can be critical in ensuring the financial well being of investors. Similar situations arise in the context of health care, wherein consumers rely on health care providers for information, advice or to make decisions on their behalf regarding medicines, treatment plans and other procedures (e.g., see Edwards and Elwyn 2009 for a recent review). For example, researchers have increasingly called for a transition from delegated-decision making to greater involvement of consumers in their health care decisions. Our findings support this perspective.

We also see some directions for fruitful future research. To isolate the effects of non-pecuniary motives from reputational effects, we have focused on one-shot interactions. Repeated interactions can provide manufacturers an incentive to build a reputation of being trustworthy in order to gain retailers’ trust. Repeated interactions can also make retailers feel less vulnerable as future interactions provide them an opportunity to “punish” untrustworthy behavior. The latter may especially be the case under DL since repeated interactions can effectively restore some control to the retailer despite delegating decision rights to the manufacturer. Thus, it can be useful to study the implications of reputation through repeated interactions on the extent of trust and trustworthiness across different arrangements. Another avenue for further research is to explore the design of more complex contracts in the presence of non-pecuniary motives. Failure to explicitly incorporate non-pecuniary motives in the design of contracts can result in poor performance (e.g., Ho and Zhang 2008; Katok et al. 2014; Donohue et al. 2015).

References


34


Appendix A  Notation

<table>
<thead>
<tr>
<th>Exogenous constants</th>
<th>Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k$ : Service cost parameter</td>
<td>$\hat{\xi}$ : Manufacturer’s information report in IS</td>
</tr>
<tr>
<td>$p$ : Retail price</td>
<td>$\hat{s}$ : Manufacturer’s advice in AP</td>
</tr>
<tr>
<td>$w$ : Wholesale price</td>
<td>$s_{lim}$ : Retailer’s service limit in DL</td>
</tr>
<tr>
<td>$q$ : Product’s intrinsic appeal</td>
<td>$s_{DL}$ : Service level set by manufacturer in DL</td>
</tr>
<tr>
<td>$\xi$ : Manufacturer’s demand information (mean $\mu$, variance $\sigma$, support $[\xi, \bar{\xi}]$)</td>
<td>$s_{opt}(\hat{\xi})$ : Retailer’s optimal service level</td>
</tr>
<tr>
<td>$\epsilon$ : Market uncertainty (zero mean, support $[\epsilon, \bar{\epsilon}]$)</td>
<td>$s_{isp}(\hat{\xi}) : s_{opt}(\hat{\xi})$, service level suggested by the report</td>
</tr>
<tr>
<td></td>
<td>$s_{ni}$ : Retailer’s uninformed service level</td>
</tr>
<tr>
<td></td>
<td>$\Pi_R (s, \xi)$ : Retailer’s expected profits</td>
</tr>
<tr>
<td></td>
<td>$\Pi_M (s, \xi)$ : Manufacturer’s expected profits</td>
</tr>
</tbody>
</table>

Appendix B  Proof for Theorem 1

B.1  Information Sharing Equilibrium

We show that there always exists an equilibrium that leads to the outcome described in Theorem 1, and that all equilibria lead to the same outcome. We also show that $\hat{\xi}$ is not correlated with $\xi$ in any equilibrium. Let $\Omega = [\xi, \bar{\xi}]$ denote the support of $\xi$. Let $\Delta (Z)$ denote the set of all probability distributions over the set $Z$. Let $\text{supp} (\cdot)$ denote the support of a probability distribution. Define the following:

(i) Manufacturer’s reporting strategy $g_{is}(\hat{\xi}; \xi) \in \Delta (\Omega)$ given its demand information $\xi$;
(ii) Retailer’s posterior beliefs $b_{is}(\xi; \hat{\xi}) \in \Delta (\Omega)$ about $\xi$ given the report $\hat{\xi}$;
(iii) Retailer’s service strategy $h_{is}(s; \xi) \in \Delta ([0, \bar{s}])$ given the report $\hat{\xi}$.

