TÉCNICO LISBOA

Exercise 3

Risk Pooling Game

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One of the most important concepts in SC:

Risk Pooling

Risk Pooling: Involves the use of centralized inventory to take advantage of the fact that if demand is higher than average at some retailers, it is likely to be lower than average at others.

Objectives

- **Risk Pooling Game shows:**

1) Risk pooling concept
2) Advantages of centralized inventory management
3) Risk pooling under different demand conditions

- **Risk Pooling Game simulates:**

A centralized inventory system, where a single warehouse serves three different retailers

vs.

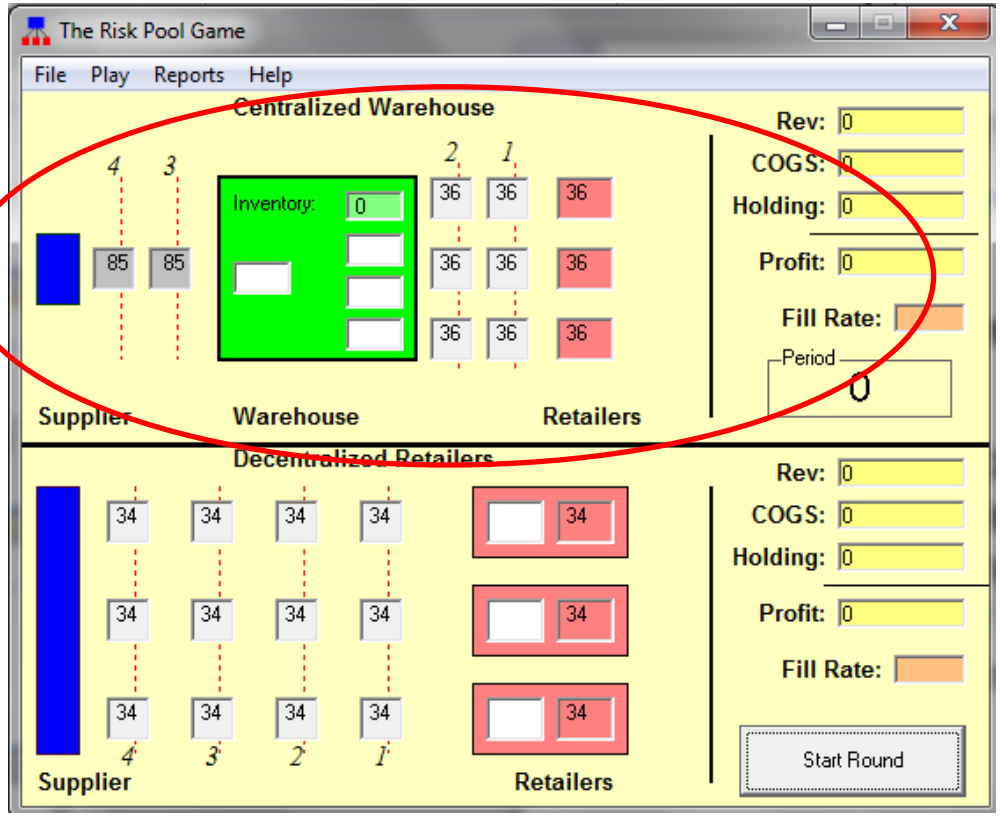
A decentralized system where three retailers maintain separate inventory and are served by a supplier separately.

Play the Game

- **Run setup file and install the game!**

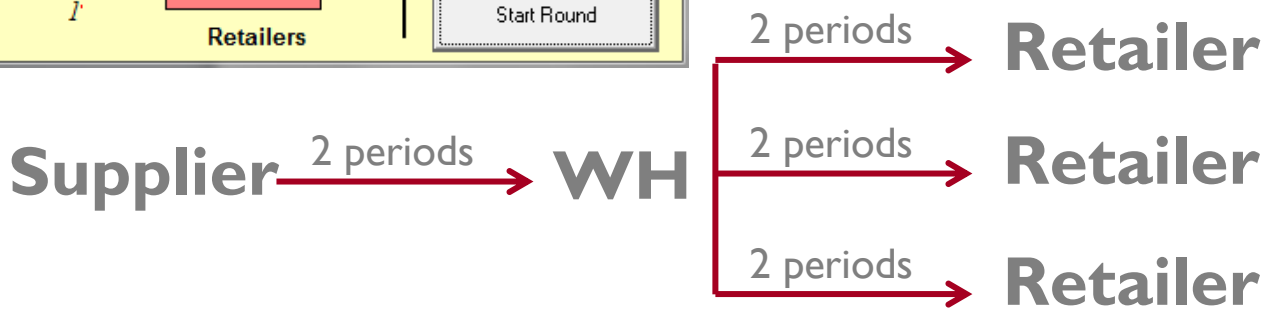
- **Note** that before playing each round of the game, you will need to initialize the game. We found that resetting will not initialize the game and you will need to exit the game each time before commencing a new round.

