Risk and Fairness in Channel Relationships: Evidence of Behavioral Inconsistencies

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In channel negotiations between suppliers and retailers there is often significant uncertainty that is unevenly distributed between the two firms. While there is ample evidence in the literature that both risk preferences and fairness would matter in such contexts, there is a lack of evidence on how subjects' beliefs and preferences for risk and fairness interact, leaving open the question of how individuals will attempt to fairly compensate risk that they or their channel partner face. To address the question, we model a wholesale pricing decision between a supplier and a retailer who may not be risk neutral and may care for fairness. We then compare the prediction of the theoretical model with data from two incentive-compatible experiments. We find that suppliers squeeze retailers more when retailers face risk, even though (1) suppliers are not more generous when they face risk themselves, and (2) retailers do not accept worse offers under risk. We show that this behavior is incompatible with preferences for risk and/or fairness in which subjects beliefs about the other players preferences are consistent with their actual preferences. Using a structural approach, we then estimate the behavioral parameters and find evidence that suppliers underestimate the risk aversion of retailers leading to significant deadweight losses in situations where the retailer (vs. the supplier) carries the risk.

Key words: uncertainty; risk preferences; fairness; beliefs; channel pricing

1. Introduction

Suppliers and retailers often have to reach an agreement under significant uncertainty about supply costs, retail prices, and demand size. For example, the accuracy of market forecasts can be as low as 40% for new products and rarely surpasses 70% even for products where the innovation is merely a cost improvement (Kahn, 2002). Similarly, there can be significant uncertainty in production costs due to a number of changing economic factors. For example, in the beer industry, a higher-than-expected summer temperature can affect barley yield up to 40% and change the cost of goods sold by an estimated 16% (Wood, 2018). Such uncertainties tend to affect suppliers and retailers differently depending on the market, with suppliers typically bearing most of the production risk and re-sellers bearing most of the demand risk.

How do contracting parties compensate each other in the presence of such (possibly uneven) risk? The answer to this question requires not only an understanding of peoples' risk preferences, but also their preferences for fairness, which has emerged as a well-documented set of preferences in channel relationships (e.g. Cui and Mallucci, 2016; Ho, Su and Wu, 2014; Kumar, Scheer, and Steenkamp, 1995, Scheer, Kumar, and Steenkamp, 2003). While both fairness and risk preferences have been shown to impact channel decisions, in this paper we provide experimental evidence showing that it is not obvious how to incorporate both of these preferences together to generate predictions in even very simple channel interactions.

To do so, we consider a stylized model setting of a dyadic channel where the supplier is a Stackelberg leader. The supplier makes a wholesale price offer to the retailer (which may be in the presence of risk). The retailer may be offered the option to accept or reject the offer. Finally, any uncertainty is resolved. We consider three risk conditions: 1) *no risk*, where supply cost and retail price are known; 2) *retailer risk*, where supply cost is known, but retail price is uncertain; and 3) *supplier risk*, where retail price is known, but supply cost is uncertain.

We implement a set of incentive-compatible experiments that replicate the settings of our model. We find, after including preferences for fairness and risk, the decisions are inconsistent with any model in which risk preferences are symmetric between players and players have accurate beliefs about those preferences. In particular, we find that suppliers squeeze retailers more when retailers face risk, despite (1) suppliers are not more generous when they face risk themselves, and (2) retailers do not accept worse offers under risk. In other words, suppliers behave as though the retailer were risk loving, although they do not act risk-loving themselves nor do the retailers. We structurally estimate behavioral parameters for the utility function of the suppliers and the retailers and provide evidence that the discrepancy is due to inconsistency in beliefs rather than to a difference in preferences between players. That is, both suppliers and retailers are risk averse, but suppliers believe that retailers are risk loving.

With this study we contribute to the literature on channel decisions and relationships. By investigating how two key elements of channel relationships – risk and fairness – interact, we gain novel insights on channel members' preferences and whether such preferences are consistent across players, roles, and contexts. We find that while risk preferences appear to be relatively stable across channel roles, systematic misperceptions of a channel partner's preferences towards risk exist. These misperceptions lead to meaningful and systematic differences in the expected profit splits and the probability of successful negotiations, depending on which channel member faces the risk.

These insights contribute to the effort to improve the efficiency of channels by suggesting avenues to improve contract design. In particular, one of our findings is that retailers reject contracts at a higher rate when they are exposed to risk because suppliers make worse offers than in the other conditions. This suggests that channel efficiency might be higher when the channel leader is the channel member that faces the highest risk, so that in the presence of uneven risk the party carrying the most risk should be the one leading the channel.

In addition, this study has more general theoretical implications for understanding player behavior in strategic settings. We find that both retailers and suppliers behave in a manner that is consistent with risk aversion, but suppliers pick prices that are consistent with suppliers believing retailers are risk loving. This behavior indicates that suppliers make erroneous assumptions about the retailer's preferences; Standard assumptions about full information on other players preferences might not hold, and even the assumption that individuals apply the same preferences to themselves as they do for others may not be accurate.

The rest of the paper is organized as follows. Section 2 presents a review of the literature most closely related to this study. Section 3 develops a simple channel pricing model that derives optimal wholesale price predictions for different risk conditions and risk preferences, and a test of such prediction using an incentivized experiment. In section 3 we replicate and extend the results of section 2 to a setting where retailers are given the option to accept or reject the contract offered by the supplier. Section 4 presents a structural estimation of a set of behavioral parameters that can rationalize the behavior exhibited by subjects in the experiment and section 5 concludes.

2. Related Literature

Channel research traditionally focused on solving the issue of channel coordination. Early research shows that, in a dyadic channel where a manufacturer sells to a final consumer through a retailer, the incentives of channel members lead them to an upward prices distortion compared to the integrated channel. These higher prices result in lower consumer demand and lower total channel profit than in a vertically integrated channel (Jeuland and Shugan, 1983). A number of solutions have been proposed for the channel coordination problem, including two-part tariffs, quantity discounts, franchising fees, and profit sharing (Jeuland and Shugan, 1983; Iyer, 1998; McGuire and Staelin, 1983). This early research generally assumes fully rational agents who maximize expected profits.

However, experimental testing of channel member decisions reveals that players systematically deviate from the predictions of the classic channel theory, both when there is no uncertainty and when there is some uncertainty (for a review see Meyer et al., 2010, and Zhang and Siemsen, 2018). Additionally, traditional channel coordination mechanisms are underused in the field and, when tested, fail to fully coordinate the channel (Lim and Ho, 2007; Ho and Zhang, 2008). These findings spin a rich literature examining a host of behavioral factors to help explain these deviations: bounded rationality (Su, 2008); fairness (Cui, Raju and Zhang, 2007; Cui and Mallucci, 2016; Ho, Su and Wu, 2014); loss aversion (Long and Nasiry, 2015); reference dependence (e.g. Ho, Lim and Cui, 2010; Ho and Zhang 2008); regret (Lim and Ho, 2007); risk aversion (Davis, Katok, and Santamaria, 2014); and trust (Ozer, Zheng and Chen, 2011; Ozer, Subramanian, Wang, 2017).

Among these, fairness has emerged as one of the leading factors explaining channel members behavior. Field surveys have shown that fairness is important in maintaining good relationships among channel members (Kumar, Sheer, and Steenkamp, 1995; Scheer, Kumar, and Steenkamp, 2003) and lab studies have shown that it impacts pricing (Cui and Mallucci, 2016; Ho et al., 2014; Katok, Olsen, and Pavlov, 2012), ordering decisions (Katok and Pavlov, 2013), and channel contract design (Davis and Leider; 2018). In addition, fairness improves channel coordination under a broad set of conditions. It alleviates and resolve the double marginalization problem both when demand is deterministic and players choose prices (Caliskan-Demirag, Chen, and Li, 2010; Cui et al., 2007) and when demand is uncertain and players choose ordering quantities (Wu and Niederhoff, 2014). As experimental evidence has highlighted the role of loss aversion (Long and Nasiry, 2015; Zhang, Donohue, and Cui, 2016), reference dependence (e.g. Ho et al., 2010; Ho and Zhang, 2008), and risk aversion (Davis et al., 2014), a few papers has started model channels where players do not maximizing expected utility. These studies find that risk preferences have a significant impact on pricing (Agrawal and Seshadri, 2000), ordering quantities (Ho et al., 2010) and channel coordination mechanisms (Gan, Sethi, and Yan, 2004 and 2005; Ho and Zhang, 2008).

Even as research steadily begins to incorporate behavioral biases in channel decision models, the majority of studies assume players have symmetric preferences and hold correct beliefs about the preferences of other players (Meyer et al., 2010). The few papers departing from these assumptions find that departures from these assumptions have significant consequences for channel efficiency and might impact the efficacy of coordination mechanisms. Tsay (2002) finds that ignoring or holding incorrect beliefs about the risk preferences of a channel partner leads to significant profit losses, while Gan et al. (2005) find that asymmetric risk preferences between a supplier and a retailer leads to a breakdown of the classic coordination mechanisms. Pavlov and Katok (2016) show that when the degree of fairness concern by the retailer is unknown the usual channel coordinating mechanisms do not always work.

Empirical testing of the symmetric preferences or correct belief assumptions is also rare. In the field, there is evidence that channel members not only hold incorrect beliefs about their long-term partner preferences, but that overconfidence also prevents partners from appropriately unbiasing their beliefs (Vosgerau, Anderson and Ross, 2008). Katok and Pavlov (2013) experimentally investigate what happens when channel members are uncertain about the degree of fairness concerns of the other party and find that this uncertainty accounts for a large share of the rejections observed. A stream of studies examines beliefs about other player rationality. Camerer, Ho, and

Chong (2004) propose that players have limited ability for strategic thinking and cannot think past a fixed number of strategic iterations. Different players have different reasoning capacity, but everyone assumes all other players are less capable than they are. Empirical studies find evidence that such a belief biases pricing (Cui and Xiao, 2016), market entry (Goldfarb and Xiao, 2011), product diffusion (Goldfarb and Yang, 2009), platform competition (Hossain and Morgan, 2013), and ordering behavior in the specific context of channel management (Cui and Zhang, 2017; Croson et al., 2008). We follow a similar approach to investigate the beliefs about supplier-retailer risk preferences.

