

Mere Choice effect: Improving supply chain performance using contract choice

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ABSTRACT

Coordinating supply chain contracts (like Revenue Sharing, Buyback, Two-part tariff, Quantity Discount etc) in bilateral monopolies are theoretically expected to incite the buyer into ordering the integrated supply chain profit maximizing quantity. These contracts circumvent the problem of double marginalization attributed to the wholesale price contract. Recent experimental results, however, suggest that not all contracts are as successful in coordinating a supply chain as theoretically expected and fall short of optimality. While these results examine the performance of each of these contracts in isolation, in this paper, we focus on situations where choice across contracts is possible. We present buyers with a menu of contracts each having the same expected profits. We experimentally establish that the act of providing contract choice to buyers considerably improves supply chain performance in high margin situations. This improvement is attributed to usage of 'Affect' heuristic by the decision makers in making their ordering decisions. We empirically show that the relative risk and return judgments determine the ordering quantities when contract choice is provided. This result has major supply chain strategy implications in that it advocates providing higher flexibility to buyers to improve supply chain performance.

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EXTENDED ABSTRACT

Introduction

The common finding across all previous literature that examined experimental supply chain contracts (Katok & Wu, 2009), (Ho & Zhang, 2008), (Niederhoff & Kouvelis, 2011), (Becker-Peth, Katok, & Thoneman, 2009) is that they exhibit lower channel efficiency than theoretically expected due to various behavioral anomalies of the subjects. The need for strategies to improve experimental contract performance to mitigate the impact of these behavioral anomalies was thus established. (Becker-Peth, Katok, & Thoneman, 2009) accomplish this improvement by customizing contract parameters to individual buyers' behavioral attributes while (Elahi, Lamba, & Ramaswamy, 2013) find that offering free items to the buyer would improve supply chain performance.

In this paper, we present an alternative approach to improve contract performance by moving the buyer orders closer to supply chain optimal. The advantage of our approach is that it is easy to implement in practice without prior knowledge of retailer behavior. The major shortcoming of our approach though is that it is useful only for high margin products (where the manufacturing cost is less than half of the market price of the product) and not for low margin products.

Theory and hypothesis

When faced with choice amongst various alternatives, subjective evaluation of the payoffs (benefit/return perception) and probabilities (risk perception) associated with each alternative determines the choice of the decision maker. Behavioral literature has shown that under certain conditions, these risk and return perceptions stem from 'Affect' the alternatives have on the decision maker (Finucane, Alhakami, Slovic, & Johnson, 2000). These conditions include time availability, availability of cognitive resources (Shiv & Fedorikhin, 1999) and presence of subliminal stimuli (Winkielman, Zajonc, & Schwarz, 1997).

In the current context, since the contracts presented are computationally complex and the subjects lack the cognitive resources to analytically evaluate exact expected profit (return) or variance of profit (risk) of each contract, we postulate the usage of affect in the contract choice decision. We propose that subjects would resort to using the mere presence select attributes to judge the relative risk and return of the contracts presented. For instance, a subject might just judge the buyback contract to be low risk, high return due to her positive predisposition to the contract attributable merely to the on the buyback feature. Another subject may be positively predisposed to the revenue sharing contract due to its low initial wholesale price and perceive low risk and high return. Since higher risk perception is associated to a lower affect, it should

make a contract unattractive. Analogously, a higher return perception is associated to a higher affect hence making the contract attractive. Since risk and return judgments would be inversely related as per the theory on affect heuristic (Finucane, Alhakami, Slovic, & Johnson, 2000), the contract choice decision would be based on internally consistent risk and return perceptions of contracts as has been shown in Figure 1.

Hypothesis 1: For a given level of return perception of a contract, likelihood of choosing a contract decreases with higher risk perception of the contract.

Hypothesis 2: For a given level of risk perception of a contract, likelihood of choosing a contract increases with higher return perception of the contract.

Coming to the ordering quantity decision, we propose that it would be aligned to the 'affect' of each of the contracts. This happens over and above other behavioral anomalies that are known to impact ordering behavior leading an increased ordering quantity in contracts that have a positive predisposition and lower ordering quantities in contracts with negative predisposition.

Hypothesis 3: Individuals order higher in contracts they decide to choose than in contracts they decide not to choose.

