ASSESSING US AUTOMOBILE SAFETY FROM AN INTERNATIONAL PERSPECTIVE: AMERICAN EXCEPTIONALISM REVISITED

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Abstract. While America's automobile safety record is often viewed as an outlier internationally because of its high motor-vehicle fatality rate and stagnant safety progress, this paper argues that America is not "exceptional." By examining the market for mobility, we explain that fatality risks are equilibrium outcomes driven by consumer demand. Disparities between the U.S. and its peer countries result from its preferences for vehicle power, speed, and driving intensity rather than from differences in its safety technology and public policies. Recognizing that the U.S. makes different trade-offs between safety and consumption than other countries is important for understanding that significant improvements in road safety are unlikely to come from policy reforms but from the adoption of autonomous driving technologies.

February 2026

1. Introduction

Motor-vehicle crashes are one of the largest preventable causes of death in the United States. The annual costs of highway accidents alone exceed $1.5 trillion annually, including fatalities, injuries, the loss of quality of life, and vehicle and property damages (Winston and Karpilow, 2020). Productivity losses of prime-age adults and the future contributions of America's youth amplify the costs of automobile accidents.

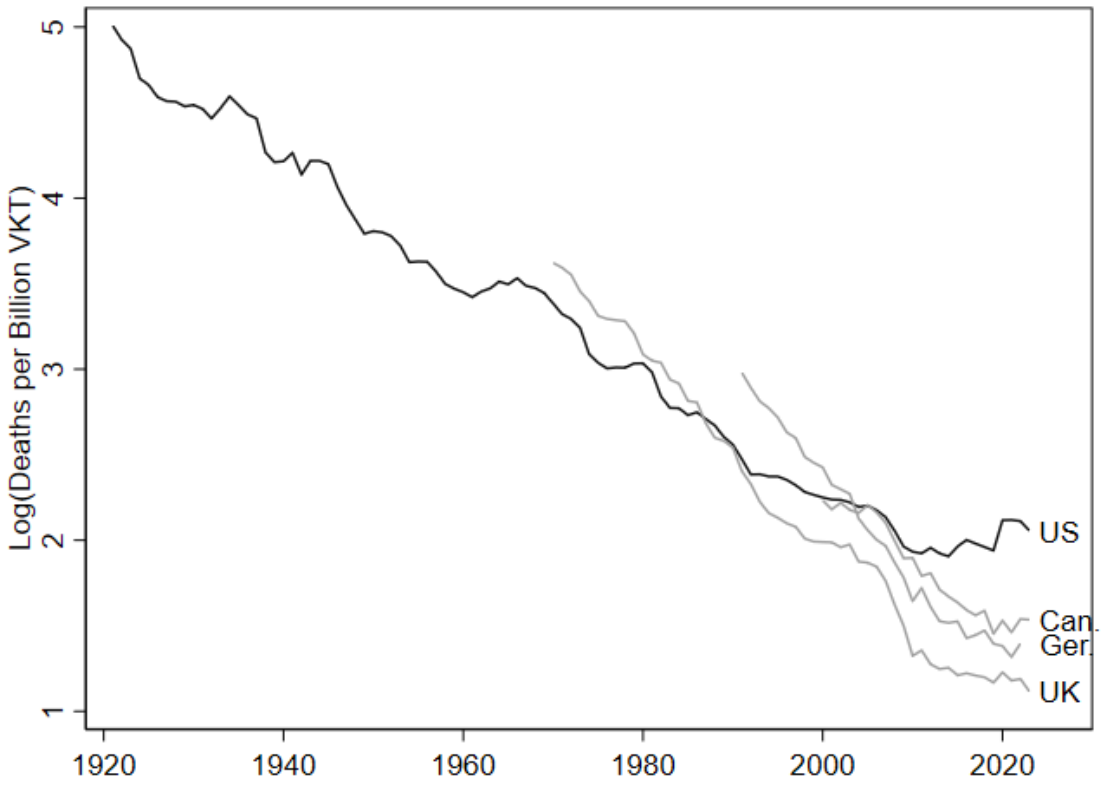
For more than a century, the United States has attempted to ameliorate those costs by regulating the behavior of drivers through licensing requirements, speed limits, and laws against driving under the influence of alcohol or drugs, improvements in highway design, such as paved roadways with visible markings, and technological advances in vehicle safety, such as reinforced structures, airbags, and electronic stability control. In addition, both the US liability system and traffic law enforcement incentivize motorists to drive safely.

As shown in figure 1, the US fatality rate (fatalities per vehicle-kilometer traveled, VKT) declined at roughly a constant rate for much of the twentieth century, but it has virtually stagnated during the past two decades. The lack of safety improvement is particularly alarming when compared with the safety performance of the peer high-income countries also shown in the figure, which in recent decades have exhibited both a lower fatality rate and a faster rate of improvement in the fatality rate.