More broadly, our research relates to the research on factors that influence the amount of risk a player is willing to take. Kahneman and Tversky (1979) established early on that risk taking is influenced by many contextual factors. Most relevant to our study, risk taking can be significantly altered by the presence of others. When people make decisions for others, they tend to choose more risk for others than they do for themselves (Beisswanger et al., 2003; Polman, 2012; Stone, Yates, and Caruthers, 2002; Wray and Stone, 2005). However, Exley (2016) finds that when people donate to a charity though a risky lottery they are more risk averse than when playing the same lottery for themselves. Consistent with other studies where players exploit uncertainty to appear more generous than they are (Dana, Weber, and Kuang, 2012), Exley (2016) concludes that the apparent increased risk aversion is due to players strategically exploiting risk to appear more generous. Exley (2016) also highlights the interdependence of risk and fairness preferences.

Fudenberg and Levine (2012) show that extending preferences for fairness to a context with uncertain payoff is not trivial and a small, but growing, body of research shows that the very interaction of social preferences and risk preferences can change subjects' propensity to take risks; however, no consensus has been reached as to the direction of the effect. Bolton and Ockenfels (2009) find more risk taking in the presence of fairness concerns; Linde and Sonnemans (2012) find more risk taking in the gain domain, but less in the loss domain; and Bohnet et al. (2008) and Brennan et al., (2008) find no systematic effects.

In the next section, we examine the interaction of fairness and risk preferences in a channel setting to provide evidence not only on how preference for fairness and for risk interact in a channel with uncertainty, but also on how they affect each other.

3. Risk and Fairness in a Channel Dictator Game

3.1. Model Setting

Here, we present a stylized model for a channel setting in which a supplier (she) and a retailer (he) split profits based on the wholesale price decision of the supplier. We first isolate preferences from strategic thinking by giving a passive role to the retailer: we force the retailer to accept the price offered by the supplier. (We later relax this assumption to a setting where the retailer can reject offers).

A supplier produces $m \geq 1$ units of a product for total production cost C, and sells it to a retailer for a wholesale price w. In turn, the retailer sells the product to the final market for total revenue P. We normalize m to one. Here, C and P may be random variables, where we interpret the realized value of P as the market clearing price.

The sequence of events is as follows. Players are endowed with initial income i. Given common information on $C = \mu_c + \epsilon_c$ and $P = \mu_p + \epsilon_p$ (where ϵ_c and ϵ_p are random variables with mean zero), the supplier announces a wholesale price $w \in [w_{Min}, w_{Max}]$ to the retailer.[1] Then, the uncertainty in C or P is resolved. The supplier produces at the realized cost c, sells to the retailer at the announced price w, who in turn sells to the final market at the realized market price p. The supplier's realized profit is $\pi_S = i + w - c$, while the retailer's realized profit is $\pi_R = i + p - w$.

We define three risk conditions. Under *No Risk* (denoted with superscript N), both the supplier's production cost and the retailer's selling price are constants ($\epsilon_c = \epsilon_p = 0$). The *Supplier Risk* condition (denoted with superscript S) keeps the retail price constant but adds mean-preserving variance to the supplier cost ($\epsilon_c > 0, \epsilon_p = 0$). Finally, the *Retailer Risk* condition (denoted with

[1] To avoid confounding the risk and fairness preferences with loss aversion, we avoid negative profits. We restrict w_{Min} and w_{Max} so that $w_{Min} > i - C$ and $w_{Max} < i + P$.

superscript R) adds mean-preserving variance to the retail price but keeps the production cost constant ($\epsilon_c = 0, \epsilon_p > 0$). Table 1 summarizes these conditions and provides an example of distributions of C and P, which we will also use later in our experiments.

Table 1 Summary of Risk Conditions

Condition	Definition	Experimental Parameters
No Risk	$\epsilon_c = 0$	$C = 10$
	$\epsilon_p = 0$	$P = 15$
Supplier Risk	$\epsilon_c > 0$	$C = \begin{cases} 5 & \text{with probability .5} \\ 15 & \text{otherwise} \end{cases}$
	$\epsilon_p = 0$	$P = 15$
Retailer Risk	$\epsilon_c = 0$	$C = 10$
	$\epsilon_p > 0$	$P = \begin{cases} 10 & \text{with probability .5} \\ 20 & \text{otherwise} \end{cases}$

3.2. Analysis of Risk Preferences Effects

Now that we have specified the supplier problem, we can derive the supplier's wholesale price decision behavior under risk preferences. Given the presence of uncertainty, we give careful consideration to subjects' preferences for risk and solve the model under different risk preferences. In addition, we consider selfish players and fair players. In all of the following models we maintain the standard assumptions that players have full information about the preferences of all players and players have the same type of preferences. Throughout the paper, we use *consistent beliefs* to refer to the assumption that players correctly know others' preferences. We use *symmetric preferences* to refer to the assumption that suppliers and retailers have the same preferences with the same parameter values.

3.2.1. Selfish Players We first consider a model where players do not have a preference for fairness, i.e., "selfish players." The supplier's utility is given by the expected value of an increasing function $g(\cdot)$ of her profits. That is, the supplier maximizes the following function:

$$max_w EU_S = max_w E[g(\pi_S)] = max_w E[g\,(i + w - C)] \tag{1}$$

If the supplier is risk neutral, $g(\cdot)$ is linear in profits; if she is risk averse, $g(\cdot)$ is concave; if she is risk seeking $g(\cdot)$ is convex. Given this set-up, it is straightforward to derive the optimal wholesale price, w. Proposition 1 establishes the equilibrium wholesale prices for a rational supplier.

PROPOSITION 1. *Under any risk preferences and no preference for fairness in the channel dictator game, the wholesale price does not depend on the risk condition or the players' risk preferences. The wholesale price is equal to the maximum wholesale price possible in each risk condition ($w^N = w^S = w^R = w_{max}$).*

All the proofs are provided in Appendix A. Intuitively, Proposition 1 follows from the fact that the profits of the supplier are strictly increasing in wholesale price. As such, a selfish player will always choose to charge the highest possible wholesale price. This extreme prediction is generally inconsistent with experimental data, as most players seem to exhibit preferences that include fairness. That is, the supplier may choose a price that would not take all the profits, but would leave some positive profit to the retailer (for a review see Camerer, 2011). We account for preferences that incorporate fairness next.

3.2.2. Fair Players We specify a fairness utility function following Fehr and Schmidt (1999) and Cui et al. (2007) by assuming that both the supplier and the retailer experience a psychological cost when profits are unequal between channel members. The utility for fairness is then given by $f_l = -\alpha_l(\pi_j - \pi_l)^+ - \beta_l(\pi_l - \pi_j)^+$, where $l, j = \{R, S\}$ and $\phi^+ = \phi$ if $\phi > 0$ and 0 otherwise. Thus, channel member l experiences a disutility if her profit is larger or smaller than channel member j's profit. We assume that players experience greater disutility when they have lower profits than the other player than when they have higher profits than the counterpart (i.e. $0 \leq \beta_l \leq \alpha_l$), and that they care more about their profit than about fairness ($\alpha_l \leq 1$ and $\beta_l \leq 1$).

Following the framework in Trautman (2009), we extend fairness to an uncertain setting by replacing certain outcomes with their expected utilities as follows:

$$E[f_l] = -\alpha_l (E[\pi_j - \pi_l])^+ - \beta_l (E[\pi_l - \pi_j])^+ \tag{2}$$

Besides being able to predict a range of well established results (Trautman, 2009), this fairness representation has the desirable properties of respecting fairness in expectations and maintaining tractability (Fudenberg and Levine, 2012).[2]

The addition of fairness leads to the following maximization problem for the supplier:

$$\max_{w} \; E[g(\pi_S)] + E[f_S]. \tag{3}$$

We derive predictions for the wholesale price under the usual assumption of symmetric preferences and consistent beliefs. Proposition 2 summarizes the results.

PROPOSITION 2. *If both the supplier and the retailer care about fairness, wholesale price offers can be uniquely ordered and the ordering depends only on the preferences for risk.*

- *Under risk neutrality, prices are the same across risk conditions. Specifically,* $(\mu_p + \mu_c)/2 \leq w^N_{RN} = w^S_{RN} = w^R_{RN} \leq w_{max}$.
- *Under risk aversion, prices are weakly higher in the supplier risk condition than in the other conditions. Specifically,* $(\mu_p + \mu_c)/2 \leq w^N_{RA} = w^R_{RA} \leq w^S_{RA} \leq w_{max}$.
- *Under risk seeking, prices are lower in the supplier risk condition than in the other conditions. Specifically,* $(\mu_p + \mu_c)/2 \leq w^S_{RS} \leq w^N_{RS} = w^R_{RS} \leq w_{max}$.

[2] Fudenberg and Levine (2012) alternatively propose that fairness could also be extended to uncertain environments by taking the expectation of the utility function of subjects, including both profits and fairness. However, that functional form does not guarantee fairness in expectation.

This proposition highlights three important results. First, in contrast with Proposition 1 where the supplier is completely selfish, the optimal wholesale prices are (weakly) lower than the maximum price. The reason we see lower prices is that, with fairness, a wholesale price change will have two effects on the supplier's utility: a direct profit change and a change in the fairness utility. Given that supplier and retailer profits are inversely related, when the supplier earns more than the retailer an increase in wholesale price has a positive effect on profit but a negative effect on fairness. Then, depending on underlying parameters, the (expected) utility of charging one extra dollar might not exceed the disutility from earning more than the retailer leading to (weakly) lower wholesale prices.

Second, the wholesale prices when the supplier faces risk are not always equal to those in the other risk conditions. In particular, when the supplier is risk averse, we see a (weakly) higher price than in the other risk conditions, while when supplier is risk loving we see a (weakly) lower price. The intuition is straightforward: a fair risk adverse supplier asks for compensation when she faces risk (vs. when there is no risk or someone else faces the risk), while a fair risk seeking supplier is willing to pay when she faces risks (vs. when there is no risk or someone else faces the risk). This pattern contrasts with the predictions in which the predicted wholesale prices are the same across risk conditions and risk preferences.