Play the Game

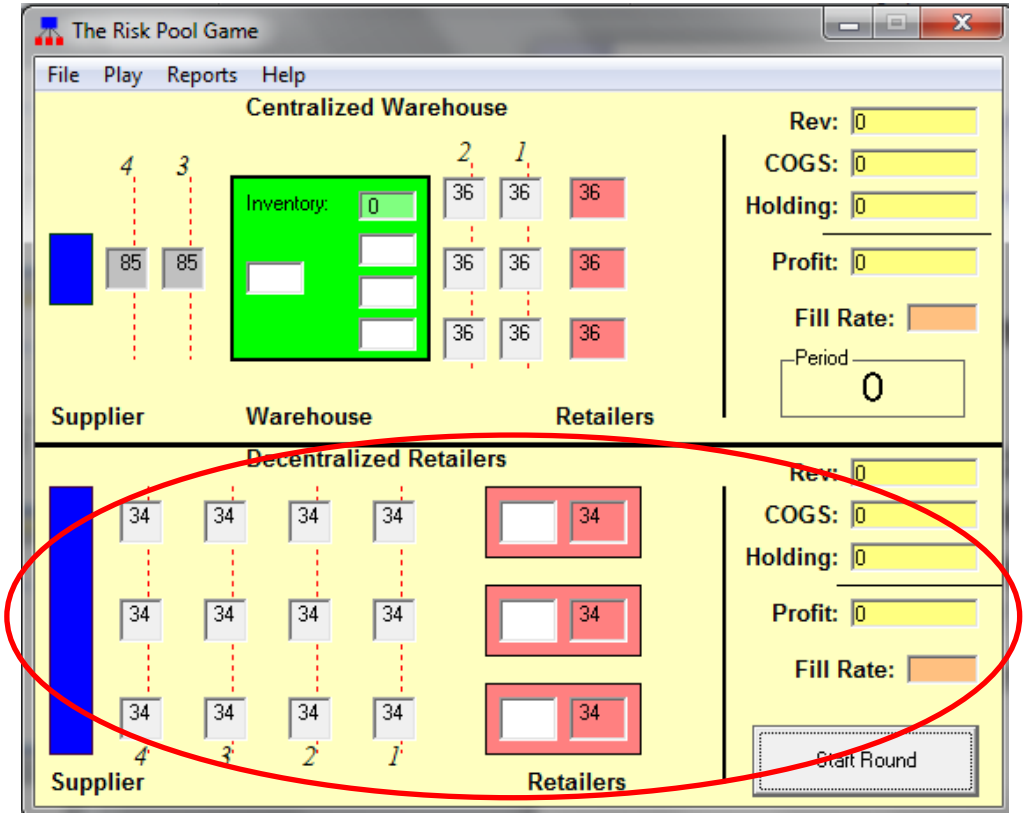


Centralized SC

The material can be stored or shipped directly



Play the Game



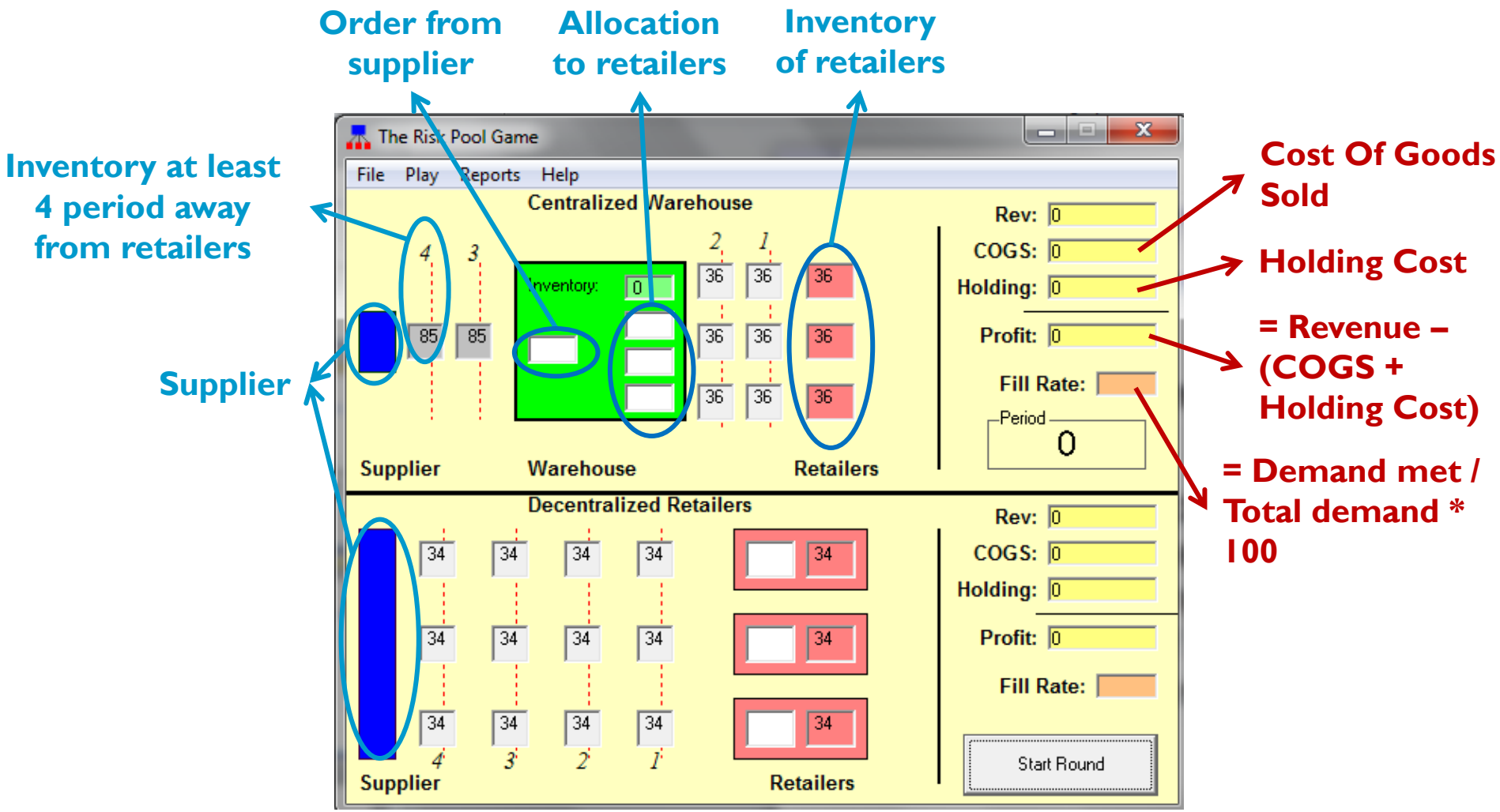
Decentralized SC

Supplier → 4 periods → Retailer

Supplier → 4 periods → Retailer

Supplier → 4 periods → Retailer

Play the Game



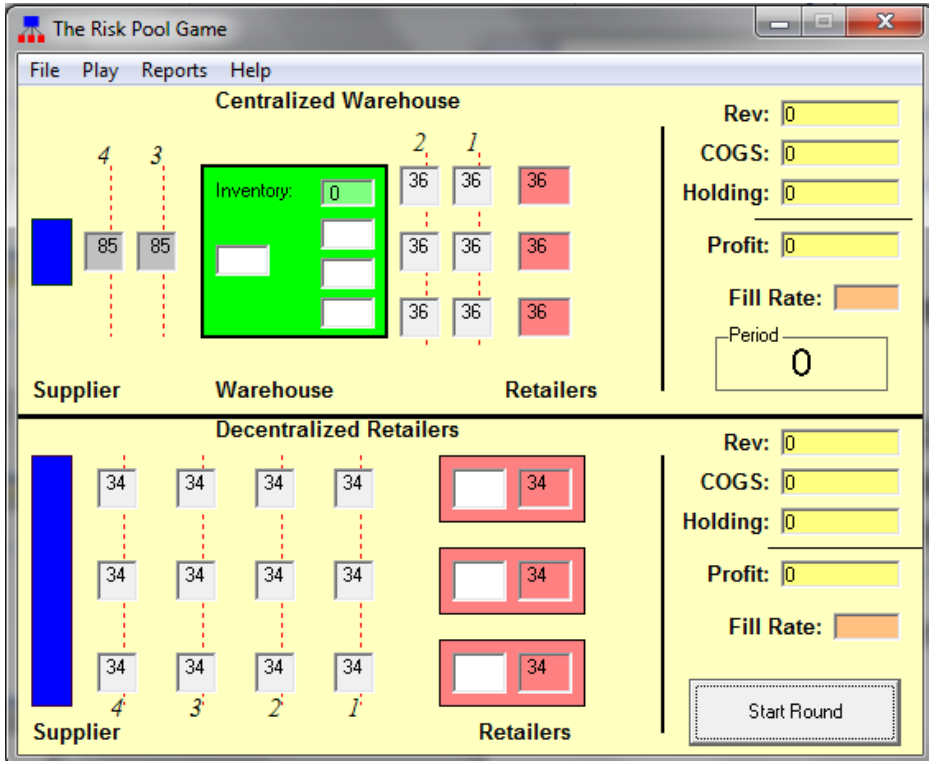
Play the Game – b)

b) Run the game for 30 weeks knowing that the average demand is 25 units and the standard deviation is equal to 10 units. Record the profit values for the centralized and the decentralized supply chains for every week. Plot the profit VS the number of weeks for centralized and decentralized supply chain (use the same plot for both supply chains). What can be concluded from the analysis of this plot?

Play the Game – b)

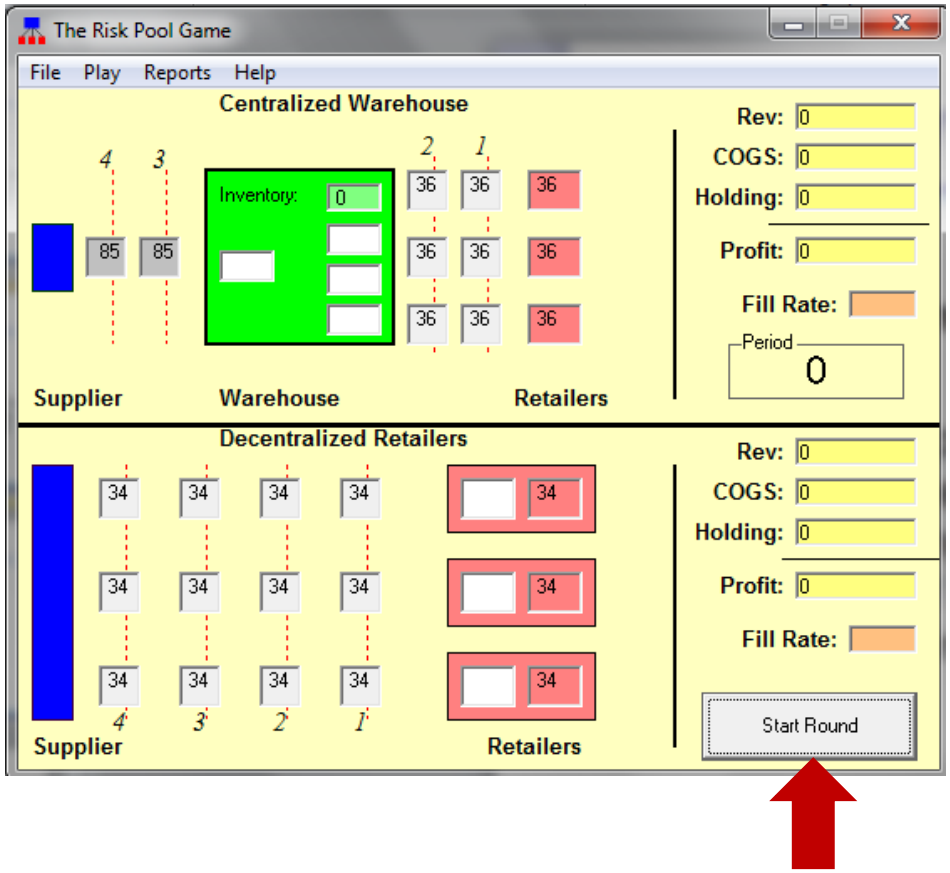
- **Price** = 20€
- **Costs:**
  - Holding Cost = 1,5€
  - Material Cost = 10€
- **Average demand** = 25 units
- **Standard deviation** = 10 units