Explanations for America's relatively poor safety performance are implied by various policy recommendations to address America's exceptionally risky driving environment including passing stricter blood alcohol concentration laws, implementing primary enforcement of seat belt laws covering all seating positions, and adopting speed-reducing roadway design countermeasures (Yellman and Sauber-Schatz, 2022). At the same time, the average U.S. passenger vehicle is 25% heavier than those in Europe and 40% heavier than those in Japan, which also reduces the safety of highway travel in the U.S. (The Economist, 2024), but we are not aware of any serious policy proposals to significantly reduce the weight of the nation's passenger vehicle fleet.

We take issue in this paper with conventional characterizations of and explanations for America's highway safety exceptionalism by arguing that, in fact, America is not exceptional when it comes to highway safety. Importantly, policy recommendations to

Figure 1. Fatality Rate Over Time in the US and Peer Countries



address America's exceptionalism are based on a misguided framework. The basis for our argument is that a market for automobile mobility exists, where we show that fatality risks are equilibrium outcomes driven by consumer demand. Thus, highway safety disparities between the U.S. and its peer countries result from American motorists' driving preferences instead of from differences in highway designs, vehicle safety technologies, and public policies. Accordingly, the U.S. makes different trade-offs between safety and consumption than other countries make, which policymakers should understand limits the efficacy of conventional public policies and motivates the importance of the U.S. adopting autonomous driving technologies.

In what follows, we develop a market for mobility that consists of the demand for mobility or quantity of driving, measured by VKT, and the supply or highway capacity for driving also measured by VKT. We introduce an explicit safety price of driving given by the fatality rate (probability or risk of a fatality per VKT). In standard analyses of transportation behavior, prices also exist that determine the out of pocket costs and time

costs of driving, but they are not central to our analysis. Equilibration of supply and demand determines the safety price of driving and the quantity of driving. Changes in automobile safety can therefore reflect shifts in the physical supply, such as lanes, or quality, such as pavement smoothness, of highway capacity, as well as shifts in the demand for mobility. Underlying motorists' demand for mobility are their preferences for speed, or driving intensity, and their driving behavior, which include alcohol and drug use.

Given this framework, the US faces the same problem as other countries face of creating a market for mobility where motorists' preferences and behavior and the public's provision of highway capacity result in an equilibrium level of fatality risk. At the same time, a tradeoff exists between the public and private expenditures that affect highway safety and the nation's consumption. Importantly, the US and its peer countries do not have fundamentally different accesses to automobile safety technologies or highway designs or have fundamentally different institutions affecting safety policy.

We find that the US has different automobile safety outcomes than other countries because it chooses a different equilibrium "bliss point" along a common safety–consumption frontier. That is, compared with most peers, American motorists appear willing to pay a higher safety price of driving to be able to drive faster in vehicles with greater power. We support this conclusion in two ways. First, we document a striking regularity based on the historical record of fatalities and driving in 22 developed countries: in most countries, the fatality rate time series in logs is very well approximated by two linear segments with a kink in the late 2000s to early 2010s. This smooth decline reflects a near constant rate of improvement in safety, which is consistent with countries' gradual accumulation and slow depreciation of a stock of "safety capital" comprised of the vehicle fleet, the highway network, enforcement capacity, and the like. The regularity is unlikely to have arisen from a sequence of idiosyncratic policy changes or technological innovations.

Second, we present evidence showing that the effect of America's demand for driving on the equilibrium level of automobile safety is stronger than the effect of other countries' demand for driving on the equilibrium level of safety. In contrast, evidence indicates that the evolution of automobile safety in peer countries is primarily attributable to the deployment of safety capital.

Given these findings we conclude that policymakers' preoccupation with conventional automobiles safety policies and investments that ether try to change drivers' behavior or that try to increase the highway safety environment will yield, at best, modest improvements in road safety. This conclusion is certainly consistent with the road system's disappointing safety performance during the past two decades. We suggest that a technological advance that shifts the safety–consumption frontier such that society could reach a new bliss point that yields higher social welfare would be the only way to significantly improve automobile safety. We conclude that emerging autonomous vehicle technologies are the leading candidate to have this effect (Winston, Yan, and Associates, 2024).

2. An Economic Framework for Analyzing Automobile Safety

Generally, the price of automobile safety, measured by fatality risk, has not been specified in previous research on automobile transportation demand. Of course, researchers have found evidence that drivers respond to changes in perceived risk by adjusting their behavior to maintain a constant probability of the risk of an accident (Peltzman, 1975, Wilde, 1982, and Winston, Maheshri, and Mannering, 2006). We specify a price for safety risk and derive the demand for and supply of mobility to determine equilibrium in the (safety-denominated) market for mobility.

