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Passover in Costa Rica

During the week of the Passover holiday, Jews all over the world eat a special type of bread called matzah.[1] The small Jewish community in San Jose, Costa Rica, consists of approximately 1,000 families. There is only one Jewish restaurant in San Jose that is supplying matzah bread to the entire Jewish community during the week of Passover at a price of $20 per box of matzah bread. To meet its demand during the week of Passover, the restaurant orders the matzah bread from a Mexican supplier about two months before the holiday. The Mexican supplier charges a wholesale price of $11 for one box of matzah bread. The cost to manufacture each box is $4, and the restaurant incurs an additional transportation cost of $1 for each box it orders. The owner of the restaurant estimates that the level of demand for matzah bread during the week of Passover will be between 4,000 and 8,000 with probabilities shown in **Table 1**.

Table 1. Demand probability.

Demand, *d*	4,000	5,000	6,000	7,000	8,000
Probability	15%	25%	20%	15%	25%
***F*(*d*)**	15%	40%	60%	75%	100%

The demand for matzah bread at the end of the week is close to zero, and thus it has no salvage value for the San Jose restaurant.

Assignment Questions

1. How many boxes of matzah bread should the restaurant order from its Mexican supplier? What would the restaurant's profit from that order be?
2. What is the Mexican supplier's profit from the Costa Rican market? What are the total supply chain profits?
3. Suppose that the restaurant owner and the Mexican supplier were working together to maximize the entire chain's profits, what would be the optimal ordering quantity of boxes of matzah for the entire supply chain? What would be the total supply chain profits? What is the supply chain loss (the loss in profit because the supply chain is not coordinated)?
4. After seeing the results in assignment question 3, the restaurant owner and the supplier would like to create a contractual agreement that will align the incentives in the supply chain with respect to the ordering quantity. The restaurant owner suggests to the supplier that they implement a return policy

[1] The Jewish holiday of Passover is one of the most important Jewish holidays celebrating the exodus of the Jewish people from Egypt.

(buyback contract) in order to reach the supply chain optimum. Instead, the supplier offers to use a revenue- or profit-sharing contract to align the supply chain incentives. Which of the contracts would be better in this case? Why? Assuming they use a revenue- or profit-sharing contract, what should be the minimal fraction of revenue/profit the restaurant shares with the supplier for the supplier to prefer this contract to the buyback contract? What would be the buyback price if they use the buyback contract?

5. What are the advantages and disadvantages of the buy-back, revenue- and profit-sharing contracts? Which products and environments would fit best for each one of the contracts?