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Freight Companies Can Share Assets to Achieve Cost and Emission Reductions and Transition to Zero-Emission Vehicles

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Issue

While freight transportation plays an important role in the economy, logistics operations generate negative externalities such as air and water pollution, noise, and congestion. New systems—such as zero- and near-zero-emission vehicles, advanced communications, and information technologies—and optimized operational algorithms can improve freight efficiency and reduce environmental impacts. However, as states like California develop initiatives and regulations to foster these technologies and strategies, the immediate economic impacts that these strategies will have on businesses, especially small- and medium-sized businesses, are not well understood. For example, small trucking companies may struggle to afford the higher up-front costs of cleaner vehicles. On the other hand, when the vehicle purchase is subsidized by the government, it could result in inefficient public spending if those assets are not used to the fullest (e.g., partially filled trucks).

One strategy that could directly reduce emissions and indirectly facilitate adoption of zero-emission vehicles is cooperation among logistics companies. Cooperation allows companies, especially smaller ones, to share loads, vehicles, and/or trips, to take advantage of economies of scale and reduce operational costs.

Researchers at the University of California, Davis developed a logistics decision-support tool that facilitates the joint routing of pick-ups and deliveries for cooperating entities to reduce environmental impacts and transport costs. The researchers implemented the tool in several hypothetical

case studies to better understand the impact of joint routing and zero-emission vehicle policies on transport companies. The tool quantifies the cost and emissions savings from coordinated operations (pick-up and delivery) by estimating reduced fleet requirements and improved utilization factors. Additionally, the tool can consider the technical specifications (e.g., payload, range) and requirements (e.g., charging/fueling) of zero-emission vehicles.

Key Research Findings

Operational improvements in routing decisions can be leveraged in the transition to zero-emission technologies. Results show that routing and dispatching tools can significantly improve the efficiency of vehicle utilization and reduce miles traveled and associated emissions. The efficiency gains can help the economics of purchasing new vehicles, including more expensive zero-emission vehicles.

Economies of scale and cooperation among freight companies can improve efficiency and reduce costs up to 70%. Empirical analyses show that, compared to independent operations, cooperative strategies between a small number of companies can achieve significant reductions in cost and maximize utilization of shared vehicles. See Figure 1 for an example of cost savings for two companies operating individually and cooperatively.

Cooperation has great potential to reduce emissions. Optimized routing and shared operations can achieve significant reductions in emissions due to decreases in vehicle miles traveled (from repositioning travel and other non-revenue travel).

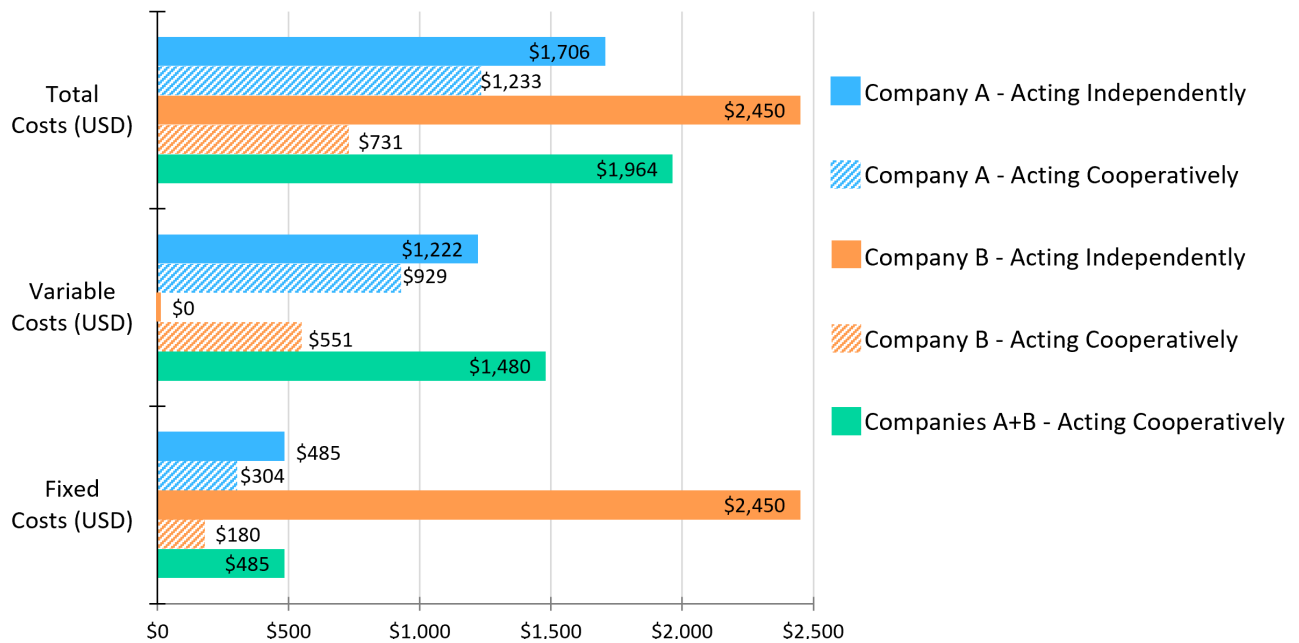


Figure 1. Example of cooperation benefits for a two-company operation.

Optimizing the level of technology substitution in fleets can balance environmental and economic factors. The analyses show that too little substitution may not generate significant reductions in emissions, and too much substitution (e.g., more than 70%) may be too costly for companies and the government to subsidize, at least in the short term. Moreover, achieving mandated fleet replacement targets for small and medium companies may only be possible under cooperation and resource sharing.

Policy Implications

The analyses in this study confirm the potential benefits of collaborative strategies, but several considerations must be addressed to put them into practice. Governmental support (e.g., resources, information, technical assistance) will be needed for companies to develop and use tools to improve operational efficiencies and to find cooperative opportunities. While large companies may have the resources and personnel to invest and use advanced information, communication,

and decision support tools, small and medium-sized companies do not. Therefore, new tools and resources are needed for sustainable and equitable improvements in the freight system. Additionally, agencies considering policies that mandate fleet improvements or emissions reductions should consider the role of cooperation and how shared assets (either privately owned or from service providers) are accounted for in new rules.

More Information

This policy brief is drawn from the report “Development of a Logistics Decision Support Tool for Small and Medium Companies to Evaluate the Impacts of Environmental Regulations in California” prepared by Miguel Jaller and Carlos Otero of the University of California, Davis. The report can be found at www.ucits.org/research-project/2020-43/.

For more information about the findings presented in this brief, contact Miguel Jaller at mjaller@ucdavis.edu.

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