Price for Safety Risk

Formally, let F_t be the total number of traffic fatalities in year *t* and Q_t be the total quantity of vehicle-kilometers driven in year *t*, so p_t is the fatality rate in year t:

$$p_t = \frac{F_t}{Q_t}. \qquad (1)$$

In the more familiar language of prices, p_t can be thought of as drivers' expectations of the number of fatalities they have to "pay" per kilometer of driving. Lower values of p_t mean that the safety price of a kilometer of mobility is lower. To express p_t as an explicit price in dollars, one can assume a value of life for F_t. For example, the US Department of Transportation currently values human life in an automobile accident for statistical purposes, referred to as the value of statistical life (VSL), at $13.7 million.

The pair (p_t, Q_t) is the equilibrium outcome in the (safety-denominated) market for mobility, where mobility is produced using infrastructure and vehicles and is consumed by households and firms who value travel but attach disutility to the risk of a fatality. The equilibrium trajectory $\{(p_t, Q_t), t = 0,1,2, \dots\}$ is observable in the data and provides information about shifts in supply and demand as in any other market.

For simplicity, we abstract from heterogeneity across drivers and environments, and we focus on fatalities rather than injuries and other costs of accidents. We also acknowledge that drivers and households make various choices that affect highway safety, such as how much and often to drive, when and where to drive, how intensely to drive, and what type of vehicle to drive. In our framework with a simplified representative driver, these choices all map into the observed equilibrium (p_t, Q_t).

Demand for Mobility and the Value of Safety

To formalize demand, we consider a representative driver who enjoys utility $v(q_t)$ from driving a distance of q_t; we assume $v'(q_t) > 0$ and $v''(q_t) < 0$. Further, we assume that the disutility from traffic fatality risk is proportional to expected fatalities, which for an individual driving q_t kilometers at safety denominated price of p_t is $p_t \cdot q_t$. Let V denote the value of a statistical life (VSL) measured in units of utility; thus, the driver's utility maximizing decision to travel a distance q at time t can be written as:

$$\max_{q_t} \; v(q) - V \cdot p_t \cdot q_t \tag{2}$$

The associated first-order condition $v'(q_t^\star) = V \cdot p_t$ implies a downward-sloping demand curve: as driving becomes riskier, a person's demand for driving decreases. Of course, demand also potentially depends on out-of-pocket and time costs, macroeconomic conditions, and the availability of modal substitutes and telework.

Supply of Mobility and Safety Capital

Unlike the demand for mobility, characterizing the supply of mobility is complicated by the presence of other vehicles on the road, possibly leading to congestion. We posit that mobility safety is affected by the physical infrastructure, technology of the vehicle fleet, and traffic law enforcement, which we denote as the safety-capital stock K_t. When the infrastructure is improved or expanded or the vehicle fleet becomes safer, the same quantity of automobile travel is possible at a lower safety denominated price. But

because infrastructure and vehicles are slowly depreciating durable goods, and policy changes take time to implement and enforce, K_t should be expected to evolve slowly and gradually.

Safety also is affected by traffic exposure itself. Thus, we specify the following simple reduced-form relationship linking fatalities to the safety-capital stock and traffic exposure:

$$F_t = \phi(Q_t, K_t), \tag{3}$$

where the safety production function satisfies $\phi_Q > 0$ and $\phi_K < 0$. Dividing this expression by Q_t yields the fatality rate; hence, we can define a supply schedule of mobility as:

$$p_t = \frac{F_t}{Q_t} = S(Q_t, K_t). \tag{4}$$

The supply schedule maps driving exposure into a fatality rate holding the stock of safety capital fixed. In uncongested conditions, $S(Q_t, K_t)$ is upward sloping because more driving leads to more exposure to other vehicles and more opportunities for vehicles to collide. But as traffic density increases and the road network becomes congested, speeds decline and crash severity is reduced (see, for example, Elvik et al., 2019.)

This point can be seen formally by expressing fatality risk as:

$$p_t = \text{Crashes/km.} \times \text{Fatalities per crash} \tag{5}$$

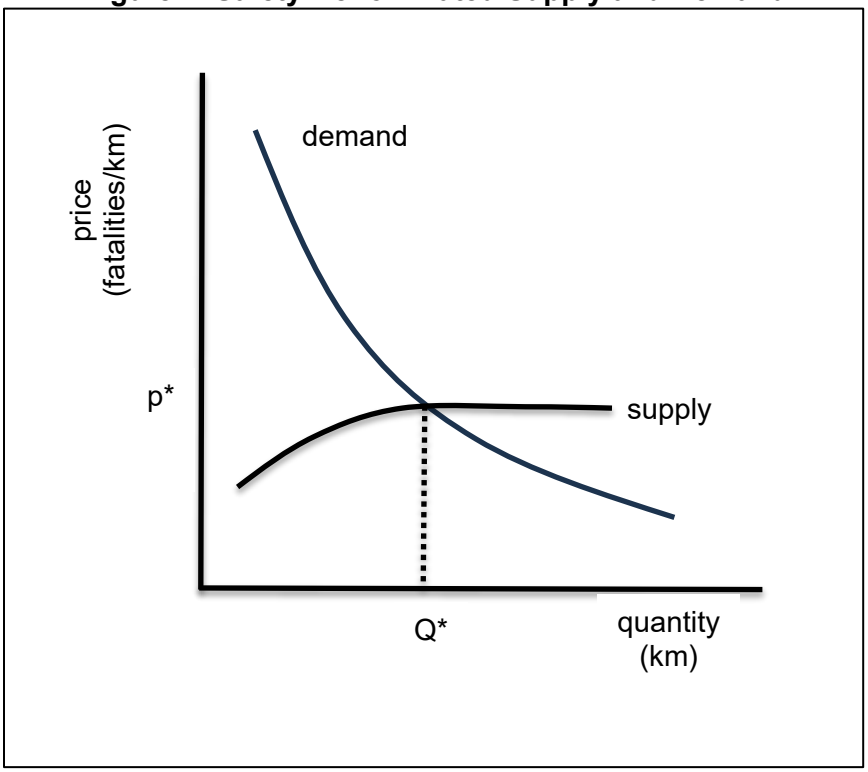
Vehicle exposure increases the first term because higher density reduces the margin for error from car-following, vehicle merges, lane changes, and crossings. Congestion reduces fatalities per crash by limiting speeds and kinetic energy upon any vehicle impact. Because even modest speed reductions can generate large reductions in fatal outcomes, when networks become congested, p_t is increased by greater vehicle exposure and reduced by less severe outcomes of a collision. We hypothesize that the offsetting forces eventually cause the mapping from Q_t to p_t to become nearly flat.

To further understand this relationship, we borrow from Vickrey (1969), who argued that once highway demand approaches or exceeds a bottleneck created by a bridge, tunnel, lane closure, or traffic signal, congestion takes the form of a queue. In this situation, throughput is fixed at capacity, and additional demand manifests itself in longer and longer

travel delays. Growing queues and delays result in very low speeds effectively shutting down the safety effect of exposure such that the relationship between the supply price of safety risk and traffic is constant.

Capacity expansions, signal optimization, access management, and targeted redesign are undertaken largely to manage delay and reliability. In the long-run, networks will expand until salient queuing begins to appear, but does not dominate all day. Thus, many jurisdictions in practice operate near the boundary between free-flow and queuing, where speed is most sensitive to demand, and the forces of exposure and congestion on the supply price of safety risk are most likely to offset each other and yield a locally flat safety denominated supply curve. Figure 2 summarizes the market for mobility where the equilibrium price of safety and quantity of automobile travel are determined by downward sloping demand and horizontal supply.

Figure 2. Safety-Denominated Supply and Demand



3. Empirical Evidence on Automobile Safety for Comparative Purposes

We apply the preceding simple framework to provide perspective on the available comparative evidence on automobile safety in the United States and peer countries. We obtained data on traffic fatalities and driving volumes to construct a panel dataset of annual automotive fatality rates per-kilometer. Generally, annual traffic fatalities are well measured and internationally comparable because they are recorded through vital statistics and national crash reporting systems. We use harmonized fatality counts from the OECD/International Transport Forum road safety databases, which are supplemented by national statistical agencies. We focus on total road fatalities to maintain comparability across time and across countries.

Obtaining consistent data on traffic volume, measured as total vehicle-kilometers traveled (VKT), is more challenging because countries measure VKT differently. Some use odometer readings from periodic inspections, others rely on traffic count models combined with sample surveys, and still others rely on fuel consumption and fleet-level estimates of fuel economy. We compiled the best available national VKT series from OECD/ITF and national transport ministries and were advised that any differences in the VKT series were not sufficiently serious to bias any of our findings. Our baseline sample includes 22 OECD countries. In descriptive regressions we exclude pandemic years beginning in 2020 because travel patterns, enforcement, and risk composition changed abruptly and dramatically throughout the world.

Evolution of the Fatality Rate

Figure 1 showed that a striking feature of the fatality rate for selected countries is its near piecewise-linearity with a single kink. Accordingly, we fit a piecewise linear regression to each country's log fatality rate in our sample as a function of time *t*:

$$\log p_{jt} = \alpha_j^1 + \beta_j^1\, t + \beta_j^2 \big(t - \tau_j\big) \cdot 1_{t \geq \tau} + \epsilon_{jt}$$

where t indexes years, j indexes countries, $1_{\{\}}$ is the indicator function, and τ_j is a country-specific kink year that is selected to maximize fit. We summarize the best-fitting slopes and kink years in Table 1, where all coefficients are statistically significant and the countries are presented in order of decreasing slopes.