If the retailer’s service strategy is a pure strategy, then we denote it by $h_{is}(\hat{\xi})$. Let $E[\cdot; \hat{\xi}, b_{is}]$ denote the retailer’s expectation given its posterior beliefs $b_{is}$ and report $\hat{\xi}$. Let $\Omega = \cup_{\xi \in \Omega} \text{supp} \left( g_{is}(\hat{\xi}; \xi) \right)$ denote the
set of reports that the manufacturer makes with positive probability. In a Perfect Bayesian Equilibrium (PBE), we require that each player’s strategy is sequentially rational given their beliefs, and that the beliefs are consistent with the strategies as per Bayes’ rule.

We now show that there always exists an uninformative equilibrium in which the retailer sets the service level $s_{ni}$ for any information report it receives in equilibrium. Consider the following specification of strategies and posterior beliefs: $g_{is} (\hat{\xi}; \xi)$ is a uniform distribution over $\Omega$ for all $\xi \in \Omega$, $b_{is} (\xi; \hat{\xi}) = F (\xi)$ and $h_{is} (\hat{\xi}) = s_{ni}$ for all $\hat{\xi} \in \hat{\Omega}$. Given the manufacturer’s reporting strategy, the retailer’s posterior beliefs are consistent with Bayes’ rule. Given the retailer’s posterior beliefs, we have that $E [\xi | \hat{\xi}, b_{is}] = E [\xi] = \mu$. The retailer’s service strategy is sequentially rational if

$$h_{is} (\hat{\xi}) \in \arg \max_{s \in [0, \bar{s}]} E \left[ \xi + \epsilon | \hat{\xi}, b_{is} \right] s (p - w) - \frac{1}{2} ks^2 = \{ s_{ni} \}$$

which holds by construction. The manufacturer’s reporting strategy is sequentially rational if

$$\text{supp } \{ g_{is} (\hat{\xi}; \xi) \} \subseteq \arg \max_{\xi \in \Omega} \xi \cdot h_{is} (\hat{\xi}) \cdot w = \Omega$$

which also holds by construction. Thus, an uninformative PBE always exists.

To establish that any PBE must be uninformative, we show: (i) the retailer follows a pure strategy for its service decision, (ii) the retailer sets the same service level for all information reports it receives in equilibrium, and (iii) this service level equals $s_{ni}$. The retailer’s faces the following maximization problem

$$\max_{s \in [0, \bar{s}]} E \left[ \xi + \epsilon | \hat{\xi}, b_{is} \right] s (p - w) - \frac{1}{2} ks^2, \quad (20)$$

which is strictly concave in $s$. Therefore, the retailer’s strategy must be a pure strategy. In any PBE, the manufacturer’s equilibrium strategy is sequentially rational if

$$\text{supp } \{ g_{is} (\hat{\xi}; \xi) \} \subseteq \arg \max_{\xi \in \Omega} \xi \cdot h_{is} (\hat{\xi}) \cdot w = \arg \max_{\xi \in \Omega} h_{is} (\hat{\xi}). \quad (21)$$

The RHS of Equation (21) is well-defined by our assumption that an equilibrium exists. It also follows from Equation (21) that $h_{is} (\hat{\xi})$ must be the same for any $\hat{\xi} \in \text{supp } \{ g_{is} (\hat{\xi}; \xi) \}$. In fact, since the RHS of Equation (21) is independent of $\xi$, $h_{is} (\hat{\xi})$ should be the same for any $\hat{\xi} \in \hat{\Omega}$. Since the retailer’s posterior beliefs must be consistent in equilibrium, we require that $E [\xi | \hat{\xi}, b_{is}] = E [\xi | \hat{\xi}]$. Further, its posterior expectation must be unbiased. Therefore,

