

An Economic Analysis of HB18-1072

Public safety is threatened when drivers violate the rules of the road, for example, by ignoring red lights or exceeding posted speed limits. By engaging in these dangerous behaviors, drivers not only increase their own risk for accident, injury, or death, but they also threaten the wellbeing of the public with whom they share the road. These risky driving habits constitute an externality—a failure to consider the costs such behaviors exact on society as a whole. By imposing fines on violators, traffic cameras encourage safer driving practices and correct this externality by penalizing risky driving behavior. By banning the use of automated traffic cameras, House Bill 1702 will not only reduce the safety of Colorado’s roads, but will also allow a market inefficiency to persist in the form of an unaddressed externality.

Nationally, traffic accidents present a major challenge to the societal and economic well-being of our country. A 2010 government study estimated the annual cost of these accidents to total \$836 billion dollars, or roughly 6% of the country’s GDP.¹

Colorado is no exception to these findings. In 2013, Colorado’s annual traffic-accident death rate was 9.1 per 100,000 people— only slightly lower than the national average of 10.4. Massachusetts, New Jersey, and New York, by contrast, have an average rate of 5.7².

While numerous factors contribute to the disparities in these rates— road design, rates of car ownership, availability of public transport, etc.— 24 states have converged on one solution to increase public safety: red light and speeding cameras³.

¹ Blincoe, L. J., Miller, T. R., Zaloshnja, E., & Lawrence, B. A. (2015, May). The economic and societal impact of motor vehicle crashes, 2010. (Revised) (Report No. DOT HS 812 013). Washington, DC: National Highway Traffic Safety Administration.

² Sivak, Michael & Schoettle, Brandon (2015, October). Mortality from road crashes in the individual U.S. States: A Comparison with Leading Causes of Death (Report No. UMTRI-2015-28). Ann Arbor, Michigan: University of Michigan Transportation Research Institute.

³ *Red light running: camera enforcement works to curb this dangerous behavior* (2018, February). Retrieved from http://www.iihs.org/iihs/topics/laws/automated_enforcement

Proponents of these systems say that traffic cameras increase road safety by deterring risky driving behavior. Critics charge that cameras have little effect on road safety and are used primarily to generate revenue for local governments. Our analysis aims to address these claims.

The data suggest that proponents are correct in their assessment of the impact of traffic cameras on public safety. Consider red light cameras (RLCs) in particular. A study by Northwestern University of RLC's in Chicago found that their use reduced rates of right-angle crashes ("T-bone" crashes) by 19%. While rear-end crashes increased by 10% after the introduction of RLCs, these sorts of crashes are both less frequent and less severe. Some cameras did increase the total number of crashes, but overall, crashes were reduced by 10%⁴.

The Chicago findings reflect the results of many studies conducted on RLCs since their introduction in 1972: generally speaking, RLCs reduce the frequency of the most severe and common accidents, and while they may increase rear-end impacts, in aggregate they reduce material damages and loss of human life. Before declaring their use a success, however, we should evaluate whether the government's use of cameras and fines constitute an efficiency-improving intervention or if there exist better, market-driven solutions.

In theory, a market might be able to solve the problem of red light running behavior most efficiently if roadway users could place a price on the benefits drivers realize from speeding or violating lights (faster travel times, etc.) and weigh those against the costs rendered to other users (increased risk of injury, material damages). Red light runners and speeders could pay other drivers to let them violate rules of the road, or other drivers might pay would-be violators to change their behavior.

⁴ Mahmassani, H. S., Schofer, J. L., Johnson, B. L., Verbas, O., Elfar, A., Mittal, A., Ostojic, M. (2017, March). Chicago Red Light Camera Enforcement, Best Practices & Program Road Map. Evanston, IL: Northwestern University Transportation Center.

In practice, however, it is difficult to imagine how such a market might be implemented effectively. Interactions between drivers are fleeting. Negotiations between hundreds of individuals in the course of one driving excursion would be prohibitively complex and costly; the costs of running such a marketplace would be excessive. For this reason, we see no such markets in existence today.

What remains, then, is an unaddressed externality: those who speed and run red lights are free to ignore the costs that their behavior imposes on the rest of society. By ignoring this externality, drivers engage in dangerous behaviors at higher levels than that which is socially efficient. Imposing a fine on violators that reflects the costs to the rest of the public forces them to consider the total costs of their behavior, reducing the number of violations towards a lower and more efficient level.

This theory has been validated in the observation that intersections equipped with RLCs see a reduction not only in accidents, but in the total number of violations as well. A meta-analysis conducted by researchers in 2010 showed that the presence of RLCs “generally reduces violations by 40-50%”⁵. Moreover, the Northwestern study showed that the number of violations decreased every year, suggesting that drivers learn and adjust their behavior.