The ordering quantity decision could also be explained based on the risk and return perceptions of a contract. Having made a choice of contract that the subject perceives to be less risky, the subject would be willing to take a higher risk when it comes to the ordering quantity decision. Similarly, having made a choice of contract that the subject perceives to be giving a high return, the subject would be willing to take a higher risk when it comes to the ordering quantity decision. As mentioned earlier, both these hypotheses would be internally consistent since risk and return perceptions are inversely related as per the theory on affect heuristic.

Hypothesis 4: Individuals order higher in contracts in which they perceive lesser risk.

Hypothesis 5: Individuals order higher in contracts in which they perceive higher return.

'Affect' is heterogeneous in nature with different subjects being attracted to different contracts for different reasons due to different perceptions of contracts usefulness/profitability/fairness etc. Thus, the act of providing choice amongst contracts enables individuals to choose contracts they are most attracted to which in turn results in ordering quantities higher than the behavioral ordering level when contract choice is provided. This is what we call the mere-choice effect.

Hypothesis 6: Providing contract choice to buyers leads to higher ordering quantities.

In what follows, we present two experimental studies in which we experimentally test out the aforementioned hypotheses.

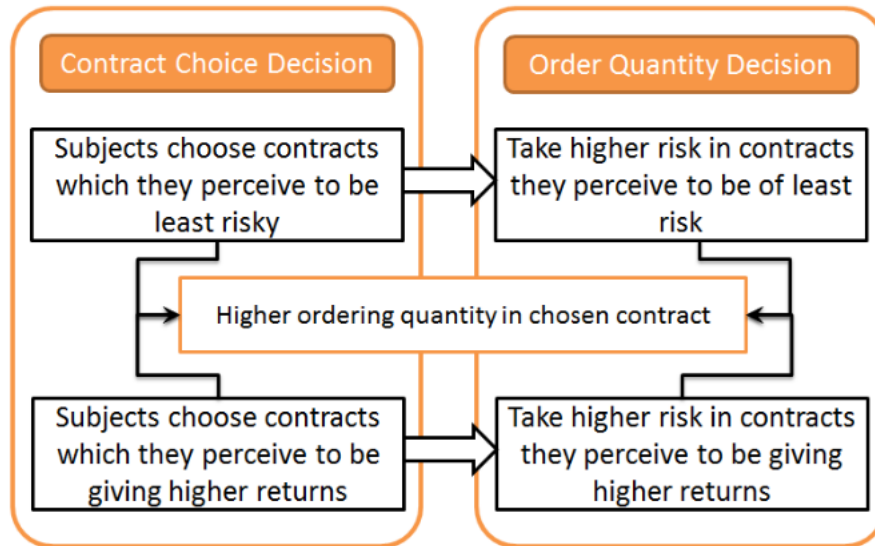


Figure 1 : Theoretical Frame

Study 1: Risk and Return Perceptions

In our first study, 88 experienced managers from various industries who were a part of an Executive General Management Program at the Indian Institute of Management Bangalore were used. The subjects were presented a situation where contract choice and order quantity decision needed to be made in a situation with demand following uniform distribution. They were provided with a menu consisting of Buyback(BB), Revenue Sharing(RS), Two part tariff (TP) and Quantity discount(QD) contracts. The contract parameters were set such that optimal ordering quantity in each of the cases was 75. . The demand information exposition in the experiment was the same as the one used in the experiment conducted by (Bolton, Ockenfels, & Thonemann., 2012).

Data elicited included subjects' risk perception scores(1-7) and return perception scores (1-7) for each of the contracts. Further, the subjects were asked to rate the likelihood that they would choose a particular contract on a scale of (1-7). The associated ordering quantities for each of the contracts were also elicited independently and the incentive structure similar to (Rudi & Drake, 2010)².

As a part of the data analysis, firstly, we regress choice likelihood scores and ordering quantities on subjects' risk and return perceptions and find statistical validation for hypotheses 1, 2, 4 and 5. Further, a comparison of order quantities corresponding to contracts that were

² Subjects were assigned contracts based on their choice likelihood scores of the contract (Ties broken arbitrarily). They were offered lottery tickets proportional to expected earning of the ordering quantity used in that contract.

chosen by each subject against those that weren't chosen by the subject has been presented in Table 1. As can be seen, the ordering quantities in chosen contracts are consistently higher than the ordering quantities in contracts not chosen. Statistical comparison of these ordering quantities showed conformance with Hypothesis 5 in 9 out of 12 comparisons and marginal non-conformance in the remaining three comparisons.

