

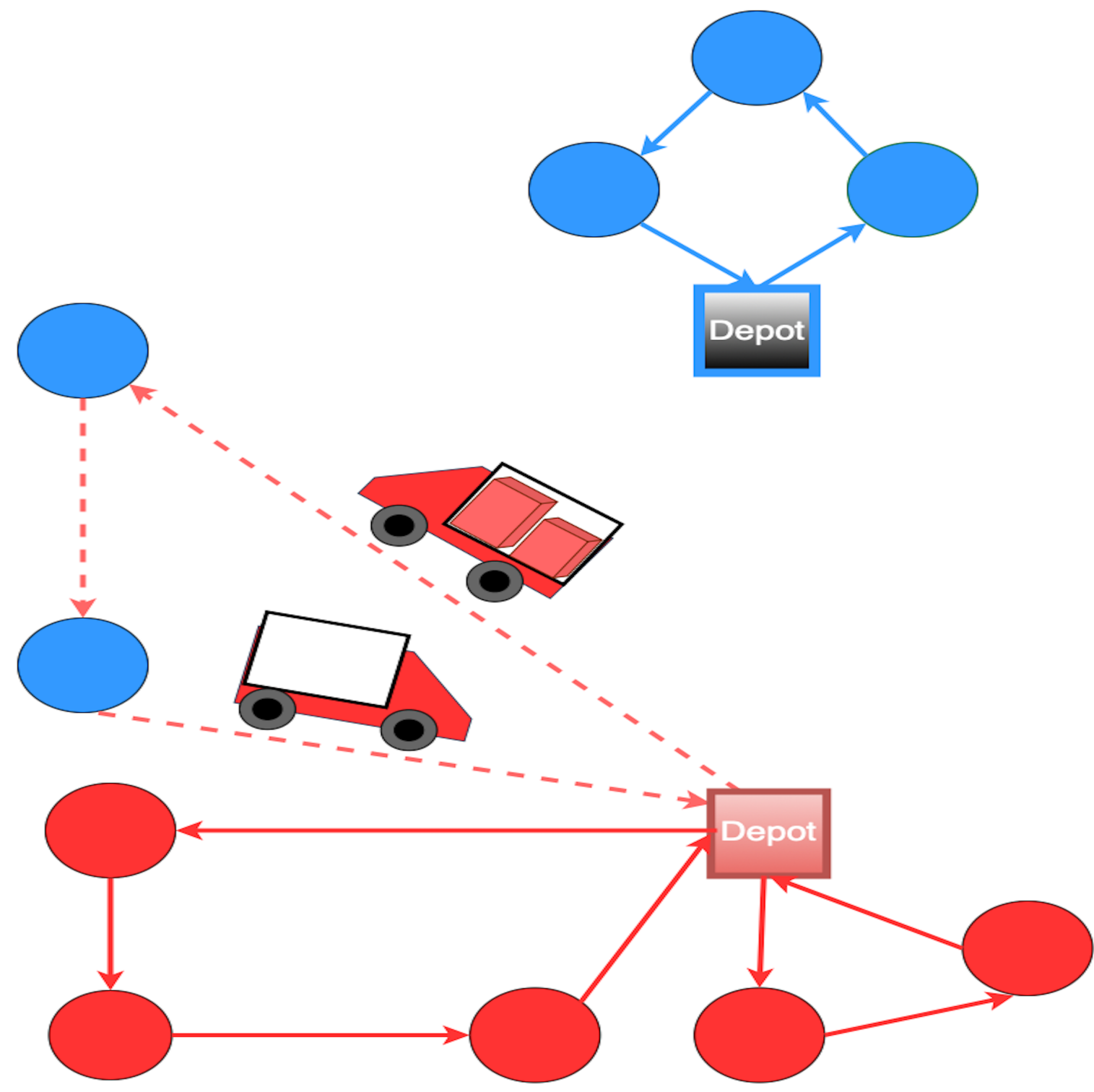
Resource sharing in logistics

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Introduction

Order sharing:

Carriers makes deliveries on behalf of other carriers.