$$E \hat{\xi} \left[ E [\xi | \hat{\xi}] \right] = E [\xi], \quad (22)$$

Finally, since the retailer’s strategy is sequentially rational, we have

$$h_{is} (\hat{\xi}) = \max_{s \in [0, \bar{s}]} E \left[ \xi + \epsilon | \hat{\xi}, b_{is} \right] s (p - w) - \frac{1}{2} ks^2 = \max_{s \in [0, \bar{s}]} E [\xi | s] s (p - w) - \frac{1}{2} ks^2 \quad (23)$$
It follows from Equation (23) that, since $h_{ls}(\hat{x})$ is the same for any $\hat{x} \in \hat{\Omega}$, $\mathbb{E}[\hat{x} | \hat{x}]$ must be the same for any $\hat{x} \in \hat{\Omega}$. In turn, it follows from Equation (22) that $\mathbb{E}[\xi | \hat{x}] = \mathbb{E}[\xi] = \mu$. Hence, $h_{ls}(\hat{x}) = s_{N1}$ from Equation (23). Thus, the PBE is uninformative.

To see that $\hat{x}$ must be uncorrelated with $\xi$ in any equilibrium, note that

$$
\text{Cov} \left( \hat{x}, \xi \right) = \mathbb{E} \left[ \hat{x} \xi - \mathbb{E}[\hat{x}] \mathbb{E}[\xi] \right] = \mathbb{E}_{\hat{x}} \left[ \mathbb{E}[\hat{x} \xi | \hat{x}] - \mathbb{E}[\hat{x}] \mathbb{E}[\xi] \right] = 0,
$$

where we have substituted $\mathbb{E}[\xi | \hat{x}] = \mathbb{E}[\xi] = \mu$ in the last step.

**B.2 Advice Provision Equilibrium**

We show that there always exists an equilibrium that leads to the outcome described in Theorem 1, and that all equilibria lead to the same outcome. We also show that $\hat{s}$ is not correlated with $\xi$ in any equilibrium. Define the following:

(i) Manufacturer’s advice strategy $g_{AP}(\hat{s}; \xi) = \Delta([0, \hat{s}])$ given its demand information $\xi$;

(ii) Retailer’s posterior beliefs $b_{AP}(\xi; \hat{s}) = \Delta(\Omega)$ about $\xi$ given the advice $\hat{s}$;

(iii) Retailer’s service strategy $h_{AP}(s; \hat{s}) = \Delta([0, \hat{s}])$ given the advice $\hat{s}$.

If the retailer’s service strategy is a pure strategy, then we denote it by $h_{AP}(\hat{s})$. Let $\mathbb{E}[\cdot | \hat{s}, b_{AP}]$ denote the retailer’s expectation given its posterior beliefs $b_{AP}$ and advice $\hat{s}$. Let $\hat{S} = \cup_{\xi \in \Omega} \text{supp}(g_{AP}(\hat{s}; \xi))$ denote the set of advice that the manufacturer makes with positive probability.

We now show that a uninformative equilibrium always exists. Consider the following specification of strategies and posterior beliefs: $g_{AP}(\hat{s}; \xi)$ is a uniform distribution over $[0, \hat{s}]$ for all $\xi \in \Omega$, $b_{AP}(\xi; \hat{s}) = F(\xi)$ and $h_{AP}(\hat{s}) = s_{N1}$ for all $\hat{s} \in [0, \hat{s}]$. Given the manufacturer’s advice strategy, the retailer’s posterior beliefs are consistent with Bayes’ rule. Given the retailer’s posterior beliefs, we have $\mathbb{E}[\xi | \hat{s}, b_{AP}] = \mathbb{E}[\xi] = \mu$. The retailer’s strategy is sequentially rational if

$$
h_{AP}(\hat{s}) \in \arg \max_{s \in [0, \hat{s}]} \mathbb{E}[\xi + \epsilon | \hat{s}, b_{AP}] s (p - w) - \frac{1}{2} k s^2 = \{s_{N1}\},
$$

which holds by construction. The manufacturer’s advice strategy is sequentially rational if

$$
\text{supp}(g_{AP}(\hat{s}; \xi)) \subseteq \arg \max_{\hat{s} \in [0, \hat{s}]} \mu \cdot s_{N1} \cdot w = \Omega,
$$

which also holds by construction. Thus, an uninformative PBE always exists.