Finally, a careful reader may notice that the model does not predict differences in prices between the no risk and the retailer risk conditions. This equivalence prediction is not our primary focus and will not continue to hold in the channel ultimatum game in Section 4. It is primarily due to the model assumptions that make fairness and risk preferences independent, so that even players that are not risk neutral over profits are risk neutral over the possible fairness outcomes. While this assumption is strong, other assumptions arguably have greater drawbacks (see Fudenberg and Levine, 2012 for a review of the issues). For example, relaxing the independence assumption can have the paradoxical effect of making risk loving subjects behave as if they were risk averse.

3.3. Experimental Results

We now test the model predictions with a set of experiments that replicate the game setup discussed above. Recall that in the *no risk* treatment, production cost and retail price are certain at the time of the supplier's price decision. We set the production cost to 10 Experimental Points (EP), while we set the retail price to EP15. In the *supplier risk* treatment, the retail price remains constant at EP15, but the production cost has risk – it can be EP5 or EP15 with equal probability. Finally, in the *retailer risk* treatment, the production cost is a constant EP10, but the retail price has risk – it can be EP10 or EP20 with equal probability.

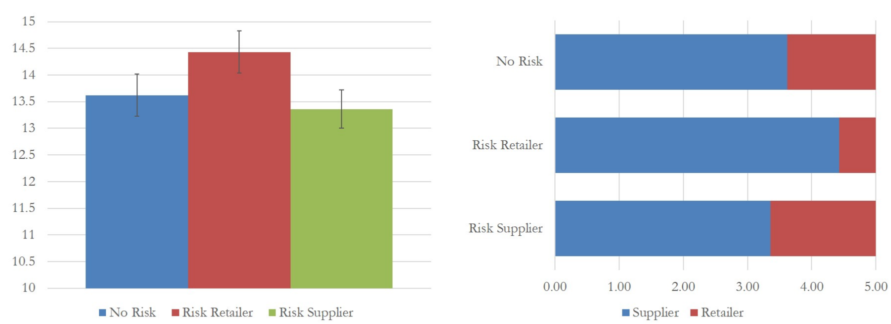
From Proposition 1 and Proposition 2, observe that if subjects are selfish or fair and risk neutral, they should not change their behavior across treatments. If they are fair and risk seeking, the wholesale price should be (weakly) lower in the supplier risk condition. Finally, if they are fair and risk adverse, they should be (weakly) higher in the supplier risk condition.

Procedure. We run six sessions of the game with three rounds each. The subjects were recruited from the paid student pool of a large public university. In each of the 6 sessions 16 to 18 subjects participated for a total of 106 participants (53 suppliers and 53 retailers). Roles (supplier or retailer) were randomly assigned to each participant at the beginning of the session and remained fixed for all three rounds of the experiment. Each participant played one round in each of the three conditions. The order in which subjects encountered each condition was varied systematically across sessions to control for order effects resulting in 53 observations per condition. Table 3 in Appendix B reports a detailed breakdown of the observations by round and condition. To approximate one-shot games as closely as possible, subjects did not receive feedback on decisions of other players or outcomes of the game until the end of the experiment. Moreover, subjects playing different roles were randomly and anonymously paired at each round with no rematch. Subjects were not told ahead of time they would face different conditions.

The game was programmed using oTree (Chen, Schonger, and Wickens, 2016). Upon arrival to the lab, subjects were randomly assigned to a computer with instructions to review (sample instructions are provided in the Online Appendix). Subjects answered a set of questions to check their understanding of the instructions and received feedback on their answers. The experimenter addressed any remaining questions, then the game started. At the end of the game, subjects filled in a survey before receiving a cash payment. Payments from the experiment were calculated by summing the payoff of each round, converting the total to dollars at a fixed rate and adding a participation fee. While the payoffs could be negative in each round, the participation fee guaranteed a positive payment for each subject. Average payment was \$14.52, and an experimental session lasted approximately 30 minutes.

Results. Because each subject played in all three conditions and the sequence of the condition was changed across subjects, the experimental design allows us to compare results within and between subjects. In this section, we present the paired test results and use all of the observations. Table 4 in Appendix B reports additional tests, which indicate that the results are robust.

When we compare prices across risk conditions, we find that the supplier charges a significantly higher wholesale price in the *retailer risk* ($M = 14.43$, $SE = .40$) vs. the *no risk* condition, $t(52) = -1.80$, $p < .1$ (see Figure 1a). We find no significant difference between the price the supplier offers in the *supplier risk* condition ($M = 13.36$, $SE = .36$) vs. the *no risk* condition ($M = 13.62$, $SE = .40$), $t(52) = -.53$, $p = .60$. Such price differences also translate to significant differences in the share of profit transferred to the retailer. The retailer expected share of profit is 27.55% in the no risk condition, 32.83% ($t(52) = -.05$, $p = .60$) in the supplier risk condition, but only 11.32% in the retailer risk condition ($t(52) = 1.80$, $p = .08$) (see Figure 1b).



(a) Wholesale Price (b) Expected Split of Profits

Figure 1 Summary of Dictator Game Results.

Given our focus on risk and risk preferences, we also collected post survey measures of risk aversion. In the survey, we asked the subjects to complete an unincentivized risk task designed by

Eckel and Grossman (2002). This procedure elicits risk preferences by asking subjects to choose their preferred gamble from a menu of six gambles with the same odds but different outcomes. The results of this survey indicated that the majority of subjects can be characterized as risk adverse (83.01%), with only a small subset (16.98%) of risk seeking individuals. Further, we find no difference in the proportion of risk seeking vs. risk adverse subjects (16.98% risk seeking vs. 83.01% risk averse for both retailers and suppliers) for subjects who play as retailers vs. suppliers suggesting that the effect is not due to systematic differences in our subject pool.

Discussion. The pattern of wholesale prices observed in Experiment 1 is inconsistent with the predictions of all previously discussed models in which preferences are symmetric and beliefs are consistent. Consistent with a preference for fairness, the wholesale prices are *lower* than the maximum, rejecting Proposition 1. More interestingly, even after restricting our attention to fair players with risk preferences, the comparisons between risk conditions are inconsistent with any of the predictions in Proposition 2. Wholesale prices are highest in the retailer risk condition, which is inconsistent with the risk neutrality prediction since there are significantly different prices across conditions. They are also inconsistent with the risk averse prediction which predicts prices to be largest in the supplier risk condition. The results are arguably most closely aligned with the risk-seeking predictions. Nevertheless, the elicited risk preferences indicate subjects are generally risk averse, and contrary to Proposition 2, suppliers do not significantly lower prices when they face risk (vs. no risk) relative to how much they raise prices under retailer risk (vs. no risk).

Part of the reason it is difficult to explain the results is that in this game the retailer has no action, so his risk preferences do not affect the predicted price offered by the supplier. In practice, however, the supplier may take those preferences into account and correct her pricing not only when she faces risk, but also when the retailer faces risk. In this case, a possible explanation for the behavior we observe could be that the supplier believes the retailer can somehow profit from the risk he faces. For example, this would be true if the retailer was risk seeking. A problem with this explanation is that it conflicts with the elicited risk preferences we observe in our subject population.

Another possible explanation is that given the absence of the possibility of rejection, suppliers have no incentive to think about the retailer preferences or even expected profits. Under these circumstances, the supplier might not carefully consider the implication of the risk faced by the retailer and exploit the uncertainty in retailer profits to claim a higher profit. This would be in line with the stream of literature that finds that players tend to exploit uncertainty to take selfish actions (Dana et al., 2012; Exley, 2016)

In the next section, we develop a model and run an experiment in which we allow retailers to reject the offer of the supplier to explore some of these possible explanations. In particular, examining retailers' rejections allows us to see if retailers behave in a manner consistent with the types of offers supplier's make (e.g., would they accept worse offers suppliers make under retailer risk?). Knowing rejections are possible gives the supplier a strong incentive to carefully consider the preferences of the other player and allows us to understand if the result is an artifact of the absence of monetary consequences for the supplier's actions, providing insight into the role of strategic thinking in the result.

4. Risk and Fairness in a Channel Ultimatum Game

4.1. Model Setting

For this second game, we keep the same setup as in the previous model, but we allow the retailer to reject the proposed wholesale price (w). If the retailer rejects the contract, both the supplier and the retailer earn the profit from their best outside option, which is normalized to zero for both players. This simple change impacts the maximization problem of the supplier that now has to take into account the possibility that the retailer rejects her offer, giving the supplier an incentive to think through the preferences of the retailer before making a decision. Moreover, we can now observe retailer's actual behavior through their rejection decisions, which is a direct indicator of their preferences.

4.2. Analysis of Risk Preferences

As in the channel dictator game, we first present a model in which players are selfish. Subsequently, we extend the analysis by considering fairness. For all the models, we maintain the standard assumption of symmetric preferences and consistent beliefs.

4.2.1. Selfish Players The maximization problem for the selfish supplier in the ultimatum game is given by:

$$max_w EU_S = max_w \begin{cases} E[g(\pi_S)] & \text{if } a = 1 \\ \\ 0 & \text{if } a = 0 \end{cases} \tag{4}$$

Where a is an indicator variable that is set to 1 if the retailer accepts the contract offered by the supplier and equal to 0 otherwise. The acceptance decision is made by the retailer who solves its own maximization problem given the wholesale price offered by the supplier. Like we did for the supplier, we assume the retailer's risk preferences can be represented by increasing utility function $h(\cdot)$ of his profits, that preferences are symmetric and that beliefs are consistent. The retailer maximization problem is then given by:

$$max_a \ EU_R = max_a \begin{cases} E[h(\pi_R)] & \text{if } a = 1 \\ \\ 0 & \text{if } a = 0 \end{cases} \tag{5}$$

As in the channel dictator model, we solve for the players' actions by backward induction and provide equilibrium predictions for both the benchmark selfish players case and the case in which subjects care about fairness. We consider the same risk conditions defined in Table 1 and derive predictions in Proposition 3.

PROPOSITION 3. *If both the supplier and the retailer are selfish, the wholesale price does not depend on the risk condition or the risk preferences of the players. Further, the optimal wholesale price is always going to be equal to the maximum wholesale price possible ($w^N = w^S = w^R = w_{max}$), and the retailer will always accept such price.*

Proposition 3 yields essentially the same predictions as Proposition 1: the optimal wholesale price is always equal to the maximum feasible price and the retailer always accepts. The intuition is that the retailer will accept any wholesale price with a non-negative expected value.[3] Given this, the supplier keeps as much profit as possible and choose $w = w_{max}$. Next, we turn our attention to the case in which players care about fairness.