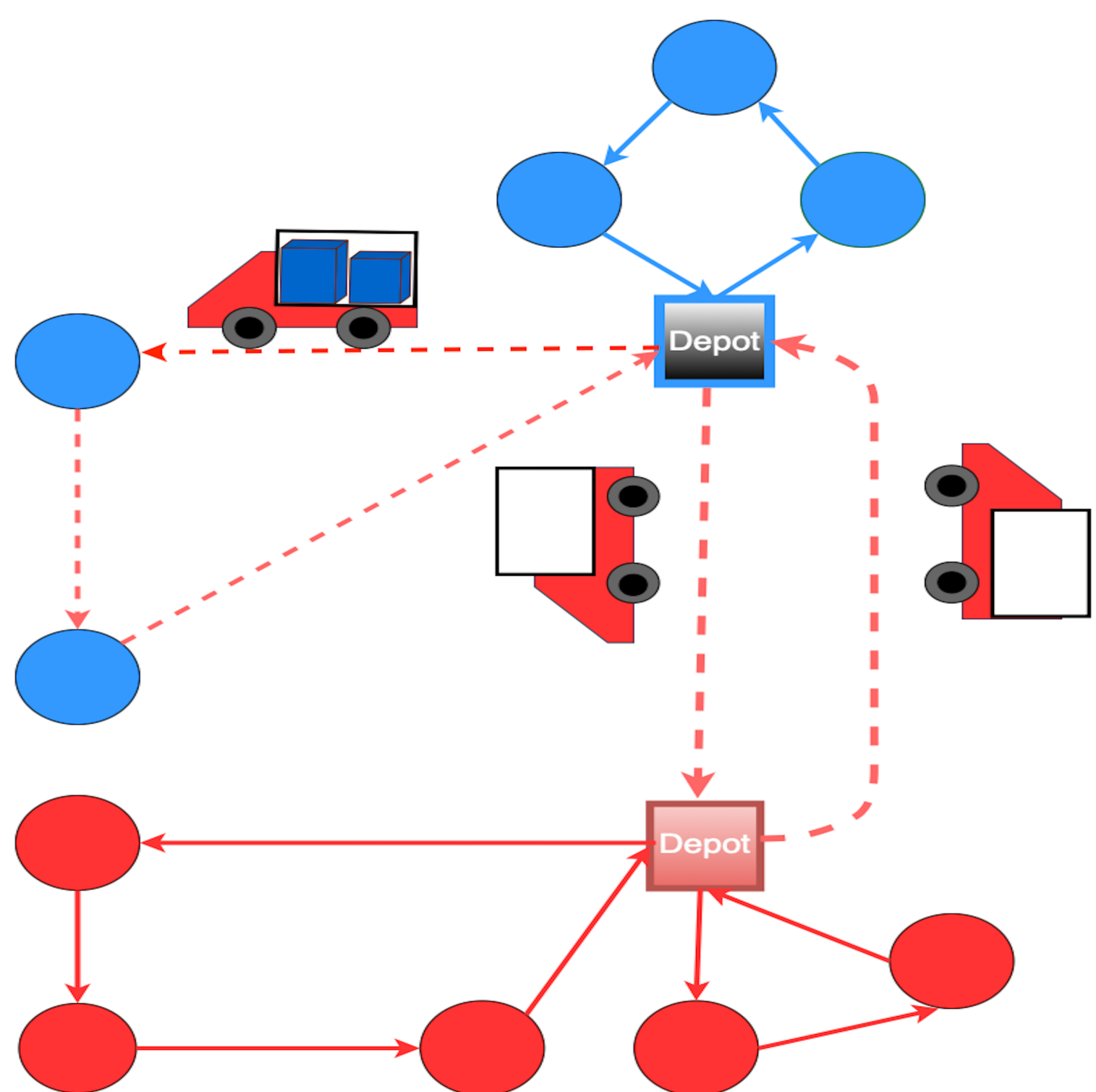


Disadvantages of order sharing:

- Trust issues
- Customer information sharing
- Delivery inconsistency

Collaborative vehicle utilization:

Carriers deliver only to their own customers using either their own or borrowed vehicles.