To establish that any PBE must be uninformative, we show: (i) the retailer follows a pure strategy for its service decision, (ii) the retailer sets the same service level for all advice it receives in equilibrium,
and (iii) this service level equals \( s_{n1} \). The retailer’s faces the following maximization problem

\[
\max_{\hat{s}} E [\xi + \epsilon | \hat{s}, b_{ap}] s (p - w) - \frac{1}{2} k s^2,
\]

whose objective function is strictly concave in \( s \). Therefore, the retailer’s strategy must be a pure strategy. In any PBE, the manufacturer’s strategy is sequentially rational if

\[
\sup (g_{ap} (\hat{s}; \xi)) \subseteq \arg \max_{\hat{s} \in [0,\hat{s}]} \xi \cdot h_{ap} (\hat{s}) \cdot w = \arg \max_{\hat{s} \in [0,\hat{s}]} h_{ap} (\hat{s}).
\]

The RHS of Equation (28) is well-defined by our assumption that an equilibrium exists. It follows from Equation (28) that \( h_{ap} (\hat{s}) \) must be the same for any \( \hat{s} \in \sup (g_{ap} (\hat{s}; \xi)) \). In fact, since the RHS of Equation (28) is independent of \( \xi \), \( h_{ap} (\hat{s}) \) should be the same for any \( \hat{s} \in \hat{S} \). Since the retailer’s posterior beliefs must be consistent in equilibrium, we require that \( E [\xi | \hat{s}, b_{ap}] = E [\xi | \hat{s}] \). Further, its posterior expectation must be unbiased. Therefore,

\[
E_{\hat{s}} [E [\xi | \hat{s}]] = E [\xi],
\]

Finally, since the retailer’s strategy is sequentially rational, we have

\[
h_{ap} (\hat{s}) = \max_{\hat{s} \in [0,\hat{s}]} E [\xi + \epsilon | \hat{s}, b_{ap}] s (p - w) - \frac{1}{2} k s^2 = \max_{\hat{s} \in [0,\hat{s}]} E [\xi | \hat{s}] s (p - w) - \frac{1}{2} k s^2
\]

(30)

Since \( h_{ap} (\hat{s}) \) is the same for any \( \hat{s} \in \hat{S} \), it follows from Equation (30) that \( E [\xi | \hat{s}] \) must be the same for any \( \hat{s} \in \hat{S} \). In turn, it follows from Equation (29) that \( E [\xi | \hat{s}] = E [\xi] = \mu \). Hence, \( h_{ap} (\hat{s}) = s_{n1} \) from Equation (30). Thus, the PBE is uninformative.

To see that \( \hat{s} \) must be uncorrelated with \( \xi \) in any equilibrium, note that

\[
\text{Cov} (\hat{s}, \xi) = E [\hat{s} \xi] - E [\hat{s}] E [\xi] = E_{\hat{s}} [E [\hat{s} \xi | \hat{s}]] - E [\hat{s}] E [\xi] = 0,
\]

(31)

where we have substituted \( E [\xi | \hat{s}] = E [\xi] = \mu \) in the last step.

**B.3 Delegation Equilibrium**

Let \( s_{dl} = g_{dl} (\xi; s_{lim}) \) denote the manufacturer’s best response given the retailer’s service limit \( s_{lim} \). We have

\[
g_{dl} (\xi; s_{lim}) \in \arg \max_{s_{dl} \in [0,s_{lim}]} \xi \cdot s_{dl} \cdot w = \{ s_{lim} \}.
\]

(32)

Therefore, \( g_{DL} (\xi; s_{lim}) = s_{lim} \). The, the retailer’s optimal limit is given by

\[
\arg \max_{s_{lim} \in [0,s]} E [\xi + \epsilon | s_{lim}] (p - w) - \frac{1}{2} k s_{lim}^2 = \{ s_{n1} \}.
\]

(33)
Appendix C  Additional Analysis

C.1 Trustworthiness in DL

Table 8 presents the results of the regression in Equation (11) for the intervening sample limits of 100, 120, 140 and 160. We observe that in all cases there is significant positive correlation between the service level decision and the actual demand information.