[3] Recall that we restrict $i - C < w < i + P$ guaranteeing a non-negative expected value for both players for any feasible price.

4.2.2. Fair Players We now expand the utility functions to accommodate preferences for fairness. The analysis of the model reveals similar results to the channel dictator model in the previous section, but with stronger ordering between no risk and retailer risk conditions:

PROPOSITION 4. *If both the supplier and the retailer care about fairness, wholesale price offers can be partially ordered and the ordering depends only on the preferences for risk.*

- *Under risk neutrality, prices are the same across risk conditions:* ($w_{RN}^{N} = w_{RN}^{S} = w_{RN}^{R} \in [min\left(w_{R}^{N}, \frac{\mu_p+\mu_c}{2}\right), w_{max}]$, *where* w_{R}^{N} *is the minimum price the retailer will accept).*
- *Under risk aversion, prices are ordered as follows:* $w_{RA}^{R} \leq w_{RA}^{N} \leq w_{RA}^{S} \leq w_{max}$.
- *Under risk seeking, prices are ordered as follows:* $w_{RS}^{S} \leq w_{RS}^{N} \leq w_{RS}^{R} \leq w_{max}$.

The results highlighted in Proposition 4 are similar to those from Proposition 2. The proposition predicts the same ordering of the no risk and supplier risk conditions as in the dictator game. However, it predicts different prices in the retailer risk compared to the no risk condition, because the retailer can now respond to the offer of the supplier so that the supplier incorporates the retailer risk preference in her choices of wholesale prices and compensates risk averse retailers for carrying the risk, while letting risk seeking retailers pay for carrying risk. As a result, the supplier will offer (weakly) lower prices when the risk adverse retailer carries the risk than when there is no risk. Similarly, when the retailer is risk seeking, wholesale prices are (weakly) higher when the retailer carries the risk than when there is no risk.

4.3. Experimental Results

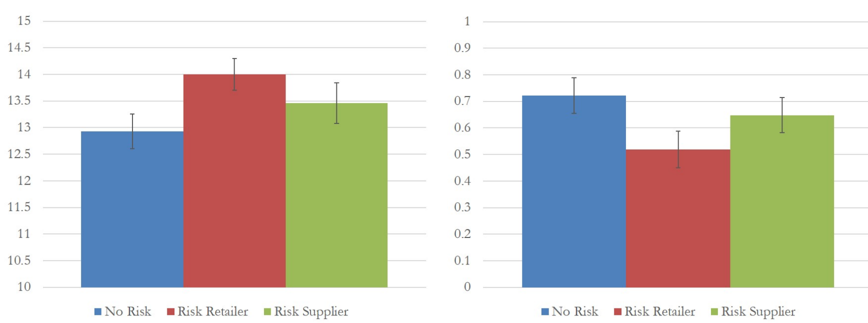
The channel ultimatum experiment is nearly identical to the channel dictator game, but allows the retailer to reject offers. As in the channel dictator game, the supplier determines the price for a good that retailer buys and sells to final consumers. However, after the supplier proposes a price, the retailer can accept or reject the proposed offer. If the retailer rejects the proposed wholesale price, both parties earn zero profit. If the retailer accepts the proposal, profits are determined in the same way as for the dictator game above.

Procedure. We run six sessions of the channel ultimatum game with three rounds each. In each round, subjects played in a different condition and the sequence of conditions was fully counterbalanced across sessions. In each session 18 subjects recruited from the paid student pool of a large public university took part for a total of 108 participants (54 retailers and 54 suppliers). Table 3 in Appendix B reports a breakdown of the observations by round and condition. The rest of the procedure is identical to the channel dictator game.

Average payment was $12.51 and an experimental sessions lasted approximately 45 minutes.

Results. The experimental design allows us to compare results within and between subjects. Here, we focus on the paired T-test results. Table 4 in Appendix B reports additional tests, which provide evidence of robustness. Additionally, Section B.1 in Appendix B examines results by rounds to show how results evolve during the experiment.

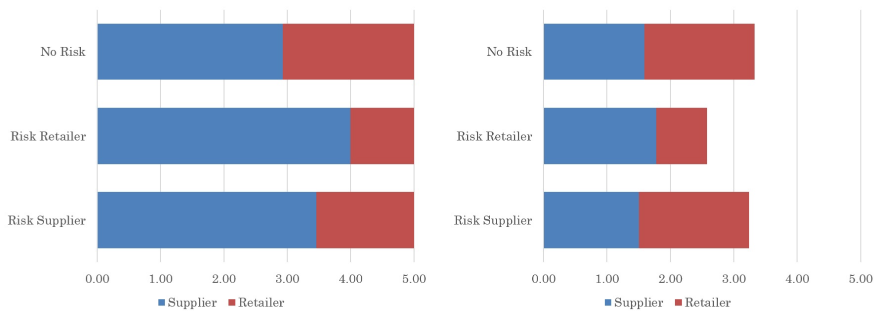
When we compare prices across risk conditions, we find that the supplier charges a significantly higher wholesale price in the *retailer risk* condition ($M = 14$, $SE = .30$) compared to the *no risk* condition ($M = 12.93$, $SE = .33$), $t(53) = -3.59$, $p < .01$. We also find that suppliers exposed to risk (*supplier risk* condition) demanded a higher price ($M = 13.46$, $SE = .38$) than in the *no risk* condition ($M = 12.93$, $SE = .33$); however, the difference is not significant, $t(53) = 1.35$, $p = .18$.



(a) Average Price (b) Summary of Acceptance Rates

Figure 2 Summary of Channel Ultimatum Game Prices and Acceptance Rates.

The different prices naturally imply different expected profit splits among suppliers and retailer (see Figure 3a). In expectation suppliers appropriate a higher share of profit in both the retailer and supplier risk conditions relative to the no risk condition. However, when we look at acceptance rates, we find a significant decrease in the acceptance rate in the *retailer risk* ($M = .52$, $SE = .07$) vs. *no risk* ($M = .72$, $SE = .06$) condition, $t(53) = -2.28$, $p < .05$, but similar acceptance rates in the *no risk* and in the *supplier risk* condition ($M = .65$, $SE = .07$), $t(53) = -.94$, $p = .35$. This drop in acceptance rates creates potentially severe deadweight losses and while it helps bring down the supplier profit does not equalize expected profit splits between the retailer and the supplier. Indeed, Figure 3b, which represents the average expected profits after rejections by conditions, shows the supplier taking the majority of the profits.



(a) Implied Profit Splits of Supplier Offers (b) Implied Profit Splits of Supplier Offers after Rejections

Figure 3 Summary of Channel Ultimatum Game Results.

Next we turn to the post-experiment survey and check risk preferences of subjects to test whether there are systematic differences that explain the observed pattern. In the survey, we ask subjects to complete the same Eckel and Grossman (2002) task described above. As before, the majority of subjects can be characterized as risk adverse (89.82%), with only a small subset (10.19%) of risk seeking individuals. We find no significant difference in the split of risk seeking vs. risk adverse subjects that play as retailers (88.89% risk averse vs. 11.11% risk seeking) vs. suppliers (90.74% risk averse vs. 9.26% risk seeking).

Discussion. In the channel ultimatum game, the retailer can reject the offer of the supplier. With regards to the wholesale price offers, the experimental results are quite similar to the results from the dictator game. We find once again that suppliers squeeze retailers more when the retailer faces risk than when there is no risk or when the supplier carries risk. In fact, the magnitude of the differences slightly increases between the dictator and the ultimatum game. Similar to the channel dictator game, we again find no significant difference in prices between the no risk condition and the one in which the supplier carries risk.

These results do not match the predictions of any of the models discussed in Section 4.2. All of the prices offered by the supplier are lower than the maximum price she could charge, in contrast to the predictions of Proposition 3. Even the predictions for fair channel members in Proposition 4 do not match the pattern of prices observed in the experiment. While the higher prices in the retailer risk (vs. no risk) condition leads us to reject both the assumption that channel members have either risk neutral or risk adverse preferences, the absence of price differences between the no risk and the supplier risk condition leads us to reject the assumption that channel members have risk seeking preferences. The observed pricing pattern cannot be compatible with models that assume both symmetric preferences and consistent beliefs, suggesting that channel members might have asymmetric preferences or they might hold inaccurate beliefs about their channel partners.

When we examine the pattern of rejections, we find a significantly lower acceptance rate in the retailer risk condition than in the no risk condition, but no significant difference between the supplier risk and the no risk condition. While retailers tolerate a (not significantly) higher wholesale price when the supplier faces risk, they do not accept it when retailers are the ones facing risk suggesting that retailers are not risk seeking. Moreover, the post experimental survey measures of risk aversion show no underlying risk preference difference in the subject population. The combination of rejection patterns and post survey measures seems to indicate that retailers are unlikely to be risk seeking, suggesting that a violation of the belief consistency assumption is more likely than a violation of the symmetry assumption.

To further examine which assumption is violated, in the next section we build a model of subjects' behavior and use the experimental data to recover the underlying parameters for fairness and risk preferences for suppliers and retailers. We first estimate the model under the assumption that subjects have both symmetric preferences and consistent beliefs and then relax each assumption. Next we compare the fit and the parameters of each model to establish what are the assumptions that best explain our results.

5. Implications for Behavioral Models: Structural Estimation and Model Fit Comparison

Given the apparent contradiction between our experimental results and the predictions of models with symmetric and consistent beliefs, we estimate structural models to answer the following questions: (1) What values of risk-preference and fairness parameters (and beliefs about others' parameters) are consistent with the data? (2) Does relaxing the assumptions of symmetric parameters and/or consistent beliefs significantly improve model fit?

In this section, our approach to answering these questions is to structurally estimate and compare four models (see Figure 4). These four models comprise a 2x2 matrix: preferences are either symmetric (S) or asymmetric (A), and beliefs are either consistent (C) or inconsistent (I). While there are many possible behavioral models one may estimate, these four models allow us to make several important comparisons.

First, by comparing Model SC to Model SI, we can observe whether relaxing the assumption of consistent beliefs significantly improves the model fit. Similarly, by comparing Model SC to Model AC, we can observe whether relaxing the symmetric preferences assumption significantly improves the model fit. Finally, by comparing these two model to the most general Model AI, we can observe whether both assumptions must be relaxed to significantly improve model fit.