Demand is not back ordered!
Demand that
cannot be met is lost!!



Goal in both SCs:
Maximize profit

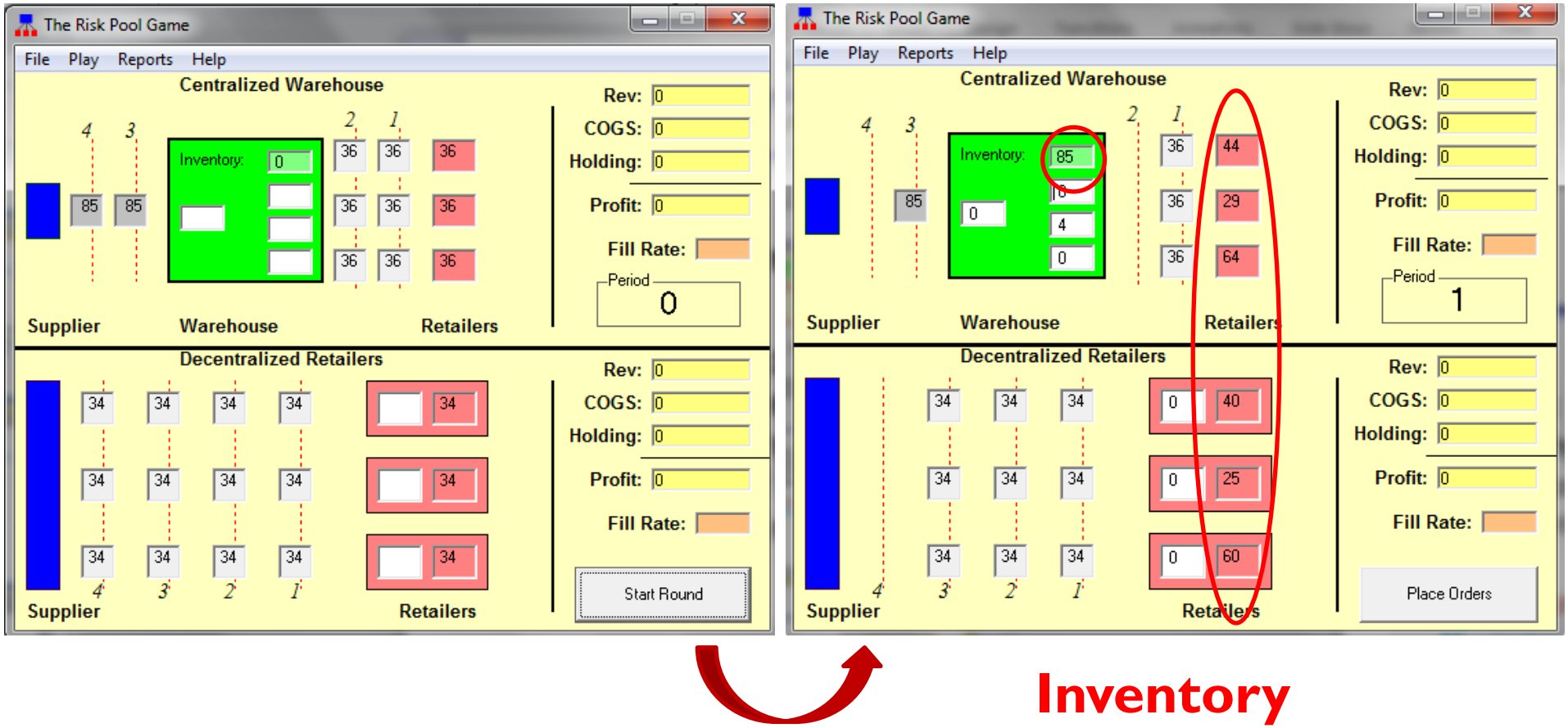
Play the Game – b)



Step 1:
Press the Start Round button

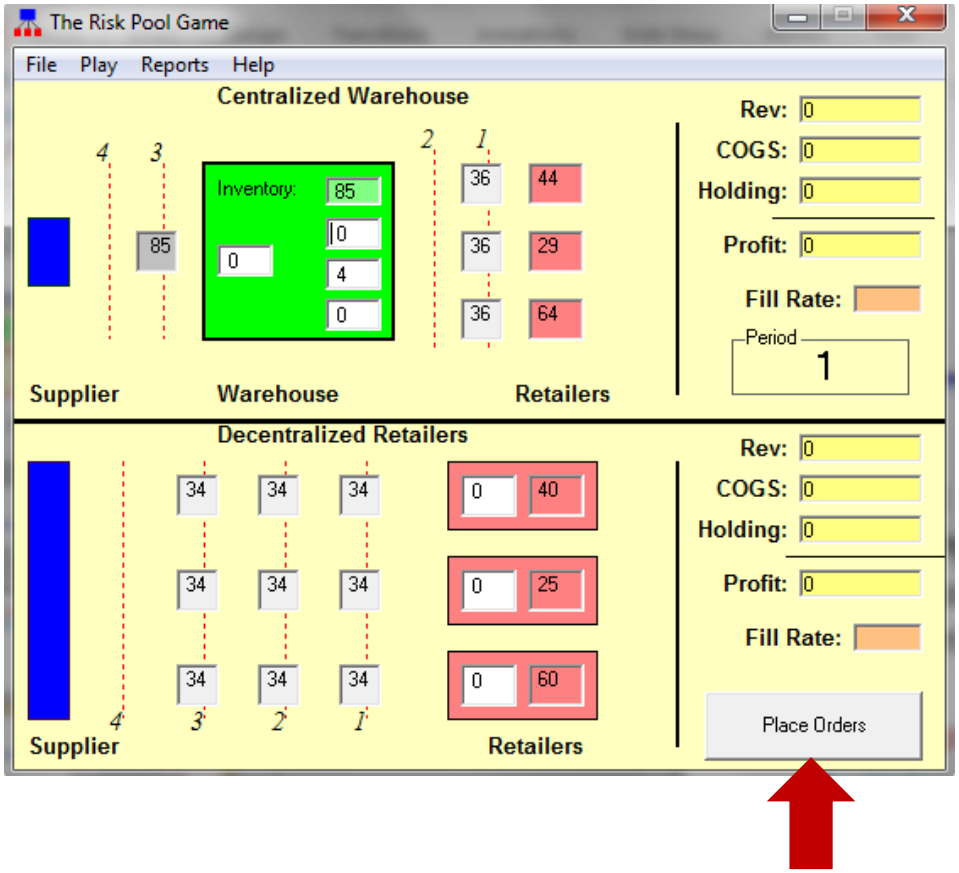
The inventory is advanced

Play the Game – b)