Table 8: Regression Results for Presence of Trust and Trustworthiness: Estimate (Standard Error)

<table>
<thead>
<tr>
<th>Variable</th>
<th>$s_{DL,100}$</th>
<th>$s_{DL,120}$</th>
<th>$s_{DL,140}$</th>
<th>$s_{DL,160}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>76.17** (5.00)</td>
<td>89.08** (13.03)</td>
<td>109.73** (17.87)</td>
<td>119.59** (19.59)</td>
</tr>
<tr>
<td>$\xi$</td>
<td>0.60** (0.08)</td>
<td>0.62** (0.10)</td>
<td>0.61** (0.13)</td>
<td>0.60** (0.14)</td>
</tr>
<tr>
<td>$b$</td>
<td>-3.08 (2.38)</td>
<td>-3.78 (2.93)</td>
<td>-4.65 (3.98)</td>
<td>-3.86 (4.31)</td>
</tr>
<tr>
<td>$t$</td>
<td>-0.44 (0.55)</td>
<td>-0.47 (0.66)</td>
<td>-0.53 (0.62)</td>
<td>-0.22 (0.95)</td>
</tr>
</tbody>
</table>

Notes: ** indicates $p \leq 0.01$

C.2 Effect of Other Sample Limits in DL

Figure 3: Cumulative Distribution of Service Level Decisions for Service Limits of 100 to 180

Figure 3 shows the cumulative empirical distribution of manufacturer service decisions for sample limits of 100 to 180. We observe that for a given service level decision, more participants choose a higher service decision under a higher sample limit, i.e., the distribution for a higher sample limit is to the right of the distribution for lower sample limits. We conduct pairwise comparisons of the distribution under a sample limit of 180 with that under lower sample limits. To compare, for instance, with the distribution under a sample limit of 100, we modify the distribution under a sample limit of 180 such that any service decision higher than 100 is set equal to 100. We find that the service decisions are significantly higher under the sample limit of 180 ($p = 0.01$ for sample limit of 100, $p < 0.01$ for sample limits of 120, 140,
p = 0.04 for sample limit of 160, Wilcoxon’s signed rank test).

C.3 Trust and Trustworthiness Types

We use random-effects regressions to account for possible within-participant correlation to perform the statistical tests comparing the behaviors of the different trust types and trustworthiness types. We use a regression with indicator variables for the behavioral types, and saints and believers serving as the base types for the indicator variables. We test whether the coefficients of the indicator variables are significantly different than zero. We use Wald’s chi-squared test for a joint test of coefficients. In the interest of space, we only report the relevant test statistic in each case.

C.3.1 IS

Table 9 presents summary statistics for the trustworthiness types. We observe that saints inflate the least and scoundrels the most. Further, this pattern continues in the last 5 rounds, e.g., those participants who are on average saints continue to be saints over time. The trustworthiness types differ significantly in the extent of their inflation (Wald $\chi^2 = 114.46, p < 0.01$). In-betweens and scoundrels inflate significantly more than saints ($z = 3.92$ and $z = 10.52$ respectively, $p < 0.01$ in both cases). The significant difference in behaviors between types persists in the last five rounds (Wald $\chi^2 = 94.03, p < 0.01$). Thus, the trustworthiness classification captures stable patterns of behavior. This is also illustrated in Figure 4, which shows the average inflation for saints and scoundrels in each decision round. We observe that saints do not inflate much while scoundrels inflate close to the maximum extent possible (dashed line). We further note from Table 9 that the demand information that participants received does not differ significantly across the trustworthiness types (ANOVA $p = 0.57$). Thus, all participants faced similar demand conditions. Yet, they inflated their reports to different extents, which suggests that the trustworthiness classification reflects participants’ inherent tendencies to be trustworthy.