Collaboration incentive:

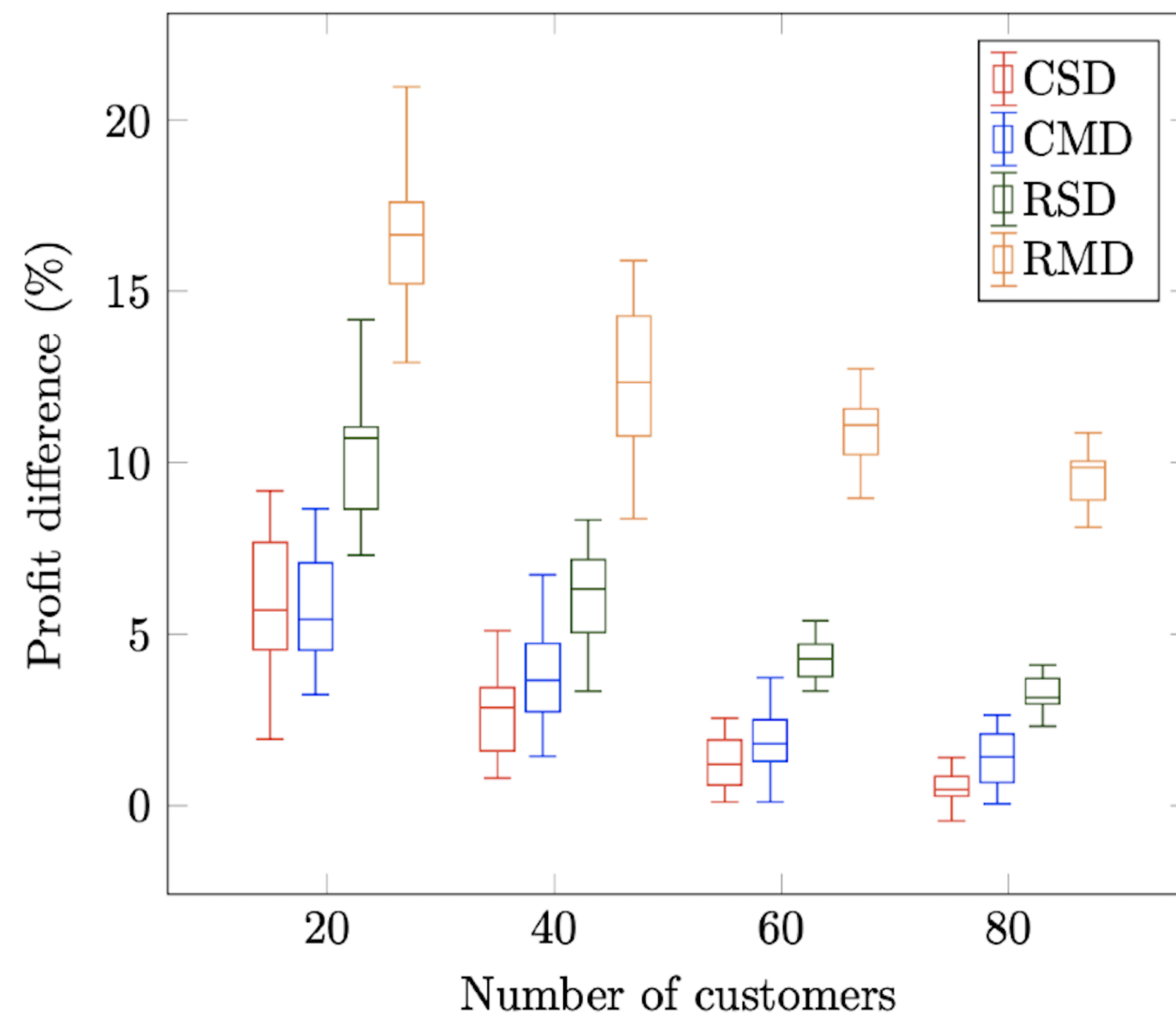
- Higher profit and customer satisfaction
- Fair profit sharing mechanism

References

- [1] Ahari, S.A., Bakir, I., Roodbergen, K.J., 2024. A new perspective on carrier collaboration: Collaborative vehicle utilization, Transportation Research Part C: Emerging Technologies, 163, 104647.
- [2] Ahari, S.A., Bakir, I., Roodbergen, K.J., (2024). Consistent collaborative vehicle utilization. Under Revision.
- [3] Ahari, S.A., Paradiso, R., Bakir, I., Roodbergen, K.J., (2025). Two-echelon vehicle routing problem with collaborative vehicle utilization. Ready to submit.