5.1. Model Specification

We estimate the structural parameters of a random utility model. Below, we first specify the retailer's structural utility equation, followed by the supplier's structural utility equation.

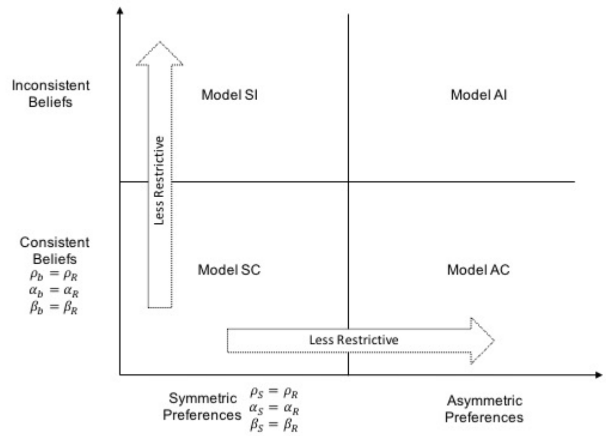


Figure 4 Four Models in Structural Estimations.

Retailer Preferences. We define the retailer's accept/reject decision as $a_{nc} = \{1, 0\}$, where 1 corresponds to accept. The index $c \in \{1, 2, 3\}$ identifies the risk condition and $n \in [1, N]$ indexes the retailer in our experiment. Define the utility function as:

$$U_R(w_{nc}) = \begin{cases} E\left[\frac{\pi_R(w_{nc})}{1-\rho_R}^{1-\rho_R}\right] + f_R(w_{nc}) + \epsilon_{1_{nc}} & \text{if } a_{nc} = 1 \\ \frac{i^{(1-\rho_R)}}{1-\rho_R} + \epsilon_{0_{nc}} & \text{if } a_{nc} = 0 \end{cases} \tag{6}$$

where $f_R(w) = \alpha_R(E[\pi_S(w_{nc}) - \pi_R(w_{nc})])^+ + \beta_R(E[\pi_R(w_{nc}) - \pi_S(w_{nc})])^+$, ρ_R is the risk preference coefficient, and $\epsilon_{a_{nc}}$ is an i.i.d. type 1 extreme-value preference shock. As it is common in the experimental literature, we use a standard CRRA function to capture risk preference $g(x) = \frac{x^{1-\rho}}{1-\rho}$ (e.g. Holt and Laury, 2002; Harrison, List, and Towe, 2007; and Harrison and Rustrom, 2008). Note that ρ captures the risk preference such that $\rho > 0$ indicates risk aversion, $\rho < 0$ indicates risk seeking, and $\rho = 0$ indicates risk neutralilty.[4] Given the distributional assumptions on the preference shock, we can write the retailer's probability of accepting an offer as:

$$P_c(a_{nc}|\theta_R) = Pr\left(U_{1c}(a_{nc}) > U_{0c}(a_{nc})\right) = \frac{e^{E\left[\frac{\pi_{R_{nc}}(w_{nc})}{1-\rho_R}^{1-\rho_R}\right] + f_R(w_{nc})}}{e^{\frac{i^{(1-\rho_R)}}{1-\rho_R}} + e^{E\left[\frac{\pi_{R_{nc}}(w_{nc})}{1-\rho_R}^{1-\rho_R}\right] + f_R(w_{nc})}} \tag{7}$$

[4] In this formulation x must be nonnegative. However, given participants were endowed with 30 experimental points at the beginning of the experiment, by assigning an endowment, i, of ten experimental points for each of the three rounds we can guarantee the argument of the risk function to be always nonnegative.

where θ_R is the vector of structural parameters representing the players preferences risk and fairness preferences $\{\rho_R, \alpha_R, \beta_R\}$. We then estimate the parameters using a maximum likelihood procedure, where the log-likelihood is given by

$$LL_R(\theta_R) = \sum_{a=0}^{1} \sum_{n=1}^{N} \sum_{c=1}^{3} log[P_c(a_{nc}|\theta_R) * y_{anc}] \tag{8}$$

where y_{anc} is the indicator function of the individual n under condition c that took action a.

Supplier Preferences. We consider a random utility model over the supplier's wholesale price decision, $w_k \in \mathbb{N}[5, 20]$, as follows:

$$U_S(w_{knc}) = \hat{P}_1(a_{knc}|\theta_b) \left(E\left[\frac{\pi_S(w_k nc)}{1-\rho_S}^{1-\rho_S} \right] + f_S(w_{knc}) \right) + \hat{P}_0(a_{knc}|\theta_b) \frac{i^{(1-\rho_S)}}{1-\rho_S} + \epsilon_{w_{knc}} \tag{9}$$

where $f_S(w_{knc}) = \alpha_S(E\left[\pi_R(w_{knc}) - \pi_S(w_{knc})\right])^+ + \beta_S(E\left[\pi_S(w_{knc}) - \pi_R(w_{knc})\right])^+$.

Here $\hat{P}_a(a_{knc}|\theta_b)$ is the expected probability of each retailer action, s, given a wholesale price, w_k. Such probability depends on the beliefs of the supplier about the retailer preferences, θ_b. Depending on the model, such beliefs can be consistent with the actual preferences of the retailer or not, i.e., $\theta_b = \theta_R$, or not , i.e., $\theta_b \neq \theta_R$.

Given this specification, the choice probabilities are given by:

$$P(w_{knc}|\theta_S, \theta_b) = Pr\left[U_S(w_{knc} > U_S(w_{jnc}) \forall i \neq j)\right] = \frac{e^{\hat{P}_1(w_{knc}|\theta_b)\left(E\left[\frac{\pi_S(w_{knc})}{1-\rho_S}^{1-\rho_S}\right] + f_S(w_{knc})\right) + \hat{P}_0(w_{knc}|\theta_b)\frac{i^{(1-\rho_S)}}{1-\rho_S}}}{\int_j e^{\hat{P}_1(w_{jnc}|\theta_b)\left(E\left[\frac{\pi_S(w_{jnc})}{1-\rho_S}^{1-\rho_S}\right] + f_S(w_{jnc})\right) + \hat{P}_0(w_{jnc}|\theta_b)\frac{i^{(1-\rho_S)}}{1-\rho_S}}} \tag{10}$$

And we estimate the relevant parameters by maximizing the following log-likelihood function:

$$LL_S(\theta_S, \theta_b) = \sum_{n=1}^{N} \sum_{w=5}^{20} \sum_{c=1}^{3} log P(w_{knc}|\theta_S, \theta_b) * y_{wnwc} \tag{11}$$

For efficiency purposes, we maximize the joint likelihood of the supplier and retailer actions and simultaneously estimate the parameters of both the supplier and the retailer utility function. The total likelihood function is then given by:

$$LL(\theta_R, \theta_S, \theta_b) = LL_R(\theta_R) + LL_S(\theta_S, \theta_b) \tag{12}$$

We estimate the four model specifications (SC, AC, SI, and IA) by imposing different assumptions on the vectors of behavioral parameters identifying players' preferences and beliefs. To model symmetric and consistent beliefs (SC), we restrict $\theta_R = \theta_S = \theta_b$. AC relax the constraint on the symmetry of the preference parameters between supplier and retailer, but imposes that the beliefs of the supplier about the retailer parameter are correct so that $\theta_R \neq \theta_S = \theta_b$. SI constrains the preferences to be symmetric, but allows the supplier to hold incorrect beliefs about the preferences of the retailer, i.e. $\theta_R = \theta_S \neq \theta_b$. Finally, IA allows all preference vectors to be different from each other so that $\theta_R \neq \theta_S \neq \theta_b$.

5.2. Estimation Results and Model Fit Comparisons

Table 2 presents the estimation of the four models outlined in Figure 4. Model SC (symmetric preferences and consistent beliefs) estimates a positive and significant risk coefficient, ρ, and indicates that subjects are risk adverse. When we add the fairness parameter to the estimation, the risk aversion coefficient remains significant and consistent with the model that includes only risk aversion, the fairness parameter not significantly different than zero, and the model fit only marginally improves ($LR = 5.85$; $p < .1$).

Model SI (symmetric preferences but allowing the supplier to have inconsistent beliefs), presents a marked improvement over model a for both the model that includes only the risk aversion parameter ($LR = 20.77$; $p < .01$) and the model that includes fairness ($LR = 15.24$; $p < .01$). In these models, we find the risk preference parameter, ρ, is positive for the actual preferences of the supplier and the retailer, but negative for the beliefs of the supplier about the preferences of the retailer. This result indicates that the supplier and the retailer are risk adverse, but the supplier believes the retailer is risk seeking. Both parameters are highly significant. Once again adding fairness to the estimation does not change the risk parameter and does not significantly improve the fit of the model ($LR = .33$; $p = .85$).

In contrast to Model SI, Model AC presents only a marginal improvement over model SC for both the model that includes only the risk aversion parameter ($LR = 4.25$; $p < .1$) and the one that includes fairness ($LR = 6.84$; $p < .1$). This model estimates the supplier to be risk adverse ($\rho_S = .16$; $p < .01$), while it estimates the retailer to be risk neutral ($\rho_b = \rho_r = .07$; $n.s.$). Adding the fairness parameter marginally improves fit ($LR = 8.45$; $p < .1$), but does not significantly change the risk parameters.

Finally, when we estimate Model AI, which allows for both asymmetric preferences and inconsistent beliefs, we find that the additional parameters do not improve the fit of the model compared to model SI ($LR = .15$; $n.s.$ for the risk only model), but they significantly improve the fit compared to model AC ($LR = 16.67$; $p < .01$ for the risk only model).[5] Further, we find that the risk aversion parameter of the base model does not significantly differ from the risk aversion parameters in model b. Indeed, in model AI we again find that subjects actual risk preferences indicate risk aversion (.28; $p < .01$ for the supplier and .24; $p < .01$ for the retailer), while the supplier beliefs about retailer preferences is that the retailer is risk seeking ($-.62$; $p < .01$).