Table 9: Summary Statistics for Trustworthiness Types in IS: Mean, [Median], (Standard Deviation)

<table>
<thead>
<tr>
<th></th>
<th>Saints</th>
<th>In-between</th>
<th>Scoundrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation ($\hat{\xi} - \xi$)</td>
<td>0.47 [0] (5.10)</td>
<td>8.87 [5] (14.02)</td>
<td>24.14 [16.5] (19.24)</td>
</tr>
<tr>
<td>Inflation in last 5 rounds</td>
<td>0.60 [0] (5.90)</td>
<td>10.66 [8] (12.61)</td>
<td>30.45 [21] (19.71)</td>
</tr>
<tr>
<td>Slope of $\hat{\xi}$ with $\xi$</td>
<td>0.98</td>
<td>0.64</td>
<td>0.31</td>
</tr>
<tr>
<td>Demand Information ($\xi$)</td>
<td>45.18 [51] (22.0)</td>
<td>42.72 [41] (20.9)</td>
<td>41.33 [35] (19.80)</td>
</tr>
</tbody>
</table>

Notes: 12 participants per type.
Table 10 presents summary statistics for the trust types. We observe that believers deflate the least, and skeptics deflate the most, and this pattern continues in the last 5 rounds. The trust types differ significantly in their deflation (Wald $\chi^2 = 119.83$, $p < 0.01$). In-betweens and skeptics deflate their reports significantly more than believers ($z = 3.53$ and $z = 10.74$ respectively, $p < 0.01$ in both cases). The significant difference in behaviors between types persists in the last five rounds (Wald $\chi^2 = 67.23$, $p < 0.01$). Thus, the trust classification captures stable patterns of behavior. This is illustrated in Figure 5, which shows the average deflation for believers and skeptics in every decision round. We observe that skeptics consistently deflate more than believers do. We also note from Table 10 that the trust types do not differ significantly in the information report that they receive (ANOVA $p = 0.47$) or the inflation in the received reports (ANOVA $p = 0.91$). Hence, the three types faced similar conditions. But they differ significantly in their behaviors, which suggests that the trust classification reflects participants’ inherent tendencies to be trusting.

Table 10: Summary Statistics for Trust Types in IS: Mean [Median] (Standard Deviation)

<table>
<thead>
<tr>
<th></th>
<th>Believers</th>
<th>In-betweens</th>
<th>Skeptics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflation ($\hat{s} - s$)</td>
<td>5.77 [4]</td>
<td>14.6 [14]</td>
<td>30.2 [34]</td>
</tr>
<tr>
<td>Slope of $s$ with $\hat{\xi}$</td>
<td>0.76</td>
<td>0.51</td>
<td>0.19</td>
</tr>
<tr>
<td>Manufacturer's Report ($\hat{\xi}$)</td>
<td>51.7 [54]</td>
<td>54.5 [56]</td>
<td>56.0 [67]</td>
</tr>
</tbody>
</table>

Notes: 12 participants per type.
C.3.2 AP

Table 11 presents summary statistics for the trustworthiness types. We observe that saints inflate the least and scoundrels the most, and this pattern continues in the last 5 rounds. The trustworthiness types differ significantly in their inflation (Wald $\chi^2 = 62.61, p < 0.01$).\footnote{As explained at start of §C.3, we use random-effects regressions for comparisons and only report the key test statistic.} In-betweens and scoundrels inflate significantly more than saints ($z = 2.06, p = 0.04$; and $z = 7.60, p < 0.01$ respectively). The significant difference between types persists in the last five rounds (Wald $\chi^2 = 25.01, p < 0.01$). We also note from Table 11 that the demand information that participants received does not differ significantly across the trustworthiness types (ANOVA $p = 0.99$). The persistent difference in behaviors despite facing similar demand conditions suggests that the trustworthiness classification reflects participants’ inherent tendencies to be trustworthy.