For virtually every country, two linear segments, showing improvements in the fatality rate, fit the time series extremely well, often with an $R^2 > 0.95$. This striking

Table 1. Country Level log(fatal/VKT) Time Series Regressions.

Country	$\hat{\beta}^1$	$\hat{\beta}^2$	τ	R^2	Sample
Poland	-0.217	-0.067	2011	0.980	2008-2019
S. Korea	-0.115	-0.067	2009	0.926	2000-2019
Austria	-0.066	-0.033	2013	0.995	1970-2019
Germany	-0.064	-0.031	2010	0.996	1991-2019
Israel	-0.061	-0.053	2015	0.980	1970-2019
Slovenia	-0.060	-0.099	2005	0.974	1970-2019
Japan	-0.059	-0.043	2005	0.956	1965-2019
France	-0.058	-0.043	2005	0.995	1970-2019
Netherlands	-0.058	0.026	2013	0.988	1972-2019
Switzerland	-0.055	-0.061	2013	0.995	1965-2019
Belgium	-0.054	-0.126	2011	0.993	1985-2017
Great Britain	-0.053	-0.018	2010	0.992	1965-2019
Australia	-0.052	-0.025	2015	0.995	1970-2019
Finland	-0.050	-0.039	2015	0.981	1975-2019
Norway	-0.050	-0.073	2011	0.980	1973-2019
Denmark	-0.049	-0.027	2011	0.987	1965-2019
Sweden	-0.047	-0.025	2010	0.985	1965-2019
Iceland	-0.046	-0.032	2007	0.813	1980-2019
New Zealand	-0.039	0.013	2011	0.939	2000-2019
United States	-0.033	0.004	2010	0.992	1921-2019
Czechia	-0.022	-0.057	2005	0.971	1980-2019
Canada	-0.013	-0.044	2008	0.988	2000-2019

Notes: All estimates are statistically significant at the 99% level.

regularity supports our expectation that safety-capital should evolve slowly and gradually because if safety improvements were dominated by discrete policy changes or one-off technological breakthroughs, we might expect a series with many abrupt changes. Instead, the smooth, nearly exponential decline in p_{jt} suggests gradual accumulation and slow depreciation of a stock of safety capital. Any major technological innovations and investments diffuse through the vehicle fleet and physical infrastructure slowly. Older vehicles remain on the road, road networks are rebuilt over decades, and drivers' behavioral norms take time to change.

Although the two-line fit is ubiquitous, countries' intercepts differ, which pins down different levels of fatality risk, as do their slopes. Given that the fatality rate is measured in logarithms, each of the slopes correspond to an average rate of change of safety improvement over the relevant period. In most countries, $\hat{\beta}^1$ is much larger (in absolute value) than $\hat{\beta}^2$, which reflects rapid declines in fatality risk followed by slowing

or stalled declines in the late 2000s or early 2010s. In most of the remaining countries, $\hat{\beta}^1 \approx \hat{\beta}^2$, implying that the slowdown or stall in safety improvement has yet to occur.

Interpreted through the lens of our safety supply–demand framework, with horizontal supply, the long-run declines in fatality rates largely reflect the rate at which the supply schedule shifts downward; that is, how quickly safety capital accumulates and how effectively it translates into lower fatality risk. Countries with faster vehicle fleet turnover, more rapid roadway modernization, or stronger adoption and enforcement of effective traffic safety laws are likely to exhibit steeper declines.