Table 1 : Ordering Quantity comparison of contracts chosen and not chosen: Average ordering quantities

| Chosen Contracts | Average order quantity | | | |
|------------------|------------------------|--------------|--------------|--------------|
| | BB | RS | TP | QD |
| BB | 78.93 | 63.65 | 57.29 | 59.93 |
| RS | 74.28 | 72.88 | 58.16 | 59.56 |
| TP | 63.64 | 53.36 | 64.45 | 52.00 |
| QD | 60.45 | 56.82 | 72.27 | 76.91 |

Study 2: Mere-choice effect

In our next study, we seek support for our hypothesis on the mere-choice effect. While in the previous section we have shown the impact of risk and return perceptions on contract choice and ordering quantity decisions, in this section we rigorously compare situations with and without contract choice to effectively demonstrate the impact of providing contract choice.

This experimental setup consists of 10 treatments, 6 of which are all possible exclusive pairs of contracts from the four we have considered and the remaining 4 treatments with individual contracts. The subjects(chosen from Amazon Mechanical Turk(AMT)³) are asked to respond with their ordering quantities of the contract(s) presented to them and in case of choice treatments asked to choose amongst the contracts presented. In the choice treatments, contracts were only presented as Option 1 and Option 2 rather than naming them in order to prevent any nomenclature or labeling related biases. Proportional incentives were provided in the form of bonuses to AMT workers.

A total of 655 responses were received for this task out of which a total of 385 responses were accepted based on the answers to the attention verification questions. Subjects were randomly assigned to each of the 10 treatments. The exercise went on until there were at least 30 participants per treatment. A comparison of ordering quantities in with choice and without choice treatments clearly supports our Hypothesis 5. Table 2 summarizes the averages of the order quantities in choice and non-choice treatments. The second column presents the average of the non-choice treatment while the next four columns show the average final ordering quantities of when the contract is coupled with each of the other contracts. The final column shows that average final ordering quantity amongst all the choice treatments for that particular

³ AMT has been observed to reliably replicate the effects obtained in laboratory experiments((Paolacci, Chandler, & Ipeirotis, 2010), (Buhrmester, Kwang, & Gosling, 2011) and has more recently been used to replicate a newsvendor scenario in (De Vericourt, Jain, Bearden, & Filipowicz, 2012)

contract⁴. The table also presents within parenthesis the wilcoxon rank sum test p-values testing the hypothesis that the order quantities in with choice treatments are greater than the non-choice treatments.

Table 2 : Average final order with and without choice(p-values of tests of hypothesis that with choice Ordering Quantity is higher than without choice ordering quantity)

| Contract | Without choice | Coupled with BB | Coupled with RS | Coupled with TP | Coupled with QD | Avg with choice |
|----------|----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| BB | 58.5 | | 70.13(0.004) | 68.93(0.009) | 67.7(0.004) | 68.92(0.0005) |
| RS | 55.35 | 70.13(0.002) | | 65.81(0.024) | 62.41(0.082) | 66.11(0.0058) |
| TP | 60.09 | 68.93(0.025) | 65.81(0.125) | | 62.76(0.180) | 65.42(0.0341) |
| QD | 52.73 | 67.7(0.004) | 62.41(0.059) | 62.76(0.055) | | 64.70(0.0092) |

Further, we repeat the experiment under low margin situations. In low margin conditions, we observe that subjects still order higher when choice is provided, however due to the positioning of the optimal ordering quantity, the supply chain performance deteriorates.

Conclusions

We observe through a series of studies that individuals order higher than the usual ordering levels in contracts they are more attracted to in contexts where choice amongst contracts is provided. This attraction is driven by the 'affect' the attributes of the contracts have on the decision maker in absence of cognitive resources to analytically analyze each of the contracts. Attractiveness towards contracts is heterogeneous in nature with different subjects being attracted to different contracts. Therefore, the act of providing choice amongst contracts enables individuals to choose contracts they are most attracted. This in turn results in ordering quantities higher than the usual ordering levels(when choice is not provided). Therefore, providing contract choice results in an improved supply chain performance under high margin conditions where the usual ordering levels are lower than the first best ordering level.

One major implication of our result is that the usage of a single supply chain contract, as is generally prevalent in practice, might not be an effective strategy. Companies should instead provide contracting alternatives to the buyers and the choice of which contract to use should be left to them. This would enable individuals to choose contracts that they perceive to be most attractive, hence enhancing supply chain performance by ordering higher. In a nutshell, buyer flexibility is the key to supply chain success.

⁴ It is to be noted that the final choice of contract may or may not be the same as the contract at the beginning of the row which is the reason why the table is symmetric about the diagonal.

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