Table 11: Summary Statistics for Trustworthiness Types in AP: Mean [Median] (Standard Deviation)

<table>
<thead>
<tr>
<th></th>
<th>Saints</th>
<th>In-betweens</th>
<th>Scoundrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflated $\hat{s} - s_i(\xi)$</td>
<td>5.15 [5]</td>
<td>13.91 [12]</td>
<td>37.42 [22]</td>
</tr>
<tr>
<td>Slope of $\hat{s}$ with $\xi$</td>
<td>1.05</td>
<td>0.78</td>
<td>0.79</td>
</tr>
<tr>
<td>Demand Information $\hat{\xi}$</td>
<td>43.3 [44]</td>
<td>43.2 [44]</td>
<td>42.8 [44]</td>
</tr>
</tbody>
</table>

Notes: 12 participants per type.

Table 12 presents the summary statistics for the trust types. We observe that believers deflate the least, and skeptics deflate the most, and this pattern persists in the last 5 rounds. The trust types differ significantly in their deflation (Wald $\chi^2 = 32.36, p < 0.01$). In-betweens and skeptics deflate their reports significantly more than believers ($z = 2.48, p = 0.01$; and $z = 5.62, p < 0.01$)

45
respectively). The significant difference in behaviors between types persists in the last five rounds (Wald $\chi^2 = 19.40, p < 0.01$). Thus, the trust classification captures stable patterns of behavior. As shown in Table 12, the advice that skeptics receive is significantly more inflated compared to that of believers (ANOVA $p < 0.01$). Specifically, skeptics are more likely to have received advice that cannot be optimal irrespective of the demand information (i.e., $\hat{s} > s_i(\bar{\xi})$). Skeptics receive such highly inflated advice in 31% of the instances compared to 3% for believers. Thus, to some degree, the higher deflation by skeptics could be because of the higher inflation in the advice they receive. Nevertheless, skeptics deflate even advice that is not as highly inflated by a larger amount compared to believers. In the remaining instances, in which $\hat{s} \leq s_i(\bar{\xi})$, there is no significant difference in inflation in the advice received by either type ($p = 0.37$). But skeptics deflate their advice significantly more than believers even in these remaining instances (20.9 units vs. 6.17 units, $z = 4.30$ and $p < 0.01$).

Table 12: Summary Statistics for Trust Types in AP: Mean [Median] (Standard Deviation)

<table>
<thead>
<tr>
<th></th>
<th>Believers</th>
<th>In-betweens</th>
<th>Skeptics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflation ($\hat{s} - s$)</td>
<td>6.78 [6]</td>
<td>20.2 [15]</td>
<td>42.8 [33]</td>
</tr>
<tr>
<td>Slope of $s$ with $\hat{s}$</td>
<td>0.46</td>
<td>0.26</td>
<td>0.03</td>
</tr>
<tr>
<td>Manufacturer's Advice ($\hat{s}$)</td>
<td>53.4 [20]</td>
<td>58.3 [57]</td>
<td>74.1 [68]</td>
</tr>
<tr>
<td>Inflation in Advice ($\hat{s} - s_i(\bar{\xi})$)</td>
<td>11.0 [7]</td>
<td>15.0 [10]</td>
<td>30.5 [15]</td>
</tr>
</tbody>
</table>

Notes: 12 participants per type.

C.3.3 DL

Table 13 provides the summary statistics for the trustworthiness types. We observe that saints inflate the least and scoundrels the most, and this pattern continues in the last 5 rounds. The trustworthiness types differ significantly in their inflation (Wald $\chi^2 = 122.51, p < 0.01$). In-betweens and scoundrels inflate significantly more than saints ($z = 2.06, p = 0.04$; and $z = 7.60, p < 0.01$ respectively). The significant difference between types persists in the last five rounds (Wald $\chi^2 = 92.47, p < 0.01$). We also note from Table 11 that the demand information that participants received does not differ significantly across the trustworthiness types (ANOVA $p = 0.67$). The persistent difference in behaviors despite facing similar demand conditions suggests that the trustworthiness classification reflects participants’ inherent tendencies to be trustworthy.