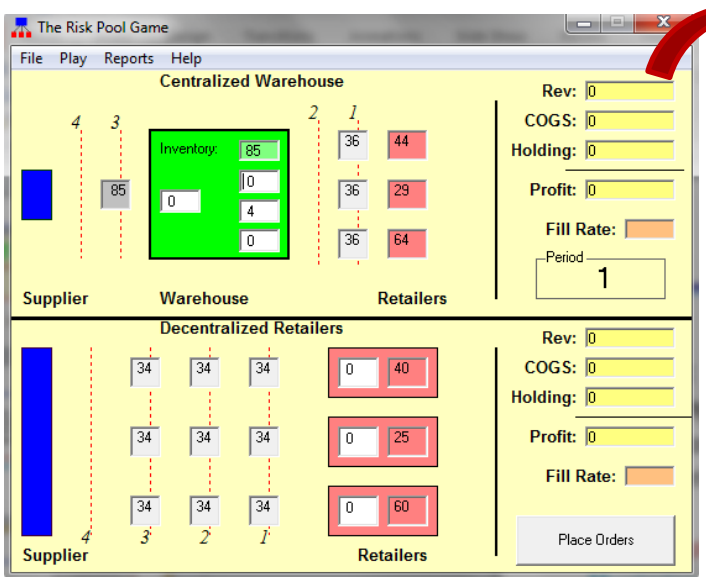


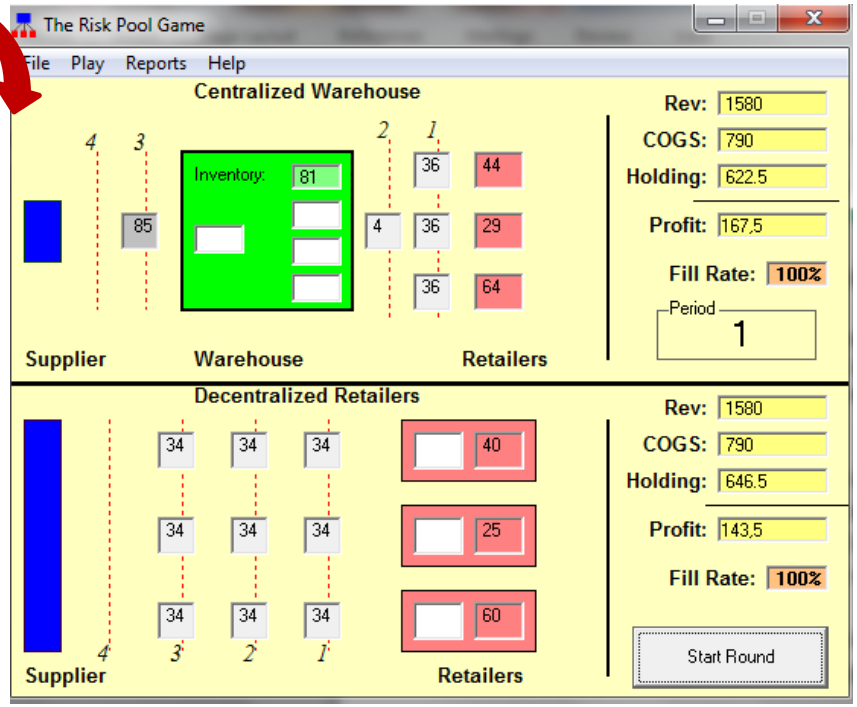
Play the Game – b)

Step 2:
Place Orders



Play the Game – b)





Demand Calculation:

Example for the 1st retailer:

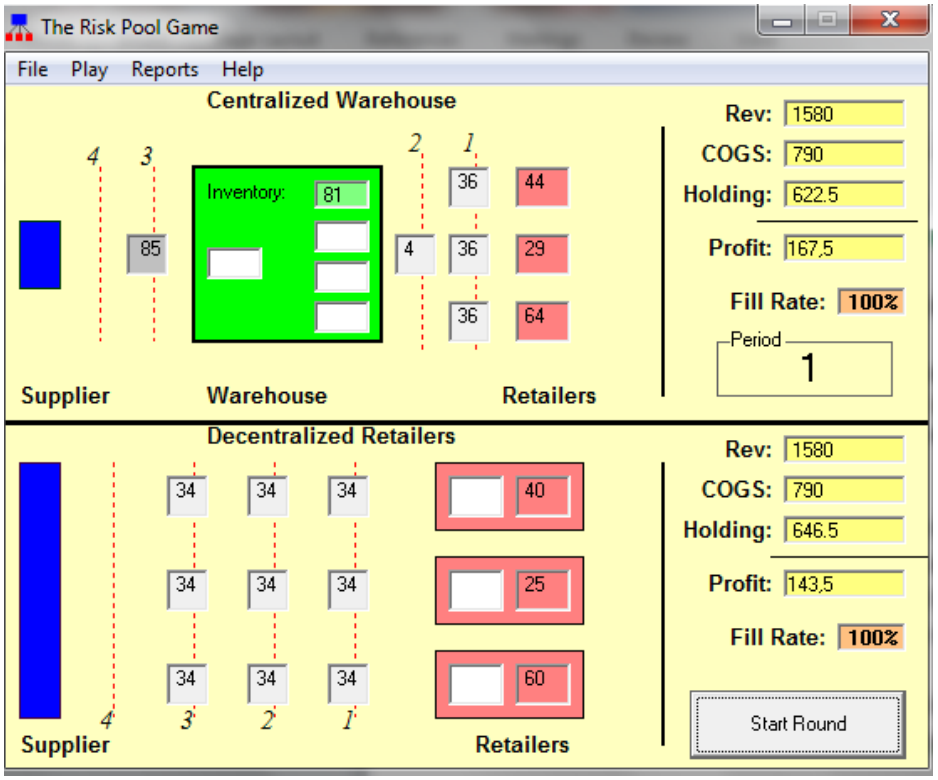
Centr SC: 36 (initial inventory at ret) + 36 (inventory arrived at ret from 1) – Demand = 44 (final inventory at ret)

------ Demand = 28

Decentr SC: 34 (initial inventory at ret) + 34 (inventory arrived at ret from 1) – Demand = 40 (final inventory at ret)

------ Demand = 28

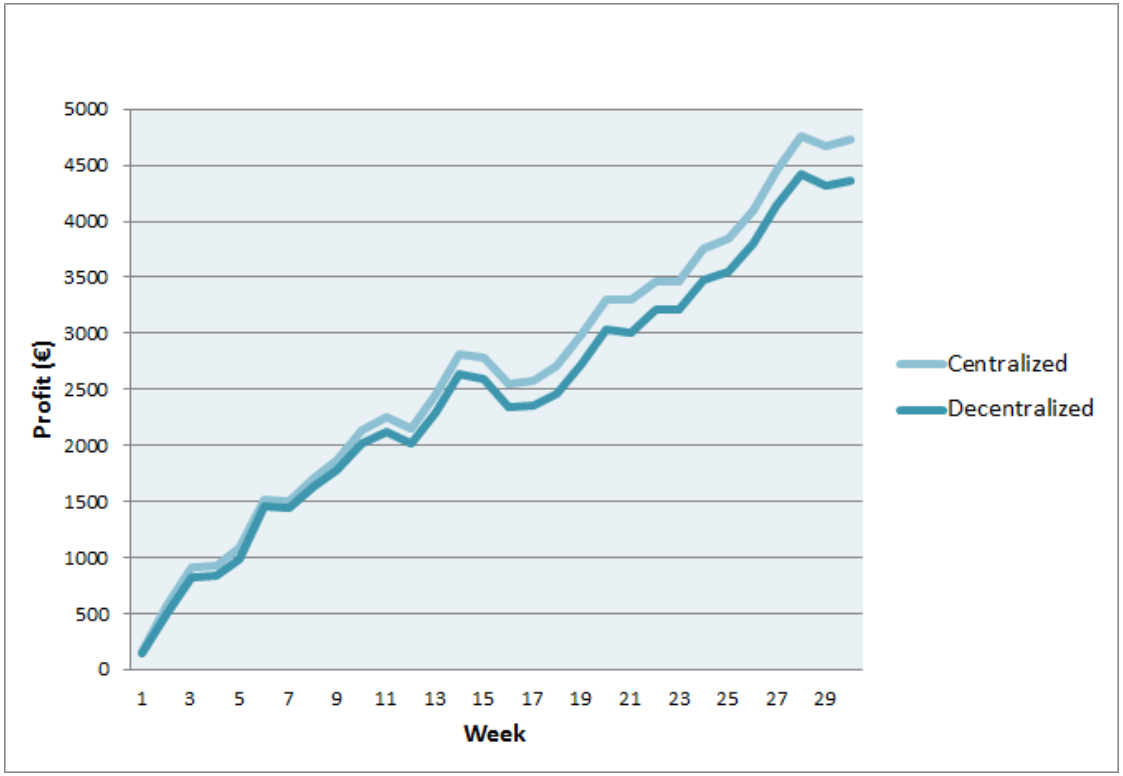
Play the Game – b)