Discussion. The estimation provides support that the experimental results are driven by suppliers' erroneous beliefs about the preferences of the retailers, not by a difference in the preferences of suppliers and retailers. In particular, a model that restricts actual preferences to be the same across suppliers and retailers but allows supplier to have erroneous beliefs about the retailer preferences can approximate data more accurately than a model that allows preferences to be different, but restricts beliefs to be accurate. When we estimate the risk parameters free of constraints we recover parameters that are not statistically different from the model in which we restrict actual risk preferences to be the same and allow beliefs to be inconsistent with retailer preference.

6. Conclusions

In a series of experiments we show that suppliers squeeze retailers more when the retailers are exposed to risk than when they are not. When given an opportunity to reject, retailers reject suppliers' offers more often when they carry the risk. In contrast, when suppliers face risk, both prices

[5] Despite more parameters, we observe a small nonsignifcant decrease ($LR = -.21$) in the LL of the model AI with fairness compared to the model AI without fairness and between model SI and AI with fairness ($LR = -.39$). This is due to the fairness parameters' negative restriction.

Table 2 Supplier's Phase

	Model SC		Model SI		Model AC		Model AI	
	$\theta_S = \theta_b = \theta_R$		$\theta_S = \theta_R \neq \theta_b$		$\theta_S \neq \theta_b = \theta_R$		$\theta_S \neq \theta_b \neq \theta_R$	
	Risk	Full	Risk	Full	Risk	Full	Risk	Full
ρ_S	.11	.09	.27	.24	.16	.11	.28	.13
	(.04)***	(.04)**	(.04)***	(.05)***	(.06)***	(.06)*	(.04)***	(.06)**
α_S	-	-.00	-	-.00	-	-.00	-	-.00
		(.01)		(.02)		(.00)		(.01)
β_S	-	-.20	-	-.07	-	-.00	-	-.03
		(.19)		(.09)		(.09)		(.11)
ρ_b	ρ_S	ρ_S	-.61	-.64	ρ_R	ρ_R	-.62	-.12
			(.10)***	(.22)***			(.10)***	(.21)
α_b	-	α_S	-	-.00	-	α_R	-	-.00
				(.02)				(.02)
β_b	-	β_S	-	-.01	-	β_R	-	-.98
				(.40)				(.37)***
ρ_R	ρ_S	ρ_S	ρ_S	ρ_S	.07	.03	.24	.17
					(.05)	(.07)	(.08)***	(.08)**
α_R	-	α_S	-	α_S	-	-.05	-	-.03
						(.05)		(.05)
β_R	-	β_S	-	β_S	-	-.61	-	-.21
						(.19)***		(.21)
LL	-469.52	-463.66	-448.75	-448.42	-465.27	-456.82	-448.60	-448.81

Note: Bootstrap standard errors in parenthesis, obtained from 1000 repetitions.

and rejection rates do not differ significantly from the condition of no risk. These findings cannot be rationalized under standard assumptions about risk preferences in which all players have the same preferences and are fully informed about them. We provide evidence that the pattern in results is due to suppliers holding incorrect beliefs about the risk preferences of retailers. Specifically, while suppliers and retailers are both risk averse, suppliers behave as if retailers were risk loving.

Our results show that the common assumption of symmetric risk preferences and full information about preferences can be violated. Even in simple settings, people apparently may incorrectly believe others have different risk preferences than themselves when trying to evaluate what is fair. This inconsistencies can have wide ranging implications for modeling channel decision making and, more generally, firms' and consumers' behavior. Further research is needed to establish how wide ranging this phenomenon is, but our results recommend caution when assuming correct beliefs about other players preferences, particularly in situations where some uncertainty is present.

Second, our findings have implications for designing efficient channel contracts. In this respect, rejection rates are higher when the retailer faces risk than when the supplier faces risk or when there is no risk. The difference in rejection rates and expected profits suggests that greater channel efficiency could be reached when the channel leader faces the higher risk. Future research could directly test this implication by comparing channel profits under different risk and channel leadership structures.

Finally, these results contribute to the literature on risk preferences by further investigating how individuals represent the risk aversion of others. We find that subjects underestimate the risk aversion of their opponents. This is consistent with evidence from previous studies indicating that individuals do not react consistently to risk that affects themselves vs. others, generally displaying a lower degree of risk aversion when making decisions for others vs. themselves (Beisswanger et al., 2003; Polman, 2012; Stone et al., 2002; Wray and Stone, 2005). It is also more broadly consistent, with Exley's (2015) findings that subjects can strategically use risk aversion to appear nicer than they are. However, we extend both of these results by showing that they persist also when opponents have a chance to respond to the offers. We show that suppliers continue to demand higher wholesale prices in the *risk on supplier* condition even when retailers can reject. Given the penalty for rejection, this persistent pattern suggests that suppliers fully expect retailers will accept their prices, pointing to biased beliefs.

Some limitations remain. First, the game is highly stylized and does not offer the same complexity of a real world channel. We argue that this simplification is necessary when attempting to isolate behavioral biases from each other and from mistakes. Further research can extend our results to a more complex setting and examine how the layering of additional complexity affects subjects' behaviors. Another open question is whether the inconsistencies would also be present in a business situation where firms interact long term and market returns discipline learning. Given field findings that firms' beliefs about partners are also biased in long term relationships (Vosgerau et al., 2008), we expect that managers in the field are unlikely to hold more accurate beliefs about the preferences of their peers than experimental subjects. In fact, Meyer et al. (2010) suggest the complexity of real world situations and the large amount of data available might make it harder for managers to receive a clear signal of partners preferences that would allow them to correct their beliefs.

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Appendix A: Proofs

A.1. Proof of Proposition 1

We start with analyzing the case in which players are risk neutral. In this case, the supplier's expected utility is equal to her expected profit:

$$EU_s = E\left[\pi_S\right] = E\left[(i + w - C)\right] = \quad i + w - E\left[C\right]. \tag{13}$$

Given $E\left[C\right] = \mu_c$ across all risk conditions, a risk neutral supplier should offer the same wholesale price across such conditions. Moreover, given that the expected profit is increasing in w, a selfish supplier should always choose the highest possible wholesale price, that is $w = w_{max}$.

When the supplier is not risk neutral, her expected utility is the expected value of an increasing non-linear function $g(\cdot)$ of her profits. If she is risk averse, $g(\cdot)$ is concave, if she is risk seeking $g(\cdot)$ is convex. That is, the rational risk averse or risk seeking supplier maximizes the following function:

$$EU_S = E[g(\pi_S)] = E[g\left(i + w - C\right)]. \tag{14}$$

Since $g(\cdot)$ is increasing in w, the rational supplier will again choose $w = w_{max}$ across risk conditions, for any given preference structure.

Hence, for a selfish supplier, the optimal wholesale price will be $w_S^N = w_S^S = w_S^R = w_{max}$, for any given risk preference.

Q.E.D.

A.2. Proof of Proposition 2.

Risk Neutral Preferences. Under risk neutrality the supplier's expected utility is:

$$EU_S = E\left[\pi_S + f_S\right] = E\left[\pi_S\right] - \alpha_S(E\left[\pi_R - \pi_S\right])^+ - \beta_S(E\left[\pi_S - \pi_R\right])^+. \tag{15}$$

To obtain the equilibrium predictions, we first note that the expected profits for the supplier are $E\left[\pi_S\right] = i + w - \mu_c$ while the ones for the retailer are $E\left[\pi_R\right] = i + \mu_p - w$. Plugging the profits into the utility function, we obtain:

$$EU_S = \begin{cases} (1 - 2\beta)\, w + (\mu_p + \mu_c)\beta + i - \mu_c & \text{if } w \geq (\mu_p + \mu_c)/2 \\ (1 + 2\alpha)\, w - (\mu_p + \mu_c)\alpha + i - \mu_c & \text{if } w < (\mu_p + \mu_c)/2 \end{cases}. \tag{16}$$

Note that for values of $w < (\mu_p + \mu_c)/2$, the expected utility is always an increasing function of w. Hence the supplier will never offer anything below this threshold. Once the threshold is crossed, the supplier's expected utility could increase or decrease depending on the value of β. In particular, the supplier will charge $w^R_{RN} = (\mu_p + \mu_c)/2$ for $\beta > \frac{1}{2}$ and $w^R_{RN} = w_{max}$ for $\beta <= 1/2$. This implies that the wholesale price for a risk neutral agent will be $(\mu_p + \mu_c)/2 \leq w^N_{RN} = w^S_{RN} = w^R_{RN} \leq w_{max}$.

Risk Averse Preferences. We now consider the preference structure that incorporates both risk aversion and fairness. As before risk aversion is captured by taking the expectation of a concave function $g(\cdot)$ to the supplier's profits. We can write the ex-post fairness expected utility as follows:

$$EU_S = E\left[g(\pi_S)\right] - \alpha_S(E\left[\pi_R - \pi_S\right])^+ - \beta_S(E\left[\pi_S - \pi_R\right])^+, \tag{17}$$

and since we are using the mean preserving profits, we can rewrite the expected utility as a piecewise function

$$EU_S = \begin{cases} E\left[g\left(i + w - C\right)\right] + (\mu_p + \mu_c)\beta - 2w\beta & \text{if } w \geq (\mu_p + \mu_c)/2 \\ E\left[g\left(i + w - C\right)\right] - (\mu_p + \mu_c)\alpha + 2w\alpha & \text{if } w < (\mu_p + \mu_c)/2 \end{cases}. \tag{18}$$

We start outlining the equilibrium predictions by noting that the no risk case and the retailer risk case must have the same equilibrium predictions since $EU^N_S = EU^R_S$. This happens because the randomness of the retail price does not enter directly into the risk preferences. Hence, in these conditions the expected utility takes the following shape

$$EU^N_S = EU^R_S = \begin{cases} g\left(i + w - \mu_c\right) \ + (\mu_p + \mu_c)\beta - 2w\beta & \text{if } w \geq (\mu_p + \mu_c)/2 \\ g\left(i + w - \mu_c\right) - (\mu_p + \mu_c)\alpha + 2w\alpha & \text{if } w < (\mu_p + \mu_c)/2 \end{cases}. \tag{19}$$

Note that when $w < (\mu_p + \mu_c)/2$ the function is always increasing. However, when $w \geq (\mu_p + \mu_c)/2$ the sign of the function is unclear, and the expected utility could be increasing or decreasing in w. Here, the maximum will be achieved when $g'\left(i + w - \mu_c\right) \ - 2\beta = 0$, so it will depend on the concavity of $g\left(\cdot\right)$ and on β. Figure 2 illustrates three possible scenarios, one where the maximum is achieved after the threshold, another when the function is increasing in all the domain of w, and one where the function achieves the maximum at the threshold. Hence, $w^N_{RA} = w^R_{RA} \in [(\mu_p + \mu_c)/2, w_{max}]$.