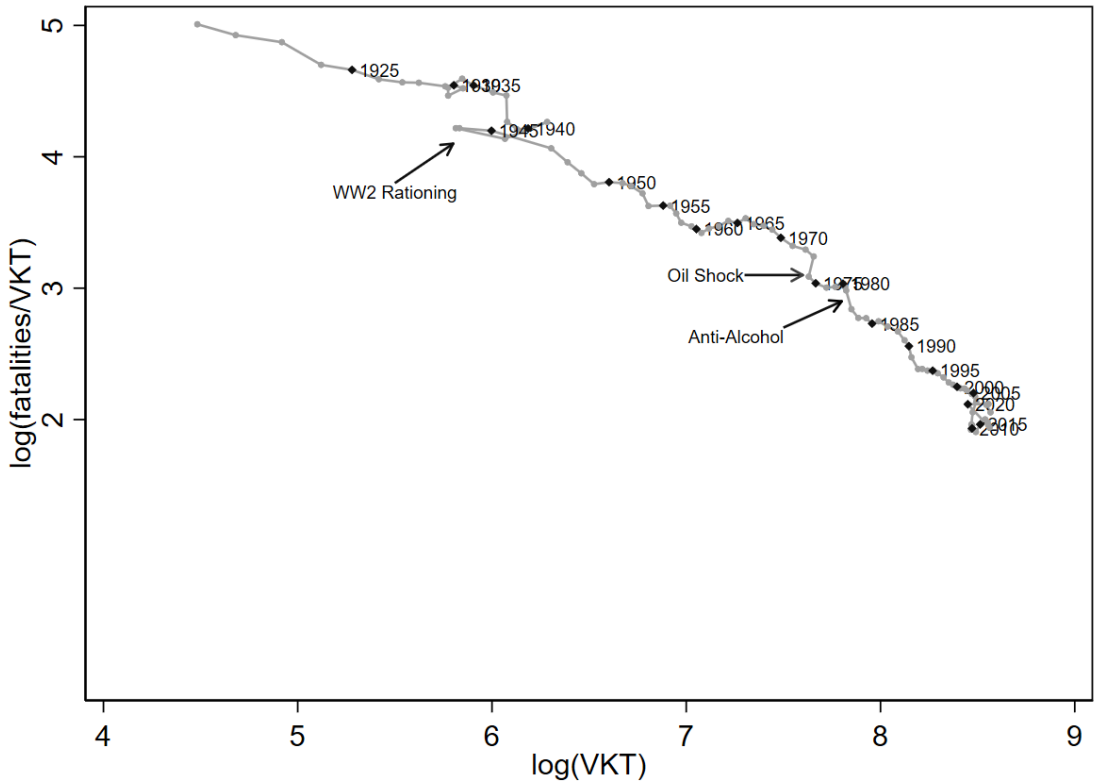
The United States is notable for both its higher level of fatality risk relative to most of its peers and for its virtually flat post-2010 slope. At the same time, its time-series pattern is broadly aligned with the two-segment structure we find for other countries. This suggests that the U.S. is pursuing a similar process pursued by other countries to improve automobile safety, but it has obtained a lower level of efficacy with a slower recent rate of improvement.

Equilibrium Trajectories

It is useful for us to plot the joint evolution of equilibrium fatality risk and driving in (p_t, Q_t) space. Locally, the trajectory's slope can be interpreted as an elasticity of risk with respect to driving exposure along the realized equilibrium path. A slope near zero indicates that risk per kilometer is insensitive to exposure—consistent with a flat supply curve resulting from offsetting exposure and congestion effects. A positive slope indicates that exposure raises risk resulting in an upward-sloping supply curve. A negative sloping supply curve indicates that additional exposure is associated with lower risk per kilometer, which could occur in a regime where speed reductions from congestion dominate exposure to other vehicles.

We present the equilibrium trajectory for the United States in figure 3 by plotting log fatality risk against log VKT. Consistent with the time series regression results, the figure shows a negative equilibrium trajectory over roughly a century of highway travel, which is consistent with the gradual accumulation of safety-capital, including the anti-drunk driving movement spurred by Mothers Against Drunk Driving in the 1980s. It is striking that the accumulation of safety capital appears to have stalled in the last two

Figure 3. Trajectory of log(fatal/VKT) on log(VKT) for the US



decades. We speculate that this is due to policymakers prioritizing maintenance of an aging road system instead of investing in ways to improve its safety.

The trajectory also drifts to the right, which given a flat safety supply curve near equilibrium, mainly reflect shifts in demand. The largest demand shifts occurred immediately following mass production of the automobile in 1910, which revolutionized travel and could be used for farm chores. Demand continued to increase in the post-war period as the US economy grew significantly, but at a slower rate as a greater share of households took to the road. Since 2000, driving demand has effectively stalled. Over the period, the largest contractions in demand occurred when fuel and rubber were rationed during World War II and during the energy shocks of the 1970s.

The US equilibrium trajectory clarifies the importance of distinguishing between policy interventions and technological improvements that reduce risk per kilometer (vertical shifts) and exposure (horizontal shifts) as well as frontier-shifting technologies that allow both safer and more abundant mobility (down-and-right movements). Given the

these distinctions, the importance of a frontier-shifting technology like automation, which we discuss below, becomes clearer.

In the appendix, we present equilibrium trajectories for all the countries in our dataset, which display some heterogeneity. Compared with other countries, the U.S. stands out for having stronger shifts in demand over time and a higher baseline level of driving exposure.

