

The External Costs of Transporting Petroleum Products by Pipelines and Rail: Evidence From Shipments of Crude Oil from North Dakota

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Executive summary

Movements of petroleum products, particularly crude oil, have received enormous media attention. Almost all of the attention, including very recent coverage has focused on spill and accident costs while ignoring pollution and greenhouse gas costs. This lack of focus is striking given that air pollution and greenhouse gas costs are also likely to be significant and the fact that pipelines and rail differ from one another in important ways. While emissions from trains occur along the transportation route, emissions from pipelines manifest at the power plants that generate the electricity consumed by pumping stations. The distance between these power plants and the associated pumping stations can be quite large. Further, ground-level emissions, such as those from locomotives, tend to be more harmful than the same level of emissions released from tall smokestacks at power stations (Muller and Mendelsohn, 2009). Finally, the existing railroad infrastructure moves goods through population centers. In contrast, power plants are typically located in less densely-populated areas. This last difference matters for pollution exposure, because the emissions from trains moving through cities are likely to affect many more people than those emitted at power plants.

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Using data from a variety of government and private sources and the AP3 integrated assessment model, which maps county-level emissions to costs for counties affected by the emissions, this paper constructs new estimates of the air pollution, greenhouse gas, and spill and accident costs associated with the long-distance movement of petroleum products by rail and pipelines. Our analysis has three main findings. First, air pollution and greenhouse gas costs are substantially larger for rail than for pipelines. For shipments of crude oil from North Dakota to the Gulf Coast in 2014, the air pollution and greenhouse gas costs are nearly twice as large for rail as for pipelines. We provide evidence that the higher air pollution and greenhouse gas costs for rail relative to pipelines generalize to other products, routes, and years in North America. Second, air pollution and greenhouse gas costs are three times as big as spill and accident costs for rail and ten times as big for pipelines. Thus, the policy debate surrounding crude oil transportation has likely put too much relative weight on accidents and spills, while overlooking air pollution and greenhouse gas emissions, which appear to be a far more serious source of external cost. Third, the air pollution and greenhouse gas costs of rail transportation of crude are about one-fifth of the air pollution and greenhouse gas costs from combusting their refined end-products in motor vehicles and about one-fifth the private cost to the shipper of rail transport. The costs for pipelines are one-tenth the costs of combusting fuel in motor vehicles and one-fifth of the private costs of shipping crude oil.

Keywords Crude oil, air pollution, greenhouse gases, railroad, pipelines.