Step 3:
Repeat until completing the 6 weeks required

Play the Game – Discussion b)

Profit variation during the 30 Weeks



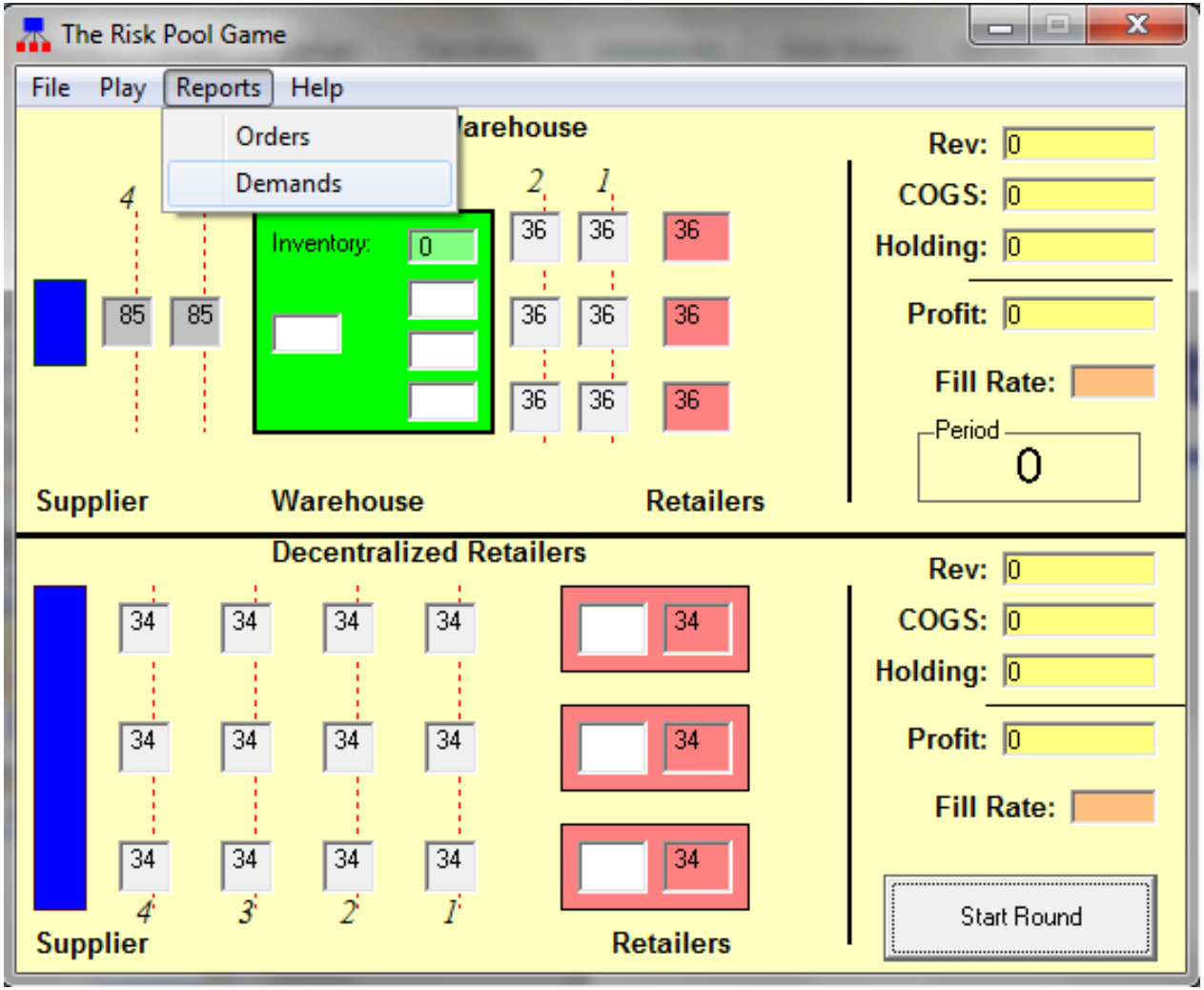
- Higher profit in the **centralized** SC
- As the time passes the gap between the profits is higher

Play the Game – c)

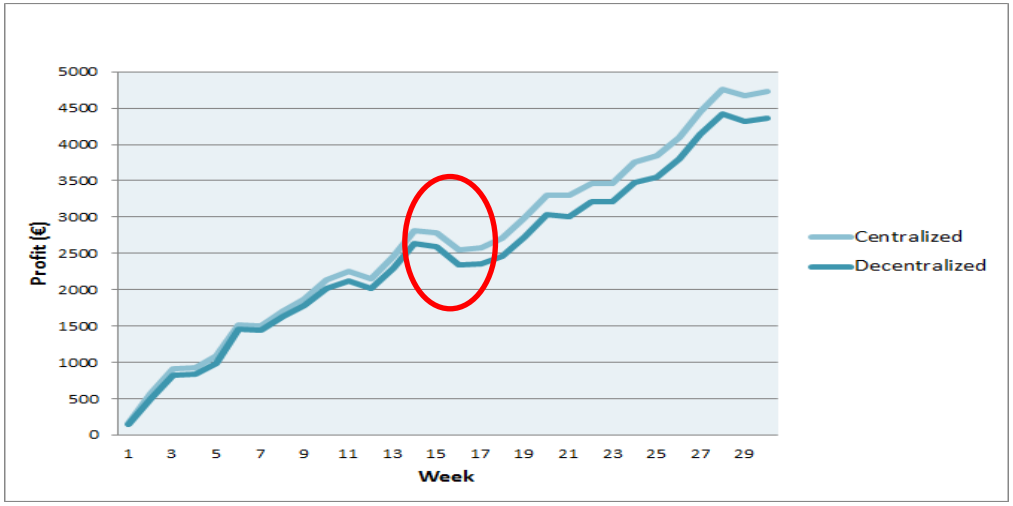
c. How can you explain the decrease of profit in some weeks? (Plot demand profile VS the number of weeks for 16 weeks. On the menu bar go to *Reports* -> *Demands* and take the demand profile for the three retailers).

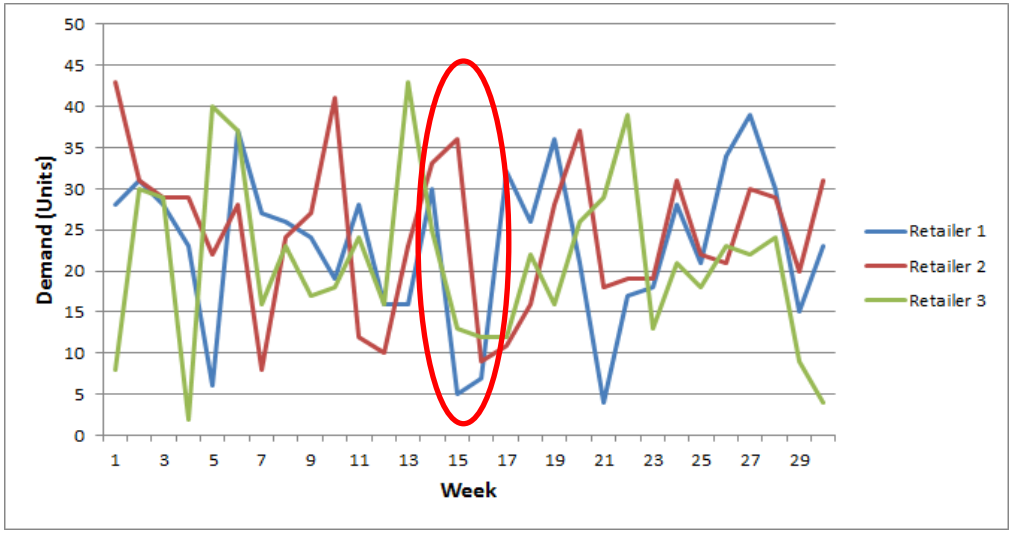
Play the Game – c)