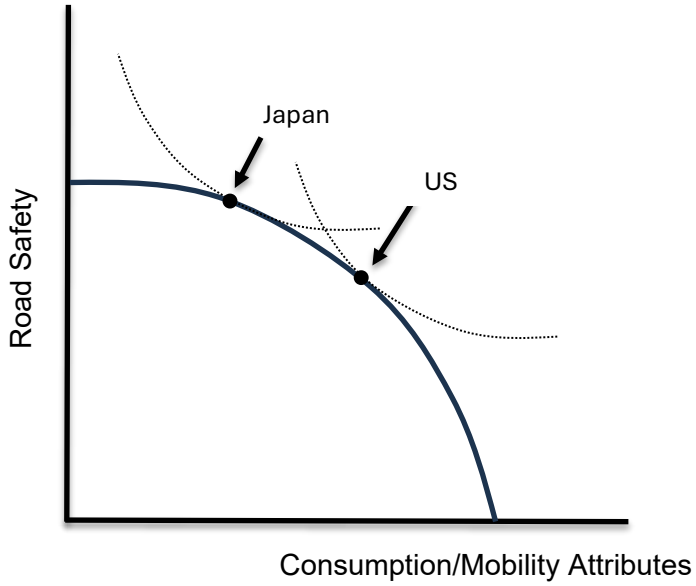
4. Discussion

The economics of automobile safety around the world raises a puzzle. First, affluent countries largely share access to the same vehicle and roadway technologies. Major safety innovations such as seatbelts, airbags, crashworthy structures, stability control, and automatic emergency braking are developed and sold in a global market by multinational automakers and component suppliers, roadway engineering, and design standards diffuse internationally. Second, the basic menu of policy instruments including speed limits, seatbelt laws, impaired-driving enforcement, vehicle inspections, insurance requirements, and emergency response exists in these countries. Finally, the empirical evidence we found indicates that these countries have similar evolutions in safety risk. Yet, there are clear differences in safety outcomes across countries; in particular the U.S. is at the high end of fatality risk and has made little improvement in reducing that risk since 2010.

Given that persistent differences in technologies or policies are unlikely to explain differences in outcomes and to form the basis for reforms to improve safety, our view is that they reflect different equilibrium choices that encapsulate how different societies trade off safety versus consumption and the convenience of driving. Consider two countries where one country has stronger preferences than the other country for mobility due to a combination of differences in land use, trip lengths, cultural preferences, and reliance on driving for work. This country will drive more and be willing to pay a higher price for safety in fatality risk, while the other country may be willing to devote more resources to safety capital because it places a higher value on safety.

The U.S. clearly has strong preferences for mobility that is essential because of extensive suburbanization that is supported by a road system that facilitates long-distance travel. The “arms race” in highway travel reflects U.S. consumers’ high value of vehicle

Figure 4. Road Safety Production Possibilities Frontier



attributes such as size and power, which correlate with speed and crash severity (Winston and Yan, 2021, Knittel, 2011). In our framework, those choices are represented by shifts in the safety denominated demand for mobility and a higher willingness to pay for the safety price of additional mobility. Given these preferences, proposed policies that would restrict mobility or speed will incur stronger political opposition than in a society with weaker preferences for mobility or speed.

Our framework therefore converges on a conventional economic concept to explain differences in countries' automobile safety outcomes and their implications: the production possibilities frontier (PPF). For example, figure 4 presents a PPF with safety on the vertical axis and a composite of consumption and mobility attributes on the horizontal axis. Affluent countries, such as Japan and the US, with similar technologies face a similar frontier, but they choose different bliss points on the frontier. The U.S. chooses a bliss point with higher consumption and mobility attributes and a higher price of road safety, while Japan chooses a bliss point with a lower price of road safety and lower consumption and mobility attributes.

Because the safety-consumption choice is not limited to automobile travel and it would be expected that countries prioritize safety in different domains, it would be misleading to draw any general implications from this example about Americans' or any other country's attitude toward safety. Consider, for example, a broader set of safety domains to include highway safety, firearm safety, and climate/heat adaptation with the numeraire consumption. As in the case of highway safety, investments in firearm safety and climate/heat adaptation can reduce mortality risk at the cost of consumption and subject to political constraints.

Recent annual fatality rates from traffic, firearms, and excess heat for the US and Europe illustrate our central point that America's relatively weaker safety performance reflects society's preferences not any shortcomings in technology, safety policies, and enforcement per se. With traffic and firearm fatality rates per 100,000 population of 11.0 and 12.1 respectively, the U.S. has substantially more deaths in these domains than the EU with traffic and firearm fatality rates per 100,000 population of 5.1 and 1.4 respectively. However, with heat-related deaths per 100,000 population of 23.5, the EU has substantially more deaths in this domain than the U.S. with heat-related deaths of 0.62. The U.S. has a somewhat lower aggregate fatality rate than the EU across the three categories.[1]

The implications of this evidence is that one should exercise caution before reacting to the greater rate of traffic fatalities in the U.S. compared with a specific country's or group of countries' traffic fatality rates by recommending a policy whose intention would be to equalize traffic fatality rates. Further, it would be inadvisable to believe that such a policy would be constructive because of its intentions.