---

29As explained at start of §C.3, we use random-effects regressions for comparisons and only report the key test statistic.
Table 13: Summary Statistics for Trustworthiness Types in AP: Mean [Median] (Standard Deviation)

<table>
<thead>
<tr>
<th></th>
<th>Saints</th>
<th>In-betweens</th>
<th>Scoundrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation ($s_{RE} - s_0(\xi)$)</td>
<td>16.51 [10]</td>
<td>52.77 [54]</td>
<td>88.86 [93]</td>
</tr>
<tr>
<td>Inflation in last 5 rounds</td>
<td>18.43 [9.6]</td>
<td>55.72 [56.8]</td>
<td>96.02 [103]</td>
</tr>
<tr>
<td>Slope of $s_{RE}$ with $\xi$</td>
<td>0.66</td>
<td>0.27</td>
<td>0</td>
</tr>
<tr>
<td>Demand Information ($\xi$)</td>
<td>44.62 [47.1]</td>
<td>43.31 [44]</td>
<td>41.13 [35]</td>
</tr>
</tbody>
</table>

Notes: Inflation is average for sample limits of 80 to 180. Slope is for sample limit of 80.

Table 14 provides the summary statistics for the trust types. We observe that believers deflate the least, and skeptics deflate the most, and this pattern persists in the last 5 rounds. The trust types differ significantly in their deflation (Wald $\chi^2 = 94.81$, $p < 0.01$). Believers deflate significantly less than in-betweens and skeptics ($z = 4.92$ and $z = 9.73$ respectively, $p < 0.01$ in both cases). The significant difference in behaviors between types persists in the last five rounds (Wald $\chi^2 = 66.41$, $p < 0.01$). Thus, the trust classification captures stable patterns of behavior. We also find that the trust types did not experience significantly different demand conditions; the expected demand level $\xi$ does not differ significantly across the types (ANOVA $p = 0.81$).

Table 14: Summary Statistics for Trust Types in DL: Mean [Median] (Standard Deviation)

<table>
<thead>
<tr>
<th></th>
<th>Believers</th>
<th>In-betweens</th>
<th>Skeptics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflation ($s(\xi) - s_{lim}$)</td>
<td>30.03 [30]</td>
<td>43.93 [45]</td>
<td>56.89 [60]</td>
</tr>
<tr>
<td>Deflation in last 5 rounds</td>
<td>30.03 [30]</td>
<td>41.77 [41]</td>
<td>57.33 [58.5]</td>
</tr>
<tr>
<td>Expected Demand ($\xi$)</td>
<td>43.77 [44]</td>
<td>41.73 [44]</td>
<td>43.83 [44]</td>
</tr>
</tbody>
</table>

Notes: 12 participants per type.

C.4 Estimation Results for Retailer Profits for Each Trust Type in IS and AP

Table 15: Impact of Trustworthiness Types on Retailer Profits: Estimate (Standard Error)

<table>
<thead>
<tr>
<th></th>
<th>IS - Believers</th>
<th>IS - Skeptics</th>
<th>AP - Believers</th>
<th>AP - Skeptics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-846.37** (57.10)</td>
<td>-414.97** (115.63)</td>
<td>-1029.56** (141.78)</td>
<td>-557.93** (134.39)</td>
</tr>
<tr>
<td>$I_M$</td>
<td>-2022.22** (86.34)</td>
<td>35.43 (89.70)</td>
<td>-155.11+ (92.37)</td>
<td>45.07 (103.70)</td>
</tr>
<tr>
<td>$S_M$</td>
<td>-301.75** (93.37)</td>
<td>-21.14 (83.64)</td>
<td>-174.17 (142.63)</td>
<td>-54.21 (95.10)</td>
</tr>
<tr>
<td>$\xi$</td>
<td>46.04** (1.71)</td>
<td>26.55** (1.54)</td>
<td>48.16** (2.15)</td>
<td>32.63** (1.72)</td>
</tr>
<tr>
<td>$t$</td>
<td>4.67 (10.93)</td>
<td>4.98 (10.49)</td>
<td>-6.97 (14.03)</td>
<td>-4.56 (12.03)</td>
</tr>
</tbody>
</table>

Notes: ** indicates $p \leq 0.01$, * indicates $p \leq 0.05$, + denotes $p \leq 0.1$. 

47