We can now see that there is sufficient justification for the use of automated cameras: an externality exists, this externality is unlikely to be addressed through market mechanisms, and the use of red light cameras corrects this externality.

However, that the mere use of RLCs reduces the number of violations does not necessarily guarantee a more efficient outcome—fines and penalties must be commensurate

⁵ Retting, R. A., Ferguson, S. A., Hakkert, A. S (2003). Effects of Red Light Cameras on Violations and Crashes: A Review of the International Literature. *Traffic Injury Prevention*, Vol. 4, Issue 1.

with the severity of the violation. To illustrate this, we might imagine an extreme penalty in which drivers were fined \$100,000 per violation. Total violations and accidents would no doubt plummet, but such penalties would plunge violators and their families into poverty and destroy lives. Many would choose not to drive for fear of accidentally running a light. Surely, this would not represent an improvement in society's well-being. It is important, then, that penalties imposed are proportional to the societal costs of each violation.

Fortunately, ample data are available that may be useful to assess the costs of these dangerous driving behaviors and optimize efficiency. By availing themselves of these data, Colorado's state and local governments could impose fines that accurately reflect the costs of violators' behavior, thereby ensuring a more efficient outcome than would be achieved by assessing arbitrary penalties.

A 2016 study by researchers at Auburn University found that nationwide, "the weighted average comprehensive cost per [red light running] crash was estimated as \$177,935". Factoring in the probability of running a red light causing a crash, the study calculated that risk-adjusted cost of running a red light to be \$118⁶. In both Denver and Boulder County, the fee is \$75, or nearly 40% lower than the calculated cost. Far from unfairly penalizing Colorado drivers, fines are likely not high enough.

We should also be skeptical of the assumption that motorists are competent judges of the risk they take by running red lights. Assuming a wait time of 30 seconds and that half of the adjusted cost of \$118 is incurred by risks to the violator, a driver running a red light with no regard for the safety of others is making a calculation that the 30 seconds they save is worth

⁶ Baratian-Ghorghi, F., Zhou, H., Zech, W. C. (2016). Red-light-running traffic violations: A novel time-based method for determining a fine structure. *Transportation Research Part A: Police and Practice*, Volume 93, pp. 55-65.

the \$59 dollars of personal risk. This amounts to a valuation of their time at \$7080/hour. Barring the possibility that a highly disproportionate number of red-light-runners are professional athletes, movie stars, CEOs or oil magnates, this suggests motorists not only underestimate the societal costs of running red lights, but their own personal costs as well. RLCs, then, represent a corrective force by providing more accurate market information through fines.

There is also little evidence to suggest that cameras issue tickets incorrectly. In Denver, drivers can appeal their tickets and request citation reviews if they feel they have been unfairly fined. Car owners can also sign a 'Not Pictured Driver Affidavit' if they are not the one recorded driving the car at the time of the violation. Speeding cameras also require verification from human operators before a citation is issued. Boulder and other cities maintain similar practices. So, while fines may provide revenue for the city, it is generated from violators only and often used to improve road safety through other means⁷.

The reasons that recommend the use of RLCs also apply to speeding cameras. Speeding cameras correct an externality in the absence of viable market alternatives, and enhance public safety while reducing material damages. A 2005 meta-analysis of 14 studies showed a wide range in the efficacy of speeding cameras in reducing accidents, injuries, and fatalities, but all showed significant reductions in the immediate vicinity of camera placement⁸. While less information is available on calculating the fee schedules for speeding violations, there is sufficient data available that would allow investigation into determining fines.

⁷ *Photo enforcement program*. Accessed February 10th, 2018.. Retrieved from <https://www.denvergov.org/content/denvergov/en/police-department/traffic-enforcement>

⁸ Pilkington P., Sanjay, K. (2005). Effectiveness of speed cameras in prevent road traffic collisions and related casualties: systematic review. *BMJ*, 330:331.

Lastly, we should remind ourselves that these cameras only assess penalties when laws are being violated. Banning their use would signal to drivers that the Colorado State Government believes the laws governing roadway safety are open to interpretation, and that perhaps these laws are in fact more a set of suggestions than real regulations. If endorsed by members of the General Assembly, this sort of selective enforcement would undermine the authority of any laws—past, present, and future— passed by the legislature.

In conclusion, the House Bill 1702 represents a step in the wrong direction. While prohibiting the use of traffic cameras might prove politically expedient—no one likes getting a ticket, after all—the very real benefits of these systems to public safety are well-documented, and their disappearance would lead to an inefficient outcome for society as a whole. This is not to say that they should be used indiscriminately—in particular, the placement of RLCs should be given careful consideration to minimize the uptick in rear-end collisions they cause while reducing angle-crashes most effectively. Fees must also be appropriately assessed. But an outright ban would allow an externality in the form of needless death, injury, and property damage costs to persist when it could instead be partially remedied through this fairly straightforward solution.