5. Policy Implications and the Role of Automation

The widespread flattening of automobile fatality-risk declines in the United States after 2010 indicates diminishing marginal returns to existing policy approaches, with slower diffusion of new safety capital, or a shift in the nature of risks. We have therefore

[1] These figures are based on the following sources. The 2019 US and EU automobile fatalities are from the U.S. Department of Transportation and OECD, respectively; 2019 U.S. Firearm Fatalities come from the CDC; 2019 EU-27 Firearm Fatalities come from Eurostat and the Small Arms Survey; 2019 U.S. excess heat deaths from the CDC; and heat deaths for the 51 countries in the UN European region are an annual average over 2000-2019, per the World Health Organization

attempted to identify how automobile safety policy could be improved by taking a comparative international perspective on safety performance. Our conclusion that differences in automobile safety across countries are driven largely by differences in motorists demand for safety relative to mobility suggests that given a fixed technological frontier, US policymakers face limited policy options because they face larger costs and stronger political resistance to trading off consumption and mobility attributes for road safety than policymakers in other countries face. Accordingly, policies and technologies that shift the technological frontier outward—making mobility safer without requiring large sacrifices in convenience and consumption—are likely to produce durable improvements in safety and not likely to encounter effective political opposition.

Autonomous safety features provide a salient example of innovation that shifts the frontier outward. Advanced driver-assistance systems (ADAS) consisting of a suite of safety features that assist in both the forward dimension (automatic emergency braking and adaptive cruise control), and the lateral dimension (lane departure warning and blind spot collision prevention) can prevent crashes by substituting for driver attention in specific tasks. Recent evidence using detailed vehicle data indicates that ADAS reduces accident risk and may substantially reduce single-vehicle fatal crashes even after accounting for selection and behavioral response (Maheshri, Winston and Wu, 2023).

The continuing improvement and diffusion of automation in vehicles will cause the supply of safe mobility to shift downward, while increasing the demand for travel by reducing the cost of lower stress, lower perceived risk, potentially lower time cost from a lack of incident delays. The net effect on highway fatalities will increasingly be less of an issue as we continue to make large strides to approach fully autonomous travel that becomes ubiquitous and pushes the frontier in figure 4 so dramatically outward in the safety dimension that cross-country differences in equilibrium safety prices narrow or even disappear (see appendix figure 1).

By focusing on the market for mobility and a production frontier that trades off highway safety for consumption and desirable mobility attributes, we have reframed the debate over U.S. automobile safety performance and constructive ways to improve it. The U.S. is not exceptional in its safety outcomes, but its slowing rate of fatality decline over time that has actually stalled during the past two decades along with its preferred point on

the production frontier indicate that significant improvements in automobile safety that notably advance social welfare will not be produced by conventional safety policies, highway investments, and stronger and more widespread enforcement. Instead, significant improvements are much more likely to come only from technological advance and infrastructure investments that shift the frontier outward. Emerging autonomous vehicle technologies are the leading candidate to have this effect. Policymakers should focus their attention on working effectively with the private sector to expedite this outcome.

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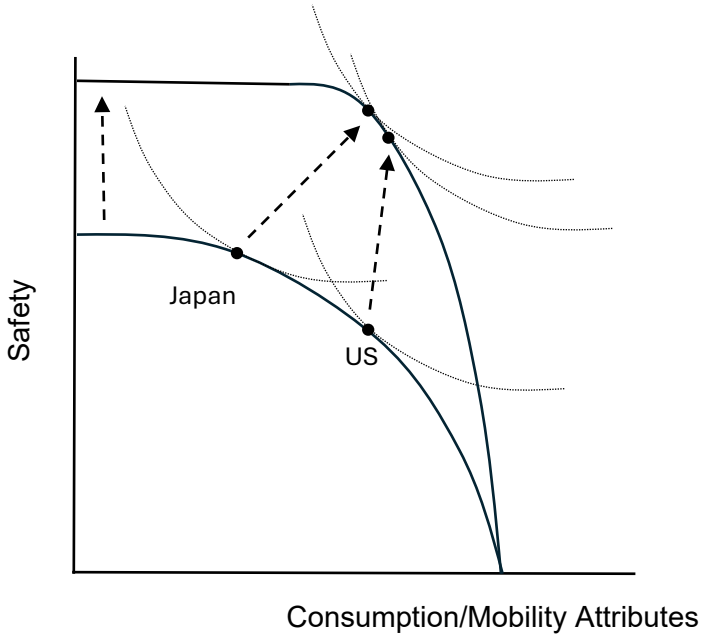
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Appendix A. Additional Figures and Descriptive Fits

Appendix Figure 1. Long Run Shift in the Safety PPF from Automation



Appendix B. Measurement

document data sources country-by-country, discuss VKT measurement differences