The last condition to consider in this preference structure is when there is supplier risk. For this condition the expected utility looks in the following way

$$EU_S^S = \begin{cases} E[g\left(i+w-C^S\right)] + (\mu_p+\mu_c)\beta - 2w\beta & \text{if } w \geq (\mu_p+\mu_c)/2 \\ E[g\left(i+w-C^S\right)] - (\mu_p+\mu_c)\alpha + 2w\alpha & \text{if } w < (\mu_p+\mu_c)/2 \end{cases}. \tag{20}$$

As before, the function is increasing for $w < (\mu_p+\mu_c)/2$. However, when $w \geq (\mu_p+\mu_c)/2$ the function sign of the function is unclear and could be increasing or decreasing in w. Here, the maximum will be achieved when $\int g'(I+w-C^S)dF(w) - 2\beta = 0$, and the value will depend on the concavity of $g(\cdot)$ and on β. The result follows for a discrete random variable replacing the integral with a sum. While we cannot pinpoint the number, we know that it will be (weakly) greater than or equal to $w_{RA}^N = w_{RA}^R$ because for any given w the concavity of $g\left(\cdot\right)$ implies that $EU_S^N = EU_S^R \geq EU_S^S$, so the slope of EU_S^S, i.e., $\int g'(I+w-C^S)dF(w) - 2\beta$, is weakly greater than that of EU_S^N and EU_S^R, $g'\left(I+w-\mu_c\right) \; - 2\beta$. Hence, for a fair, risk adverse supplier, the optimal wholesale price will be $(\mu_p+\mu_c)/2 \leq w_{RA}^N = w_{RA}^R \leq w_{RA}^S \leq w_{max}$.

Risk Seeking Preferences. The last preference structure to analyze is risk seeking preferences. Now we consider a convex $g(\cdot)$ in the expected utility function. Aside from the concavity of $g(\cdot)$ the expected utility is the same as equation (18). Because of that, we obtain that the equilibrium predictions for the no risk and risk in the retailer conditions will be the same. That is, $w_{RS}^N = w_{RS}^R \in [(\mu_p+\mu_c)/2, w_{max}]$, since equation (19) holds. Similarly, for the condition of risk in the supplier equation (20) holds, nevertheless, $g(\cdot)$ is convex now, and it implies a reversed order to that of risk averse preferences.

Hence, for a fair, risk seeking supplier, the optimal wholesale price will be $(\mu_p+\mu_c)/2 \leq w_{RS}^S \leq w_{RS}^N = w_{RS}^R \leq w_{max}$.

Q.E.D.

A.3. Proof of Proposition 3

If players are *risk neutral*, the supplier's expected utility is equal to her expected profit given by equation 4. Similarly, the retailer's expected utility is equal to

$$EU_R = E\left[\pi_R\right] = E\left[(i+P-w)\right] = i + E\left[P\right] - w. \tag{21}$$

Given that $E\left[P\right] = \mu_P$ and $E\left[C\right] = \mu_C$, the equilibrium predictions must be the same across all risk conditions

We now proceed by backward induction. A risk neutral retailer will accept any offer that ensures $EU_R = i + \mu_P - w > 0$. The supplier knows this, and faces the following optimization problem

$$Max \;\{0,\; EU_S(w^*)\} \tag{22}$$

which reduces to $w^* = argmax \;\; EU_S$ s.t. $i + \mu_P > w$. However, $w_{max} > i + P$ by assumption, which implies $w_{max} > i + \mu_P$ across risk conditions, so that the problem becomes $w^* = argmax \;\; EU_S$, which is equivalent to the maximization problem in Proposition 1. Hence, following the same logic as in Proposition 1 it follows that $w^* \leq w_{max}$ and that w^* is the same across all conditions.

When the players are not risk neutral, the expected utilities are the expected value of an increasing non-linear function of their profits. Proceeding by backward induction the rational risk averse or risk seeking retailer will accept the wholesale price only if $E\left[h\left(i+P-w\right)\right] > 0$. The supplier knows this and solves the following problem $Max\{0,\; EU_S(w^*)\}$, where $w^* = argmax \;\; EU_S$ s.t. $E[h(i+P-w)] > 0$ and since $i + P^R - w_{max} > 0$ for all the support of P^R, the problem will again reduce to the one of Proposition 1.

Hence, for a selfish supplier, the optimal wholesale price will be $(\mu_c + \mu_p)/2 \leq w_S^N = w_S^S = w_S^R \leq w_{max}$ for any given risk preference.

Q.E.D.

A.4. Proof of Proposition 4

Risk Neutral Preferences. Under risk neutrality the retailer's expected utility is:

$$EU_R = E\left[\pi_R\right] - \alpha_R(E\left[\pi_S - \pi_R\right])^+ - \beta_R(E\left[\pi_R - \pi_S\right])^+. \tag{23}$$

To obtain the equilibrium predictions we recall that the expected profits are $E\left[\pi_S\right] = i + w - \mu_c$ for the supplier and $E\left[\pi_R\right] = i + \mu_p - w$ for the retailer. By plugging into the utility function (23) the expected utility of the retailer can be written as a piecewise function:

$$EU_R = \begin{cases} i + \mu_p - (1+2\alpha_R)\,w + (\mu_p+\mu_c)\alpha_R & \text{if } w \geq (\mu_p+\mu_c)/2 \\ i + \mu_p - (1-2\beta_R)\,w - (\mu_p+\mu_c)\beta_R & \text{if } w < (\mu_p+\mu_c)/2 \end{cases}. \tag{24}$$

The retailer will accept any $w \geq (\mu_p+\mu_c)/2$ only if $\frac{i+\mu_p+\alpha_R(\mu_p+\mu_c)}{(1+2\alpha_R)} > w$. This is feasible if $\frac{i+\mu_p+\alpha_R(\mu_p+\mu_c)}{(1+2\alpha_R)} \geq \frac{\mu_p+\mu_c}{2}$. This is true whenever $i \geq \frac{-2\mu_p+\mu_c}{2}$, which is always true in our setting. Hence, across risk conditions the rational, fair and risk neutral supplier will request:

$$w_{RN}^R = w_{RN}^N = w_{RN}^S = \begin{cases} \frac{i+\mu_p+\alpha_R(\mu_p+\mu_c)}{(1+2\alpha_R)} & \text{if } \frac{i+\mu_p+\alpha_R(\mu_p+\mu_c)}{(1+2\alpha_R)} < w_{max} \\ w_{max} & \text{otherwise} \end{cases}. \tag{25}$$

Risk Averse Preferences. In order to introduce risk aversion we consider the following expected utility for the retailer:

$$EU_R = E\left[h(\pi_R) + f_R\right] = E\left[h(\pi_R)\right] - \alpha_R(E\left[\pi_S - \pi_R\right])^+ - \beta_R(E\left[\pi_R - \pi_S\right])^+, \tag{26}$$

where $h(\cdot)$ is an increasing concave function. Using the same procedure as before, the equation can be rewritten as a piecewise function as follows:

$$EU_R = \begin{cases} E[h\left(i + P - w\right)] - 2\alpha_R w + \alpha_R(\mu_p + \mu_c) & \text{if } w \geq (\mu_p + \mu_c)/2 \\ \\ E[h(i + P - w)] + 2\beta_R w - (\mu_p + \mu_c)\beta_R & \text{if } w < (\mu_p + \mu_c)/2 \end{cases}. \tag{27}$$

We start by outlining equilibrium predictions for the no risk condition. Because there is no uncertainty in the retailer's profit we can rewrite equation 27 as follows:

$$EU_R = \begin{cases} h\left(i + \mu_p - w\right) - 2\alpha_R w + \alpha_R\left(\mu_p + \mu_c\right) & \text{if } w \geq \frac{\mu_p + \mu_c}{2} \\ \\ h\left(i + \mu_p - w\right) + 2\beta_R w - \left(\mu_p + \mu_c\right)\beta_R & \text{if } w < \frac{\mu_p + \mu_c}{2} \end{cases}. \tag{28}$$

A utility maximizer retailer will accept $w < \frac{\mu_p + \mu_c}{2}$ if

$$h\left(i + \mu_p - w\right) - \beta_R\left(\mu_p + \mu_c\right) + 2\beta_R w \geq 0 \tag{29}$$

and they will only accept $w \geq \frac{\mu_p + \mu_c}{2}$ if:

$$h\left(i + \mu_p - w\right) - 2\alpha_R w + \alpha_R\left(\mu_p + \mu_c\right) \geq 0. \tag{30}$$

Let $\underline{w}_R^N$ be the wholesale price that satisfy (29) with equality and $\overline{w}_R^N$ the one that satisfies (30) with equality, the the retailer will accept any price $w \in [max(\underline{w}_R^N, w_{min}), min(\overline{w}_R^N, w_{max})]$. For notational convenience and given the restrictions, from here on we use $\underline{w}_R^N$ to indicate the minimum acceptable and feasible price (i.e. $max(\underline{w}_R^N, w_{min})$) and $\overline{w}_R^N$ to indicate the maximum acceptable and feasible price (i.e., $min(\overline{w}_R^N, w_{max})$). Given this, the supplier maximization problem becomes:

$$Max_w \begin{cases} EU_S^N(w) & \text{if } w \in [\underline{w}_R^N, \overline{w}_R^N] \\ \\ 0 & \text{otherwise} \end{cases} \tag{31}$$

$$EU_S^N = \begin{cases} E[g\left(i + w - \mu_c\right)] + (\mu_p + \mu_c)\beta - 2w\beta & \text{if } \frac{\mu_p + \mu_c}{2} < w \leq \overline{w}_R^N \\ \\ E[g\left(i + w - \mu_c\right)] - (\mu_p + \mu_c)\alpha + 2w\alpha & \text{if } \underline{w}_R^N \leq w \leq \frac{\mu_p + \mu_c}{2} \\ \\ 0 & \text{otherwise} \end{cases}. \tag{32}$$