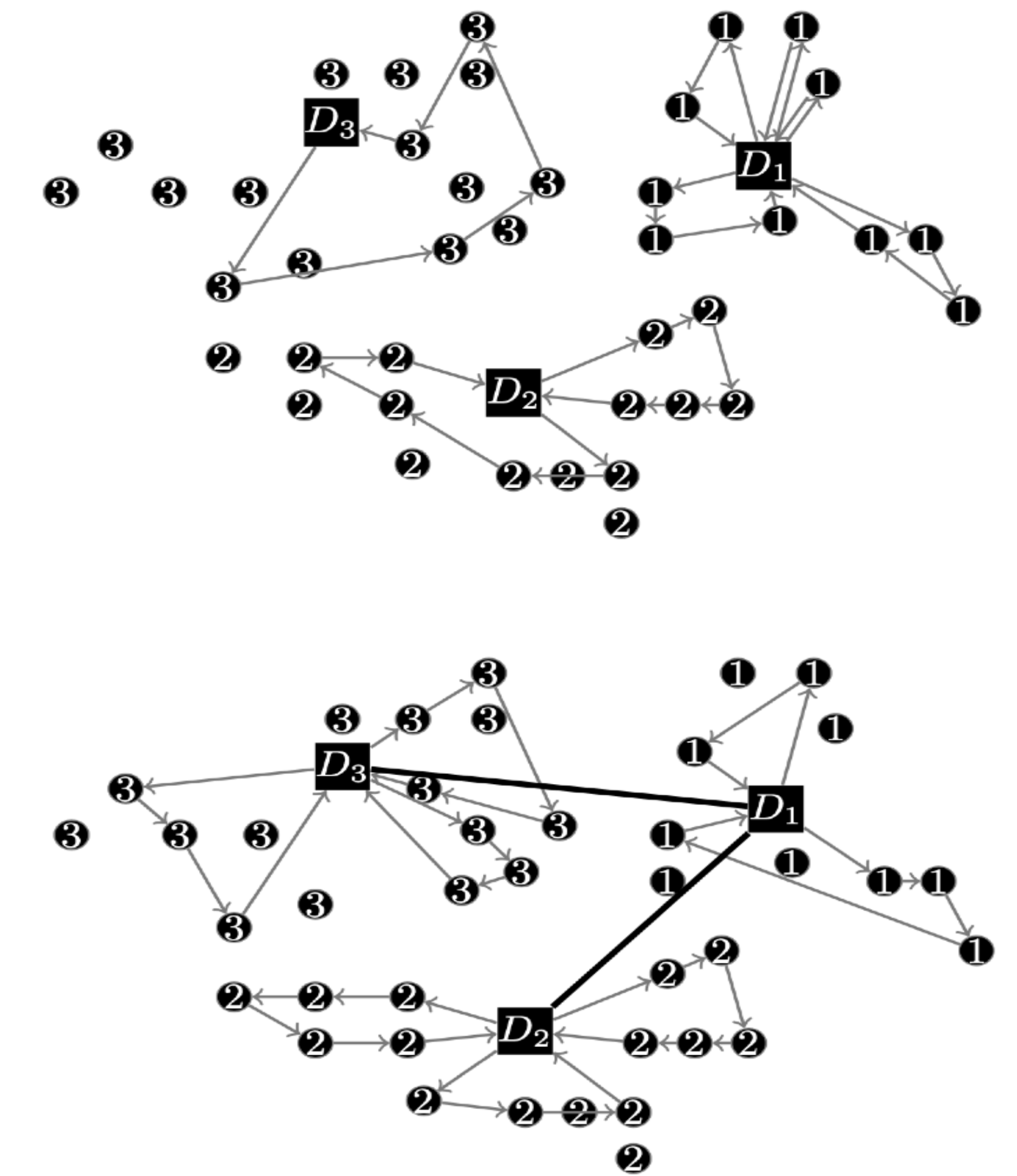
Collaborative vehicle utilization (CVU) [1]

- CVU achieves profits within 6.4% of order sharing on average while avoiding sharing customer information with other partners.