To see the demand profile



Play the Game – c)



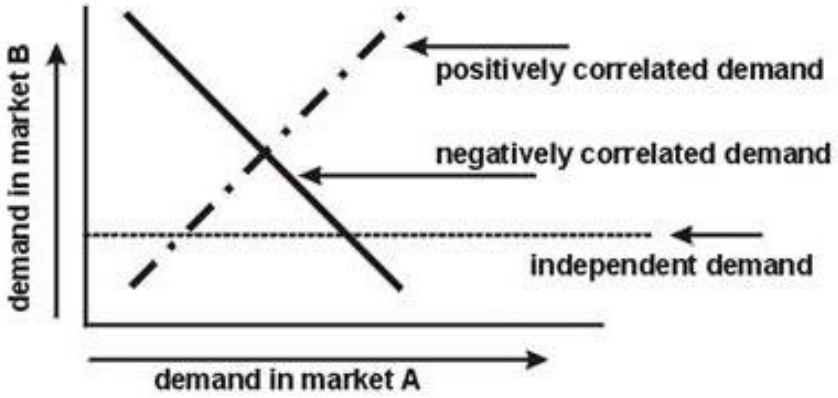


- Demand decreases
- Excess of inventory
- Profit decreases

Play the Game – d)

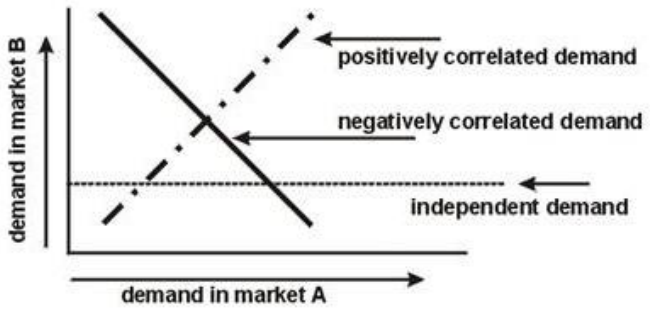
d. Evaluate how profit of the firms varies under different demand conditions in different markets.

Profit data should be recorded for 30 weeks. Compare the results.



Run no.	Demand Correlation	Mean demand	Standard Deviation of demand
1	Strongly Positive	25	10
2	Strongly Positive	25	15
3	Strongly Positive	25	5
4	Independent	25	10
5	Independent	25	15
6	Independent	25	5
7	Strongly Negative	25	10
8	Strongly Negative	25	15
9	Strongly Negative	25	5

Play the Game – c)



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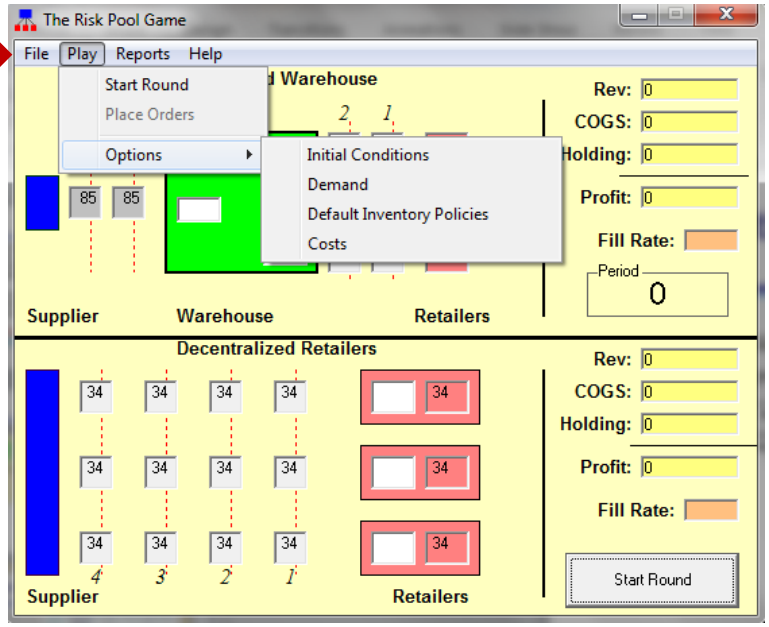
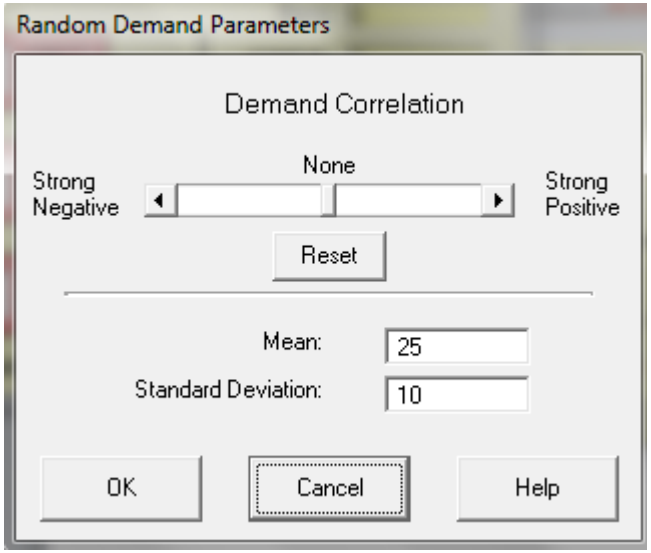
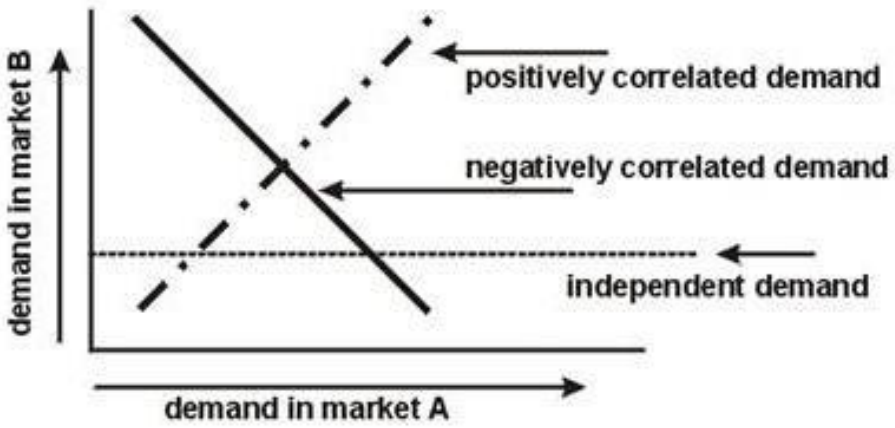




Play the Game – c)



Positively correlated demand

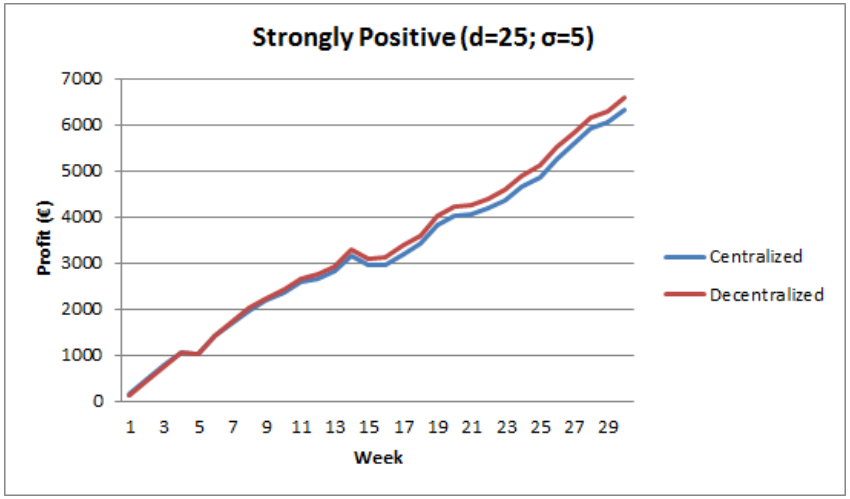
If one retailer has demand greater than average, demand from another retailer is likely to be greater than average

