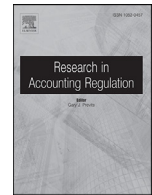




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Research report

Measuring the financial impact of environmental regulations on the trucking industry

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ABSTRACT

Since 2002, the Environmental Protection Agency has enacted federal regulations aimed at reducing pollution caused by diesel engines. This study provides an empirical examination of the effect of EPA regulations on the financial performance of firms in the trucking industry. The findings are relevant to regulators, practitioners, and academics because it addresses the impact of environmental regulations as well as the financial accounting standards process.

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1. Introduction

The transportation industry impacts nearly every American in terms of traveling from one location to another, shipping products throughout the country, or working in a transportation-related occupation. One important component of the American transportation system is the trucking industry. By 2018, 80% of all communities in the U.S. will be served exclusively by the trucking industry, and 70% of all tonnage will be moved by commercial trucks (American Trucking Association, 2009).

With the onset of deregulation, the Environmental Protection Agency (EPA) also increased its regulatory oversight of the trucking industry. The EPA established new requirements for the industry that included new engines and new types of diesel fuel. Three waves of regulation significantly impacted trucking companies, with one deadline established in 2002, and another in 2007. The third phase of the EPA mandates was integrated in 2010. With record-high fuel prices and asymmetric response to oil prices (Valadkhani, Smyth, & Vahid, 2015) along with lower rates because of an increasingly competitive industry, trucking firms found themselves examining the impact of becoming a “green” industry. While previous research has examined the impact of disclosure requirements (Fogel, El-Khatib, Feng, & Torres-Spelliscy, 2015) and compliance programs (Martin, Sanders, & Scalan, 2014), few researchers have examined the relationship between environmental factors and financial (or firm) performance (Ashcroft &

Smith, 2008; Clemens, 2006; Pugliese, Minichilli, & Zattoni, 2014). Moreover, this paper is the first to focus on the financial impact of EPA mandates on the trucking industry.

As such, the objective of this paper is to provide an empirical examination of the effect of EPA regulations on the financial performance of firms in the trucking industry. The measure of financial performance employed is the operating ratio, which is the ratio of operating expenses to operating revenues. Management, investors, creditors, regulators, and analysts most commonly use the operating ratio as an indicator of efficiency and profitability of trucking industry firms (Cassidy, 2013).

The research documented in this report is of potential relevance to the readership of this journal (regulators, practitioners, and academics) because it addresses two different types of regulations: the environmental regulations whose trucking industry impact is assessed, and the financial accounting standards regulation process of the FASB, which could consider requiring trucking firms to disclose their operating ratios on a supplemental basis to enhance external users’ ability to assess the impact of environmental and other regulations on the financial performance of those firms.

2. Background and relevant literature

The trucking industry as it exists today was created at the beginning of the 20th century. With the increase in number of firms entering the industry in the 1920s, railroads, as well as trucking companies, petitioned Washington for protective regulation. The existing firms in both industries wanted restrictions on both entry into the industry as well as constraints on prices (Stigler, 1971). The Interstate Commerce Commission (ICC) began regulating the

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trucking industry in 1935 and restricted both entry into the industry by new firms and prevented the expansion of existing firms. This process continued until 1980 when regulatory reform was enacted. These actions effectively removed barriers to entry and price restrictions for new firms, leading to increased competition in the for-hire trucking industry (Silverman, Nickerson, & Freeman, 1997).

Prior to the 1980s, the number of carriers remained relatively stable since the ICC had to approve new carriers entering the industry as well as local price bureaus setting price floors for freight and routes (Corsi, Grimm, Smith, & Smith, 1992; Silverman et al., 1997). Under this system, carriers earned substantial margins, with a portion paid to unionized labor (Silverman et al., 1997). As the number of carriers increased because of the removal of entry barriers, profit margins were reduced substantially, attributable to the downward pressure on price (Corsi et al., 1992).

The trucking industry predominantly uses diesel engines for a number of important reasons (Kilcarr, 2010); however, diesel engines are inherently pollutant as they emit large quantities of particulates in engine exhaust and nitrous oxide (NO₂). Therefore, it is not surprising that the EPA focused on the industry, as such focus is also consistent with the recent regulation to raise the Corporate Average Fuel Economy (CAFE) standards from 35.5 mpg to 54.5 mpg for 2025 model year vehicles (Ullman, 2016).

In 2001, a landmark case highlighted the extent of the EPA's investigative and enforcement powers. The American Trucking Association, the U.S. Chamber of Commerce, and nearly twenty trucking companies and other industry groups filed a lawsuit against the EPA, challenging the limits of the Agency's authority. In the landmark case, *Whitman versus American Trucking Associations*, the Supreme Court overruled an appellate court ruling restricting the EPA's enforcement abilities to only those that entailed a substantial cost/benefit analysis. In this unanimous decision, the Supreme Court upheld the EPA's authority to establish and enforce air quality standards under the new law, regardless of any costs imposed by the Agency's policies (The Oyez Project, *Whitman v. American Trucking Associations*). After the Supreme Court ruling, new regulations specifically aimed at the trucking industry have increased.