Note that $E[g\,(i+w-\mu_c)] - (\mu_p+\mu_c)\alpha + 2w\alpha$ is increasing in price, so while the value of the optimal wholesale price, w^* for this problem will depend on the concavity of the function $g(\cdot)$, the values of α_R and β_S , we know it will be such that:

$$w_{RA}^N \in \left[\frac{\mu_p+\mu_c}{2}, \overline{w}_R^N\right]. \tag{33}$$

We now consider the condition of risk on the supplier. Since the retailer is not facing risk, her expected utility is the same as equation (28), which means that the retailer will accept any price in range $w \in [\underline{w}_R^N, \overline{w}_R^N]$. On the other hand, the supplier faces risk, and because of that her optimization problem changes as follows

$$EU_S^S = \begin{cases} E[g\,(i+w-C^S)] + (\mu_p+\mu_c)\beta - 2w\beta & \text{if } \frac{\mu_p+\mu_c}{2} < w \le \overline{w}_R^N \\ E[g\,(i+w-C^S)] - (\mu_p+\mu_c)\alpha + 2w\alpha & \text{if } \underline{w}_R^N \le w \le \frac{\mu_p+\mu_c}{2} \\ 0 & \text{otherwise} \end{cases}. \tag{34}$$

Note that $E[g\,(i+w-C^S)] - (\mu_p+\mu_c)\alpha + 2w\alpha$ is increasing in price, so while the value of the optimal wholesale price, w^* for this problem will depend on the concavity of the function $g(\cdot)$, the values of α_R and β_S , we know it will be such that

$$w_{RA}^S \in \left[\frac{\mu_p+\mu_c}{2}, \overline{w}_R^N\right]. \tag{35}$$

Further, because of the concavity of $g(\cdot)$ and following the same argument as in Proposition 2, we can partially order the wholesale prices as follows $w_{RA}^S \ge w_{RA}^N$.

The last case to analyze is risk on the retailer. For this case the expected utility of the retailer takes the following form:

$$EU_R = \begin{cases} Eh(i+P_R-w) - 2\alpha_R w + \alpha_R(\mu_p+\mu_c) & \text{if } w \ge \frac{\mu_p+\mu_c}{2} \\ Eh(i+P_R-w) + 2\beta_R w - \beta_R(\mu_p+\mu_c) & \text{if } w < \frac{\mu_p+\mu_c}{2} \end{cases}. \tag{36}$$

Because of the concavity of $g(\cdot)$ we know that $E[h(i+P_R-w)] < h(E[i+P_R-w])$. Because of this, the wholesale price that makes the retailer indifferent between accepting and rejecting is weakly smaller than that of the supplier or no risk conditions. Therefore $w_R^R \in [w_R^N,\ w_{max}] \le w_R^N$. Knowing this the supplier has to solve the following problem:

$$Max\ \left\{0,\ EU_S^N(\check{w})\right\} \tag{37}$$

where $\breve{w} = argmax\ EU_S^R$ s.t. $w > W_{R^R}$ and $EU_S^R = g(i + w - \mu_c) + (\mu_p + \mu_c)\beta_S - 2w\beta_S$

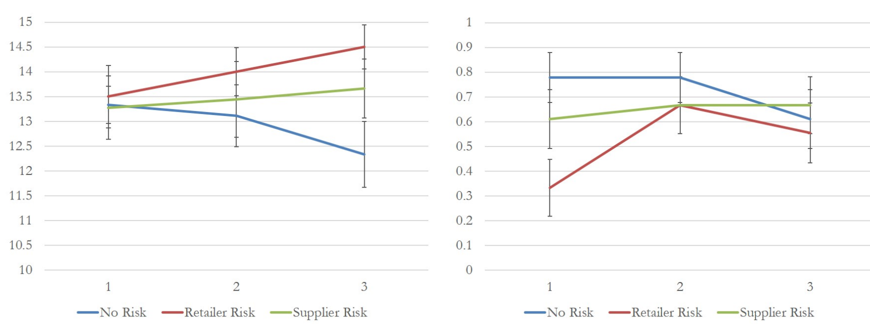
As before, the solution of this problem will depend on the concavity of $g(\cdot)$, the values of α_R and β_S. However, because $w_{RA}^R \leq w_{RA}^N$, we know that the optimization occurs with a tighter restriction. Thus, we can partially order the wholesale prices as follows: $w_{RA}^S \geq w_{RA}^N \geq w_{RA}^R$.

Risk Seeking Preferences. The last preference structure to consider is risk seeking. The partial order implications follow immediately, following the same logic as in the risk adverse case, but considering the risk preference function is now convex instead of concave. To see this, note that for the case of risk in the supplier the convexity of $g(\cdot)$ will imply that $w_{RS}^N \geq w_{RS}^S$ at the moment of the supplier optimization. For the case of risk in the retailer, we obtain $w_{RS}^N \leq w_{RS}^R$ when the retailer is asking his minimum acceptable price, since now he optimizes over a convex function.

Hence for a fair supplier, the optimal price will be such that $w_{RS}^R \geq w_{RS}^N \geq w_{RS}^S$.

QED

Appendix B: Additional Tables and Robustness Checks



(a) Average Price by Round (b) Summary of Acceptance Rate by Round

Figure 5 Summary of Ultimatum Game Prices and Acceptance Rate by Round

B.1. Analysis of Decisions by Rounds

The counterbalanced design allows us to see how subjects' decisions evolve over time. We find that, while prices start at a similar level (No Risk $M = 13.33$, $SE = .37$; Risk Retailer: $M = 13.5$, $SE = .63$; Risk Supplier: $M = 13.28$, $SE = .64$), their trajectories diverge. Prices in the no risk condition decrease over time ($Beta = -.5$, $SE = .40$, $t(2) = -1.26$, $p = .22$), while in the retailer risk condition ($Beta = .5$, $SE = .37$,

$t(2) = 1.36$, $p = .18$) and, to a lesser extent, the supplier risk condition ($Beta = .20$, $SE = .47$, $t(2) = .41$, $p = .68$) prices increase over time. None of these trend reaches significance, but they combine to generate a significant difference between no risk ($M = 12.33$, $SE = .66$) and retailer risk prices ($M = 14.5$, $SE = .44$) by round 3, $t(34) = -2.72$, $p < .05$. While acceptance rates varies across rounds, there are no distinct trends over time.

Table 3 Number of Observations per Round

	Dictator Game			Ultimatum Game		
	Round 1	Round 2	Round 3	Round 1	Round 2	Round 3
No Risk	18	18	17	18	18	18
Retailer Risk	18	35	0	18	18	18
Supplier Risk	17	0	32	18	18	18

Table 4 T-test of Price, Accepted Price and Acceptance Rate

	Ultimatum Game	Dictator Game	
	Price	Price	Acceptance Rate
	t-stat [DF]	t-stat [DF]	t-stat [DF]
No Risk vs. Retailer Risk			
Paired	-1.80* [52]	-3.59*** [53]	2.28** [52]
Unpaired	-1.45 [104]	-2.41** [106]	2.21** [106]
No Risk vs. Supplier Risk			
Paired	.53 [52]	-1.35 [53]	0.94 [53]
Unpaired	.5 [104]	-1.07 [106]	0.82 [106]
Retailer Risk vs. Supplier Risk			
Paired	2.19** [52]	1.4 [53]	-1.48 [53]
Unpaired	2.02** [106]	1.11 [106]	-1.37 [106]

Note: ***, ** and * represent 99 percent, 95 percent and 90 percent significant differences.

Appendix C: Online Appendix: Instructions

You are about to participate in a decision-making experiment in which you will earn money based on your own decisions and the decisions of others. Please follow the instructions carefully. You can receive a considerable amount of money based on your actions and the actions of others. Experimental points earned in this game will be converted to real dollars, paid to you in cash at the end of the study. **One experimental point equals 0.30 real dollars.** It is important that you do not look at other peoples computer screens, and that you do not talk, laugh, or make noises during the experiment. If you have any questions please raise your hand.

The Game

In todays experiment, you will be playing one of two different roles: the **Supplier** or the **Retailer**. At the beginning of the game, you will be randomly assigned to play one of these roles, which stays the same for three rounds. Each player will be initially endowed with 20 experimental points. Based on your performance and the performance of others you could lose up to all 20 points or make up to 30 additional points

In each round, one Supplier and one Retailer will be paired to negotiate a contract. The computer controls the random matching so that pairings will change from round to round. You will never meet the same person more than once. You will not be able to identify the person with whom you are paired.

In each round:

1. The Supplier offers to make a new product for the Retailer for a price P_S.
2. The Retailer decides if he wants to accept or reject the offer of P_S proposed by the Supplier.

(a) If the Retailer rejects the offer, then both parties walk away from the negotiation with no earnings or losses.

(b) If the Retailer accepts the offer, the supplier then makes the new product and sells it to the retailer for P_S. In turn, the retailer sells the new product to the final customer market.

Market Research

This is a new product and there is often some uncertainty about how much it will cost the supplier to make (the suppliers production cost is C), and/or how much the retailer will be able to sell it for (the retailers sales price is P). However, this uncertainty can sometimes be resolved through market research. Any research available will be shared with both Supplier and Retailer.

The first screen will show the results of the marketing research that has been conducted on the product. Both players will see the same information. The marketing research presents three equally likely scenarios

Below is an example of how the research is presented. **Each scenario is equally likely** and production cost scenarios are independent from retail price scenarios (i.e., it is possible that in a given round the realized production cost is the one shown in scenario 1, and the realized retail price is the one shown in scenario B).

Market Research on Production Cost		
Scenario 1	Scenario 2	Scenario 3
10 points	15 points	20 points

Market Research on Retail Price		
Scenario A	Scenario B	Scenario C
15 Points	20 Points	20 Points

Final Outcomes

If the Retailer rejects the Suppliers offer, both players earn 0 experimental points

If the Retailer accepts the Suppliers offer, the supplier makes the product and sells it to the Retailer at the agreed price. In turn, the Retailer sells the product to the customer market at the retailer sales price. Thus, profits are computed as follows:

For Supplier: $P_S - C$

For Retailer: $P - P_S$

After all players are done with their decisions for the first round, the game will move on to the next round for you to repeat the task. At the end of the third round, a feedback screen that summarizes the game results for all rounds will be shown to all players. The computer will display, for each round, the offer made by the Seller, the choice of the Responder, and the final and outcome for both players.