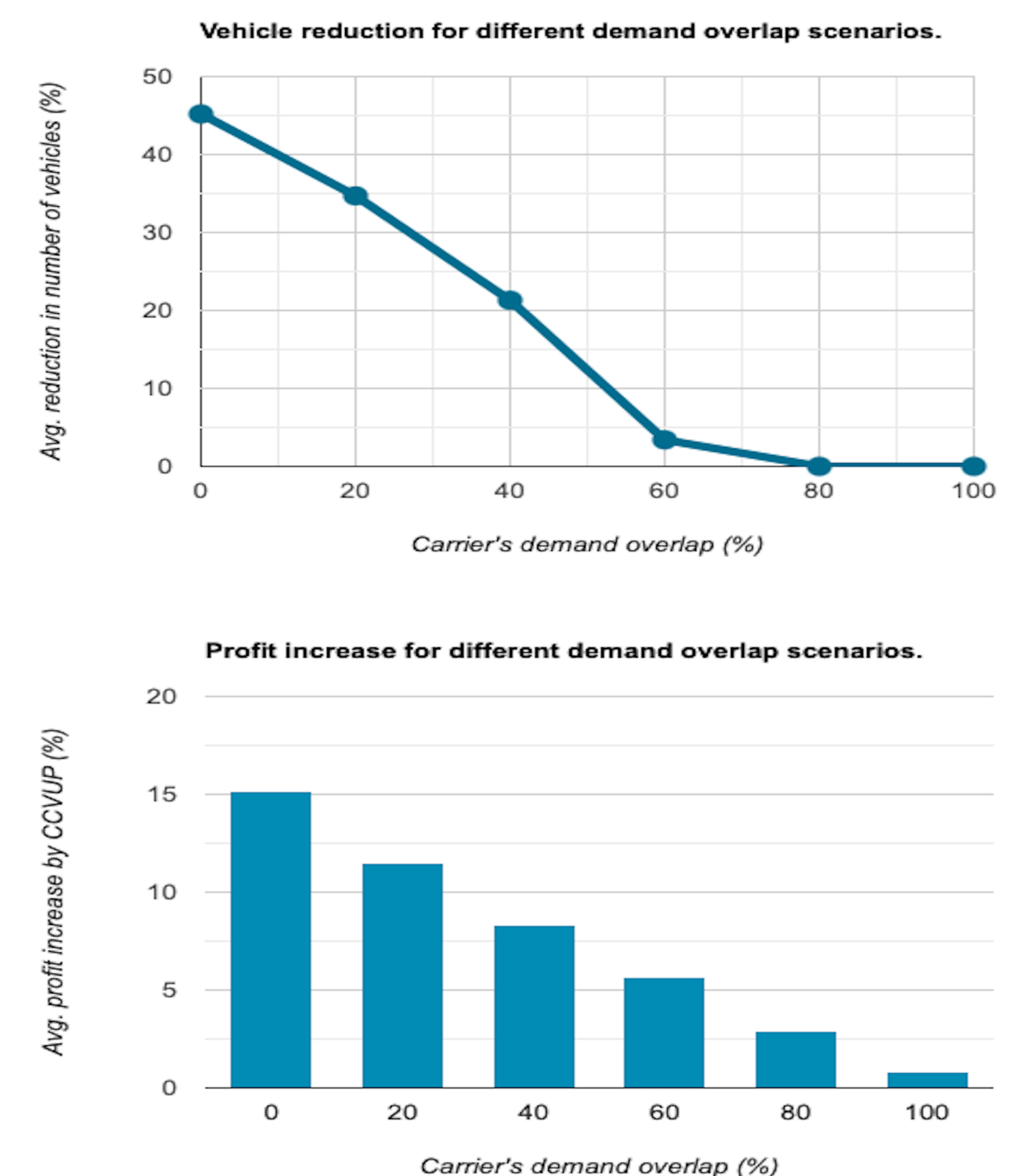
- The profit-sharing mechanism ensures that carriers are not better off leaving the coalition.

- CVU increases the number of visited customers by up to 11% while achieving a profit gain of up to 15%.



Consistent collaborative vehicle utilization (CCVU) [2]

- Extends CVU to a multi-period setting with consistency measures.
- Customers may choose delivery times from a predefined set of time windows.
- Carriers assign a fixed time window to each customer, selected from the customer's preferred set, for the entire planning horizon.
- Slight customer flexibility in time windows can significantly boost carrier profitability.
- Collaboration enables carriers to uphold consistent service standards without sacrificing profitability.



Two-echelon vehicle routing problem with collaborative vehicle utilization (2EVRP-CVU) [3]

- The problem features a two-echelon delivery structure for urban areas: CDCs to satellites, then satellites to customers.
- Vehicle sharing between carriers is allowed within each echelon.
- First-echelon vehicles make single trips, while second-echelon e-vehicles perform multiple trips.
- Satellites have capacity constraints, and capacity sharing is introduced to assess its impact on profitability.
- On average, vehicle sharing across both echelons yields savings of up to 10%, while satellite capacity sharing provides an additional 13% gain.

Case study