The relatively recent set of new regulations centered around two primary issues. These issues included the diesel motors that power the trucking industry and the fuel that has historically been used in these engines. The new rules required trucks to use more environmentally friendly engines and ultra-low-sulfur diesel fuel to achieve a marked reduction in the amount of pollutants created by on-highway engines. According to the EPA, the new mandates will cut harmful pollution by 97% over the course of three specified implementation stages. The EPA allowed a phase-in approach between 2002 and 2010 for these changes to occur, with each phase requiring more stringent standards for air pollution levels (Hannon, 2005).

In addition to the changes in engine design, the diesel fuel itself underwent a major transformation to meet new EPA requirements. The Agency required a 97% reduction in the sulfur content of diesel fuel. In essence, this reduction cuts levels of sulfur in diesel fuel from 500 parts per million to 15 parts per million. These changes are estimated to reduce NO₂ by 2.6 million tons per year and particulate matter by 110,000 tons (Kilcarr, 2010). To complicate the situation for the trucking industry, the use of old diesel fuel will cause major structural damage to the newly mandated engines.

Most of these changes that the EPA enacted were motivated by health-related issues. However, there is a cost to these changes. Some of the additional expected costs are higher priced engines and increased fuel costs. Other (indirect) costs may not be as obvious. For example, catalytic reduction technology (SCR), already used in over half a million trucks in Europe, will be one of the major changes in the EPA-compliant engines. Trucks equipped with SCR technology will reduce NO₂ to near-zero levels using

special diesel exhaust fluid. This exhaust fluid is injected into the engine's exhaust stream. The process converts truck exhaust to nitrogen and water, which are normal, non-pollutant elements in the atmosphere (Hartenstein, 2008).

Aside from the additional costs of the diesel exhaust fluid that has to be carried in separate storage tanks on the truck, the new engines will have special exhaust filters to process the truck's emissions. These filters hold a limited amount of soot. Thus, a process for burning off the pollutants using the special exhaust fluid must be incorporated into the engine's technology. This scenario creates several cost-related problems. To periodically burn off the material trapped in the exhaust filter, the temperature of the exhaust must be increased to temperatures exceeding 600 °C, causing serious problems with current docking facilities (Carey, 2005). Trucks could literally cause fires by backing up to loading docks with elevated exhaust temperatures. Costly changes will have to be made to delivery docks to avoid these types of potential problems.

Another significant cost relates to the particulate filter. For the filter to function properly, it must include high cost materials such as platinum and palladium. The more platinum that coats the filter, the less fuel needed to burn the soot from the filter. Therefore, a trade-off exists between production costs for these filters and efficient truck fuel usage. Third, aside from the inherent additional maintenance costs related to the newer engines, the industry also will face increased maintenance costs because of the new filtration systems (Carey, 2005). Some unique features of its operating structure exist. Trucking companies have some options for their organizational structure that are unavailable to other transportation sectors. For example, trucking firms can choose to use independent contractors who own their own trucks to haul freight. Alternatively, it is highly unlikely that the airline industry could contract outside pilots who own their own jumbo jets. Of course, the way a trucking company is organized can play a role as to the impact of deregulation and newly imposed EPA rules.

Two types of carriage exist in trucking: less-than-truckload (LTL) and truckload (TL). LTL carriage encompasses shipments of under 10,000 pounds, while TL comprises loads over 10,000 pounds and normally involves shipments from initiation points to specified destinations (Silverman et al., 1997). LTL and TL firms have markedly different operating characteristics because of the way each type of trucking company delivers its goods. The main difference lies in the manner that goods are delivered. LTL firms make extensive use of hub systems to collect and further distribute goods from single to multiple locations, and vice versa. This type of structure requires a significant investment in terminals that enhance breaking down large shipments. Since the choice of carriage significantly impacts a firm's investment in fixed assets, the additional costs of capital investment also impact the profitability of that company (Silverman et al., 1997).

Prior to deregulation in the 1980s, the Interstate Commerce Commission (ICC) used operating ratios to raise or lower freight rates. Under regulation, a rate increase/decrease was based on an operating ratio of approximately 93%. Trucking companies used an operating ratio in excess of 93% to support a request for rate increases. However, these rate increases were typically not granted until the entire regional rate bureau experienced similarly higher costs (Giordano, 1989). As noted in the introduction, even though the trucking industry was deregulated in the 1980s, most trucking companies continue to evaluate efficiency in terms of the operating ratio percentage as a measure of profitability. While the operating ratio is of practical importance to the industry, minimal research has been conducted in this area.

The empirical research to date focuses on three primary areas of study, including deregulation issues, use of owner-operators, and the effectiveness of the EPA in drafting environmental guidelines. Regarding deregulation, Silverman et al. (1997) addressed

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