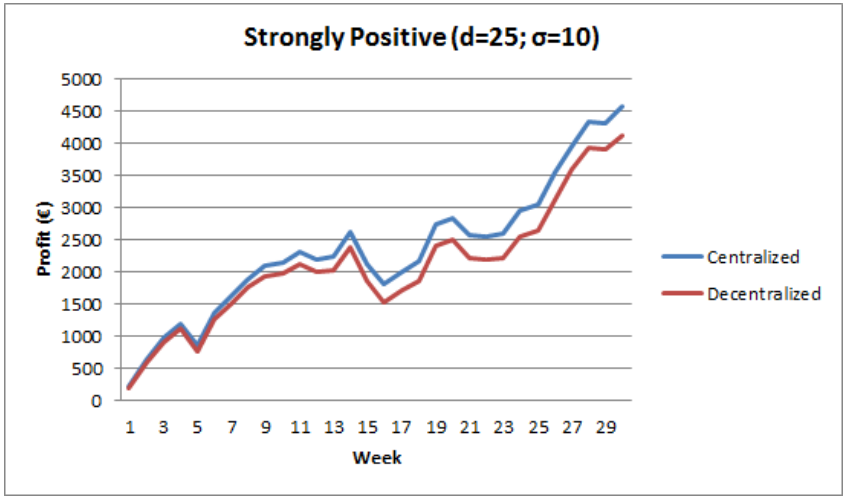
Negatively correlated demand

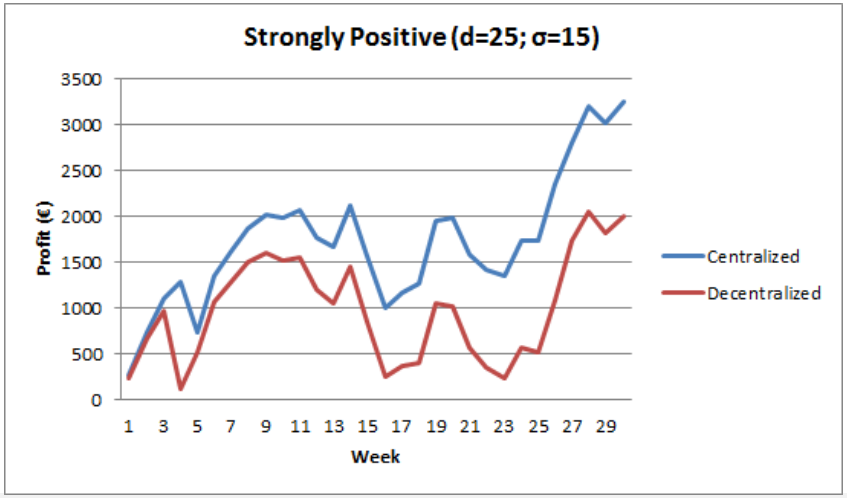
If one retailer has demand higher than average, demand from another retailer is likely to be lower than average

Play the Game – Discussion c)

Strongly positively correlated demand: Increase variability

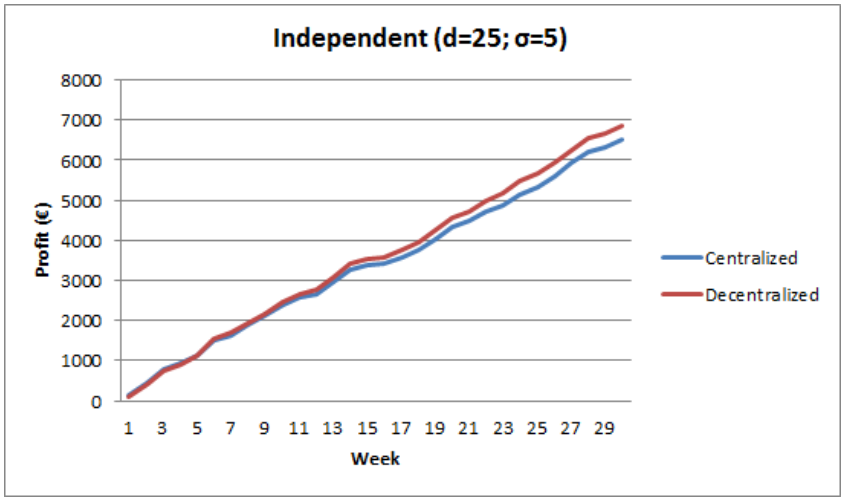


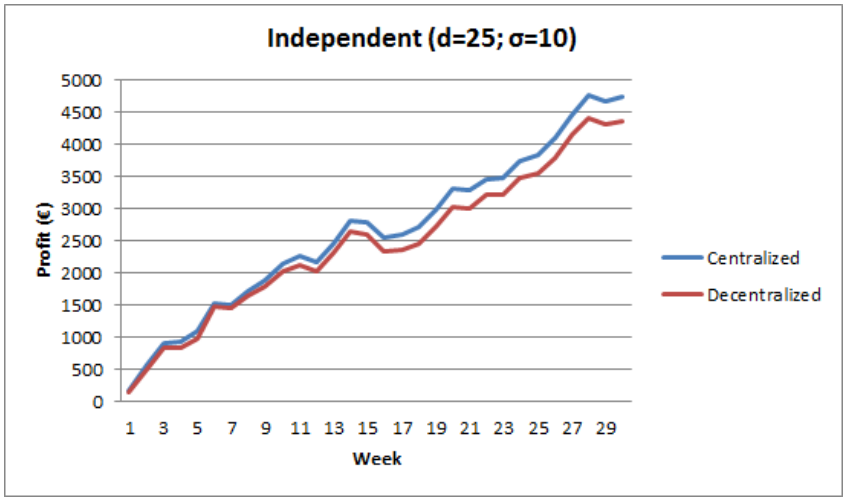


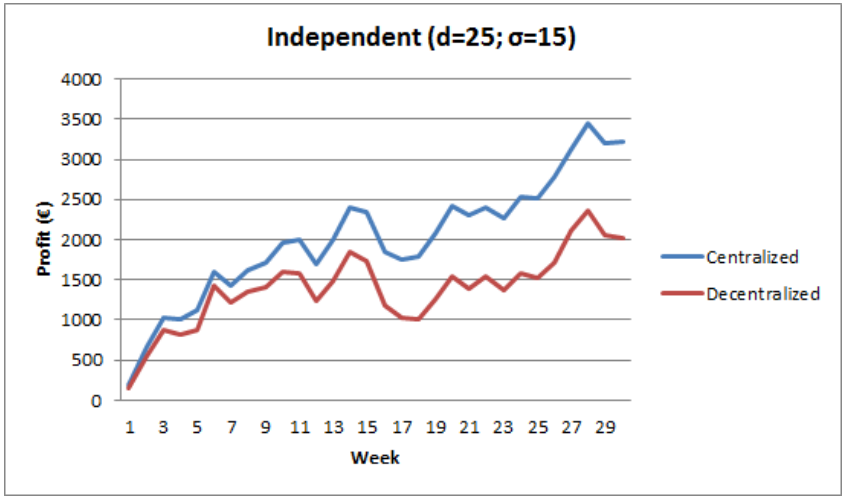


Play the Game – Discussion c)

