

ABSTRACT

Everett, Stephanie R. Ph.D., Purdue University, May 2015. Overweight Vehicle Permitting Alternatives. Major Professors: Kumares C. Sinha and Samuel Labi.

Overweight vehicles exceed the federal and/or state statutory limits for either the gross vehicle weight (GVW) or the weight of individual axles or axle groups. National and state limits on vehicle weights were established to preserve the highway infrastructure and to protect the safety of the overall traveling public. Past research has shown that while overweight operations cause significant damage to roads and bridges, overweight vehicles are much more efficient for the trucking industry, which provides substantial economic benefits.

In the United States, individual states administer oversize and overweight vehicle permit programs to regulate and collect revenues from overweight operations. The fragmented network of state truck size and weight limits and overweight permit programs is far from optimal. For the agencies, the cost of consumption of highway infrastructure has far exceeded the collected revenues. For the users, the multitude of different regulations is disruptive to interstate operations.

The current study presents four alternatives to improve overweight vehicle permitting systems: a multiple objective optimization of traditional mechanisms, incentives for infrastructure friendly vehicles, an application of transportation demand

management through a quota with auction allocation, and harmonization among the varied overweight regulations.

The first three alternatives are quantitatively and qualitatively applied to a case study of new overweight commodity permits for metal commodities, up to 120,000 lbs, and agricultural commodities, up to 97,000 lbs, in Indiana. The study concludes with a qualitative discussion about harmonization of truck size and weight regulations and overweight vehicle permitting systems, including available tools and data needs to achieve harmonization.

The multiple objective optimization problem formulation is defined using Indiana specific estimated parameters. The results of the optimization are visualizations of the multiple Pareto optimal solutions and tradeoffs among the competing objectives of minimizing uncompensated consumption of highway assets and maximizing total logistics cost savings for the trucking industry.

Incentives for infrastructure friendly vehicles were recently introduced in Indiana for the overweight commodity permits. Survey data were used to estimate carriers' willingness to pay for investment in vehicles that do less damage to the state's highway infrastructure assets while still allowing trucking companies to reap the benefits of higher GVWs.

The proposed overweight vehicle quota system with auction allocation is similar to the Vehicle Quota System used in Singapore to manage demand for all vehicles, with modifications appropriate for the new application. Auction parameters, including the quota measure, the supply, and the auction format, are recommended based on Indiana's overweight commodity permit data.

The International Registration Plan and International Fuel Tax Agreement provide mechanisms that can be applied to streamline the collection of overweight vehicle permit fees among multiple states. In addition to the collection tool, individual states need to cooperate to identify overweight vehicle permitting best practices. Currently, many states compete against one another to attract economic activity through ever more permissive overweight practices. This has both ratcheted up the allowable weights, and resulted in a piecemeal system with many differences between neighboring states. Harmonization will benefit the trucking industry, industries of regional importance that rely on interstate overweight trucking to move materials and goods, and the participating states.