Independent demand: Increase variability

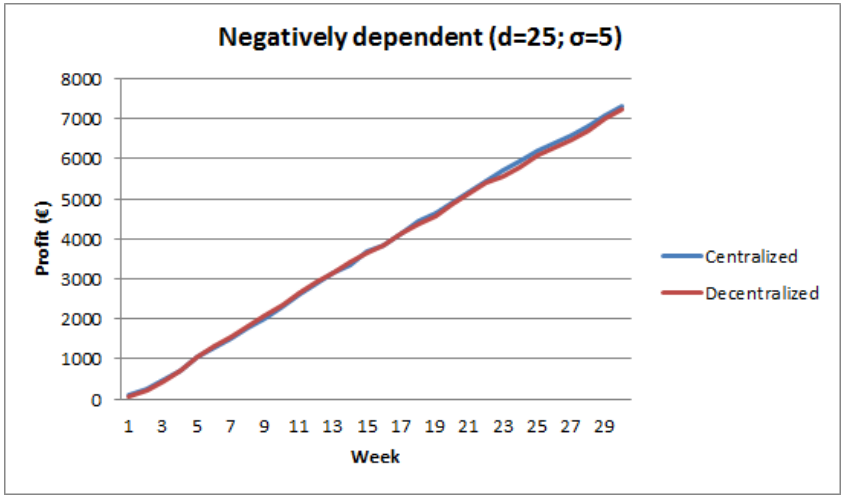


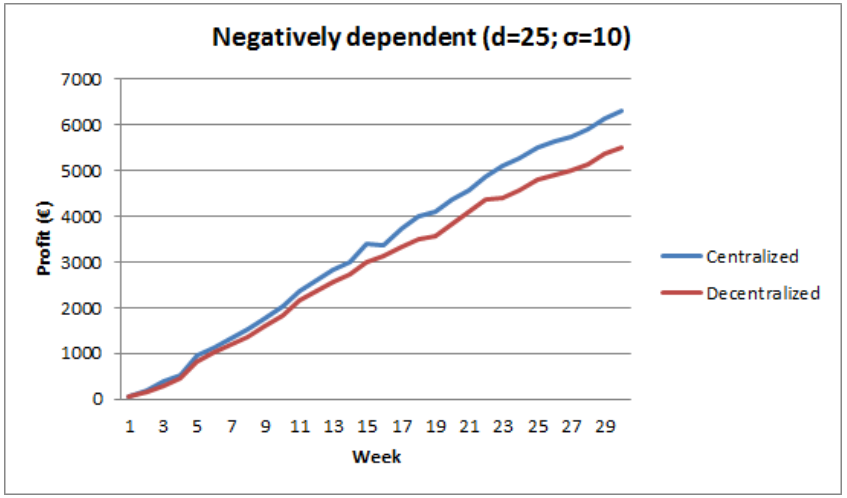


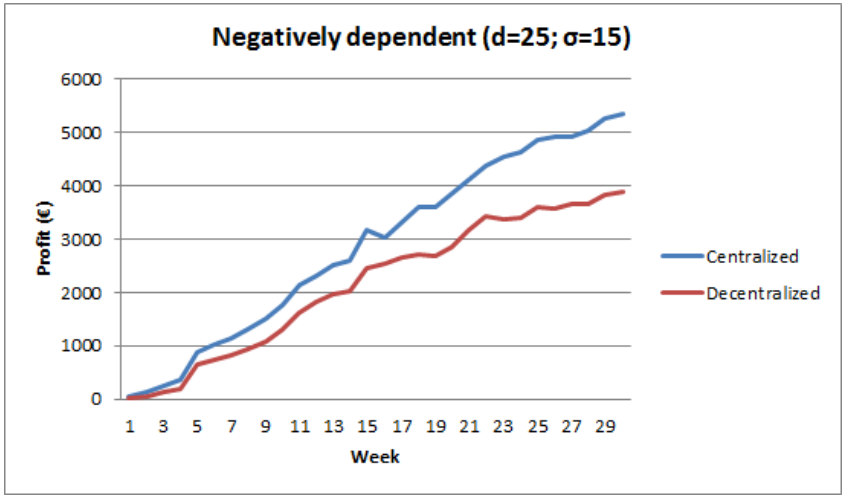


Play the Game – Discussion c)

Strongly negatively correlated demand: Increase variability

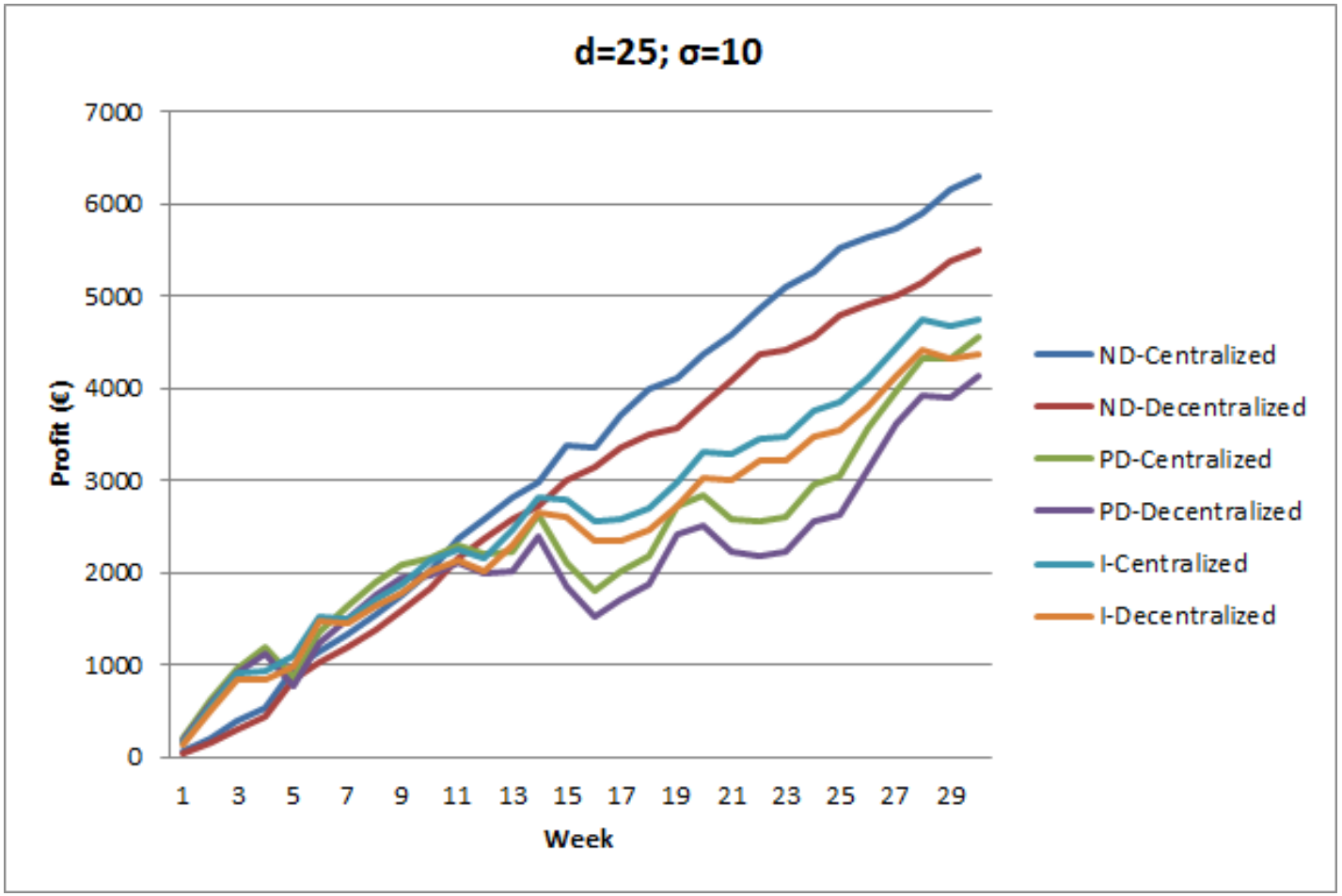






Play the Game – Discussion c)

Same demand variability: Different types of market correlation



Conclusions

- The Risk Pooling Game shows the effectiveness of centralization of inventory under certain conditions.
- Risk pooling is most effective when demands across markets are strongly negatively dependent. Risk pooling is less effective when the markets are strongly positively dependent.
- When the demand variability is high, risk pooling effect is higher and consequently it is better to adopt a centralized SC (gap between centralized SC and decentralized SC is higher).